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A holistic, scenario-independent, situation-awareness and guidance system for sustaining the Active Evacuation Route for large crowds

EVACUATE EXPLOITATION PLANS

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List of Acronyms - Definition

| Acronym | Definition |
|----------|--------------------------------|
| DoW | Description of Work |
| EUAB | End User Advisory Board |
| ISV | Independent Software Vendors |
| EC | European Commission |
| EVACUATE | Project acronym |
| MXX | Project Month XX |
| DX.X | Project deliverable number X.X |
| TX.X | Project Task number X.X |

EXECUTIVE SUMMARY

1.1 SCOPE

“Business Model, Stakeholders Exploitation and Business Plans” describes the partners’ exploitation and business plans, in line with the exploitation intentions and modalities associated with the eVACUATE project results.

The deliverable elaborates on the joint exploitation efforts of the consortium and it includes a basic market analysis and also potential analysis of competitor projects and services.

This first release is primarily an assessment of eVACUATE framework exploitation plans at an early stage of the project. At the time of editing, requirements have been clearly defined, while the architecture and framework capabilities will be released at the same time as the current deliverable. As such the exploitation plans are expected to evolve as the R&D work advances and user tests are carried out.

The deliverable will rely on the outputs of task T12.2.1 that is intended to initially identify the exploitable products and services of the project, which will be built around the eVACUATE framework. The exploitable products and services include the eVACUATE framework for exploitation and understanding in emergencies management, as well as individual components of the framework that could be exploited autonomously.

The document is more focused on partners’ exploitation plans and the discussion for joint exploitation planning is only starting. It will evolve during project activities and will be clearly defined in the following versions of this deliverable.

1.2 AUDIENCE

The content of this deliverable can be of interest to a wide range of individuals within these groups:

- **eVACUATE project members:** It will help project members to understand ideas regarding business plans and market targets and will help an advanced discussion for joint exploitation solutions.
- **eVACUATE End-Users:** End Users will have a basic idea of what kind of products and services may be available in the future through the eVACUATE framework.
- **Stakeholders:** the deliverable provides information that can be disseminated to potential stakeholders while helping future market analysis and feedback collection.

1.3 STRUCTURE

The deliverable is structured as follows:

- Section 2 – Introduction
- Section 3 – A preliminary Exploitation Strategy description for the eVACUATE project
- Section 4 – A description of exploitable products and services
- Section 5 – A Market analysis
- Section 6 – A description of eVACUATE partners individual exploitation plans

2 INTRODUCTION

Research projects represent the possibility to join different kinds of experiences and entities trying to achieve goals in the evolution and exploitation of opportunities and technologies.

Also research projects should lead in the possibility to find real and effective utilization of ideas, technologies and platforms that have been developed. It's important to develop not only solutions and technologies but also try to clearly understand real world applications and also adapt to stakeholders' requirements, aspiration or just long term expectations regarding their mission.

The opportunity to get strong feedback from end users directly involved in the project as partners and also as external end users provides technical partners with the ability to design the future evolution of project results and derivative products and services in the most effective way.

In this stage of the project, products and services which have been developed, including eVACUATE single components, are going to be integrated in the final prototype system which will be demonstrated in several reference scenarios. This deliverable will provide an exploitation plan of the different components and solutions and will define the exploitation and commercial roll-out strategy which will be adopted by the eVACUATE consortium.

A Market analysis is described in this document but due to rapid evolution of markets and other business proposals, this initial market analysis will be further developed during the evolution of the project in its last phases. The idea is to maintain a clear view of the market and of available solutions that may be similar to eVACUATE and also try to define enhancements that may emerge from observation.

Transforming the eVACUATE prototype system, components and services from prototypes to robust and commercial oriented products and services will be the scope of the final stage of the project and will eventually require additional development efforts after the conclusion of the project lifecycle.

As part of the exploitation and commercialization plans, the eVACUATE consortium industrial partners will put in place their capabilities as market player and technological partners for an effective commercial proposition: this will represent an important part of business proposal because will involve not only the capabilities to create an effective solution but also to adapt and evolve in time and with reasonable resources to a changing world.

3 EXPLOITATION STRATEGY

In this chapter are described the main steps that should be followed in terms of defining a complete exploitation strategy, including expected project results, approach to new markets, inclusion of additional Stakeholders and exploitation plans.

The main phases of the exploitation strategy are:

1. **Target Market:** Within this phase the identification of the most interesting/ attractive market areas, which eVACUATE may target will be defined. In a second phase the current trends/gaps that exist in each of the selected markets will be defined, while tracing the potential competitors and the technological commercial available solutions provided by each one of them. A market analysis indicating the potentials of the existing markets in the long run should be also performed.
2. **eVACUATE Outcomes:** The results obtained from target market analysis will be used as reference for the eVACUATE products and applications in order to meet specific market needs.
3. **eVACUATE Market penetration:** For introducing successfully eVACUATE outcomes into the targeted markets, several actions should be performed including the identification of the existing links and establishing communication channels and promotion into those markets. The target audience which every application should serve, the expected benefits that those audiences will experience after using this application as well as the dissemination strategy which should be followed to make the applications and their corresponding technologies a reality to the targeted end users and relevant stakeholders will be included in this phase.
4. **Implementation Strategy:** Implementation strategy deals with those actions that need to be performed in view of minimizing the potential risks from the deployment of project applications in mass market. It includes the identification of **Key performance Indicators, the achievement of a risk** and **SWOT analysis** as well as the comparison of the developed technology and its corresponding features with those already existing and can be used as benchmark for performance evaluation.

3.1 EXPECTED PROJECT RESULTS

The research carried out in the eVACUATE project will be used to drive the implementation of the next generation emergency management and crisis management tools, which will leverage latest advances in crowd management information gathering, processing, analysis and incident identification.

eVACUATE will lead to several exploitable products and services, which will enable business benefits and revenue streams for the consortium partners, but also for additional companies/stakeholders that might be able to successfully adopt, deploy and sell the eVACUATE approach.

These eVACUATE products are comprised of both individual components and an integrated solution, namely the eVACUATE platform (as a whole), allowing solution providers to more easily develop, deploy and operate turn-key security solutions. The eVACUATE platform is complemented by the eVACUATE emergencies management solutions, based on the four use cases.

The individual exploitable components identified until now include:

- eVAMAPP app
- COP/EOC
- Smart Spaces (e.g. digital exit signs)
- Predictive module
- Data fusion engine
- Crowd behaviour module
- Simulations
- Communication Gateway
- 3D Computer Vision Module including hyperspectral and thermal imaging techniques

Moreover, the eVACUATE project will generate intangible results in the form of knowledge assets, e.g. system architectures and blueprints for emergency management solutions. These knowledge assets are particularly valuable for providing specialised consulting services.

3.2 EXPLOITATION MARKETS (TARGET MARKETS)

Evolution of worldwide crisis and security risks in developed countries in term of social, geopolitical, extremisms and terrorism is pressing countries and security organization to look for new instruments and technologies.

Also advanced connection speed and coverage for mobile devices has created a powerful grid of eyes and observers that may be exploited in many situations. eVACUATE intends to take a prominent position in the relevant markets such as:

Transportation infrastructures

- **Passenger ships and cruise ships.** Our consortium has a history within this field due to collaboration with STX France (partner in FP7 eVACUATE), the dockyard that recently completed the biggest cruise ship (Harmony of the Seas, capacity of 5,500 passengers and 2,300 crew).
- **Ports and airports,** where specific regulatory requirements exist (for example in airports, ICAO rules influence the evacuation process). Our consortium has relevant background knowledge and connections, due to the collaboration with Athens International Airport, where testing of subsystems will take place on 2017 (partner in project eVACUATE). In addition, European Aviation Security Center¹, an independent research centre for aviation security in Europe has already expressed its support to the project and willingness to transfer their experience through their participation in the stakeholders community of the project.
- **Railway and Metro stations.** The consortium has already collaborated with Metro Bilbao, where testing of the subsystems will take place in 2017 (partner in project eVACUATE), as well as Metro of Marseille that already expressed their interest in the project via a letter of support (see relevant Annex of submitted DoW version).

Large commercial and recreational public spaces

- **Entertainment venues** (they use part or all of the facility, however they modify the use of spaces). They would appreciate a complete system that coordinates their human resources, connects to facility infrastructure, etc. and could easily assess and operate safely any arrangement of space in the building.
- **Commercial and recreational complexes and buildings** (e.g., shopping malls and large amusement parks).
- **Single-building commercial structures.** Large office spaces, large museums and hotels.

Large education, healthcare infrastructures. Hospitals, Universities, School complexes.

3.3 STRATEGY FOR APPROACHING POTENTIAL NEW MARKETS (MARKET PENETRATION)

During the eVACUATE project evolution, the integrated work of dissemination and End Users requirements analysis will offer an advanced point of view to exploit new ideas and possibilities and to intercept new requirements that may also lead to the development of the platform for different markets. Potential markets may come from business organization or other organization that may need to face different kind of emergencies (market emergencies, information security, etc.) or possibilities.

Entering a new market is usually a painstaking process that requires careful planning. A comprehensive analysis is needed in order to understand the new target market itself (e.g. market size, who the customers are, how they think and feel, what their needs and desires are, what their purchase habits are, etc.) and

¹ <http://www.easc-ev.org/en>

the competitors active in the target market. After this analysis is conducted more time is then generally needed in order to conduct further customisation of the product for the target market.

Another important activity when preparing an entry into a new market is to ensure that there is a demand for the proposed product. For this reason customers might need to be “educated” in order for them to see their requirements from a different perspective or realise the problem they are facing.

Focusing on a very specific market segment or leveraging the power of an already established network are useful strategies for new entrants and could alleviate some of the risks associated with a late arrival to a market, eVACUATE should also aim to follow a direct customer contact approach since the proposed solution is still not yet commonplace for most people.

When the system capabilities and functionalities will be fully demonstrated in the reference scenarios foreseen for the project demos, more concrete information will be given about the foreseen new markets and the strategy to be pursued. This could be different for each identified product as foreseen eVACUATE products and services will be owned and exploited by several partners and plans might not necessarily be common.

3.4 STRATEGY FOR APPROACHING POTENTIAL STAKEHOLDERS

In the eVACUATE business model, end-users will be the final customers of the eVACUATE integrated solutions. In the eVACUATE value chain such end-users will be able to license the eVACUATE platform and/or use on the basis of an outsourced utility computing model. From an economic viewpoint, end-users will be able to achieve a tangible financial return on their eVACUATE investments, due to the increase in their productivity and their ability to plan and operate more efficiently.

The consortium composition ensures the involvement of all necessary stakeholders in the Value Chains of the emergencies management and evacuation systems. Dissemination activities, conferences and public events represent the most visible platform to present eVACUATE project, scope and evolution and also represent the best occasion to pick the interest of other stakeholders that may be interested in project research and also in eVACUATE platform and technologies implementation and use. This kind of approach requires that all eVACUATE partners will concur in participating to all events that may be in line with project areas for dissemination and also to get feedback from participants.

A subset of these dissemination stakeholders are also the foreseen exploitation stakeholders, namely:

- Security agencies/forces;
- Civil protection agencies;
- Security/defence system integrators;
- Facility managers;
- Utilities dealing with the Smart City concepts.
- Public Administration Managers (Hospitals, touristic monuments, public markets, etc)
- Private sector managers (Hotels, shopping centers, etc)
- Culture and Sport Entities (Stadiums, multipurpose spaces, etc)

All these stakeholders will be candidate users of the eVACUATE technologies in their efforts to leverage/include crowd managements and event managements capabilities into their products.

3.5 ROLE OF THE STAKEHOLDERS IN THE EVACUATE CONSORTIUM

The End Users' presence in the eVACUATE project Consortium aims to address a common problem related to the effectiveness of identifying new technologies, methods and capabilities and to overcome the lack of connection between end-user and the industry sector.

Apart from the end-users organizations involved in the project as partners, eVACUATE will benefit from an advising collaboration of end-users and security authorities with the aim to help with the elicitation of testing, validation and assessing of the security solutions developed in the project.

The Stakeholders will collaborate to various project activities, evaluating the relevance of taken decisions and results, guaranteeing the sustainability of the solution, evaluating new research proposals that will come from partners or from relevant sources outside the project. Stakeholders opinion and support will help eVACUATE partners.

eVACUATE partners also have the opportunity to maintain a real connection with the End Users' reality, to get first-hand information in crisis and emergency management and also feedback about the applicability and effectiveness of the design and uses cases in real world.

Currently our stakeholders' community hosts organizations from the public and private security sector across the whole EU as also shown from the table below, with a leading role in the confrontation of crisis situations and the coordination of evacuation activities when these are considered necessary.

| Stakeholders Community | Contact Person | EU Country |
|---|--|----------------|
| Civil Protection Service of Campania Region | <i>Giovanni Battista Chirico</i> | Italy |
| GUARDIA MUNICIPAL DE DONOSTIA | <i>Josu Garcia</i> | Spain |
| | <i>Joxe Anta</i> | |
| General Directorate of Civil Protection (Department d'Interior, Generalitat de Catalunya) | <i>Ramon Toldra</i> | Spain |
| Romanian Police | <i>Radu Petre</i> | Romania |
| Ertzaintza | <i>Ramón Estancona</i> | Spain |
| | <i>Iñigo Altuna</i> | |
| | <i>Ignacio Abendaño</i> | |
| Egil Bovim Consulting Company | <i>Egil Bovim</i> | Norway |
| Greek Police | <i>George Leventakis</i> | Greece |
| Greek Fire Brigade | | |
| Greek Coast Guard | | |
| Ecole Nationale de la Sécurité et de l'administration de la mer | <i>Laurent Galy</i> | France |
| ICTS Europe Ltd. (UK) | <i>Paul Weinmann</i> | United Kingdom |
| | <i>Yechayahu Rozanski (Vice President)</i> | |
| Oslo Airport | <i>Robert Dybdahl</i> | Norway |
| ID Partners | <i>Charles De Couessin</i> | France |
| Gatwick Airport | <i>Roger Gentle</i> | United Kingdom |
| KEMEA - Center for Security Studies - Ministry of Public Order and Citizen Protection | <i>Georgios Kioumourtzis</i> | Greek |
| Consorzio Milano Ricerche | <i>Ilaria Giordano</i> | Italy |
| Heatrow Airport Limited | <i>Ray Fitzgerald</i> | United Kingdom |
| Pará University | <i>Adamo Santana</i> | Brazil |

New interested stakeholders has been also identified across EU since the specific list is a living one that updated randomly during the project lifetime, including Basque Police and Fire brigade agencies from Spain as well two new football stadium owner from Italy and Greece.

4 EXPLOITABLE PRODUCTS AND SERVICES

EVACUATE Platform/Framework (As a Whole)

The strongly complementary expertise and multi-disciplinary nature of the eVACUATE consortium is a real added value for the project, which will investigate the complementarity of applied technologies for crisis management and critical infrastructure secure evacuation challenges from different perspectives: technical, business and societal. This involvement and cooperation of major industrial players in Europe, often competitors, is a clear evidence of their belief in the project's strategic importance for their business activity. The involvement of Stakeholders and prominent End-Users is particularly important for a relevant and concerted European dissemination of eVACUATE innovative technologies. A consistent representation of several security companies shows a strong commitment that eVACUATE objectives are crucial for a new approach to crowd management in crisis situations..

The integrated result of the project will be the eVACUATE platform, which will provide the means for security solution providers to develop, deploy and operate turn-key Technologies and solutions for the management and control of the guidance System for sustaining the Active Evacuation Route for large Crowds. The result is a service-oriented decision-support which can contribute to the management of these situations, giving the management responders a powerful tool to act in real-time.

The technologies developed to support integrated search within eVACUATE form a potential product that could be commercially exploited. In particular, the following components provide relevant functionalities that are of interest to security, emergency response or government agencies.

4.1.1 SOFIA platform

4.1.1.1 SWOT Analysis

The analyse of the SOFIA Platform through a SWOT, is reflecting the state of the art of the technology platform that is allowing the communications in the project.

Strengths: The biggest strength of the SOFIA Platform is its own versatility into the integration of different products or solutions. In this specific scenario, the design of the platform to be integrated with emergency management systems, provides to this platform, in front of other ones, a better performance and a higher capacity to process messages and to dispatch them, but also to support the commandment by giving safe and effective evacuation strategies, based on a resilient and seamless integration.

On the other hand, the capacities to deal with real time information and historical information on separated databases gives the capability to process and access to the information faster and to provide easier analytic capabilities on top.

Weaknesses: The concept of platforms is nowadays used for many different situations and products, and the market is coped by limited products based on simple Cloud storage and M2M capabilities. This is affecting somehow, the reputation and the value of a platform to integrate and coordinate.

On the other hand the lack of standards to integrate services and IoT devices, conducts to a continuous integration of new services and protocols, that forces the platform to be continuously updating its capabilities.

Opportunities: SOFIA, on the evacuate project, has the opportunity to show its capabilities by managing a very high number of messages from different components and performing great results on this action. It is, somehow, a strong test of capabilities and soundness of the platform.

On the other hand, it also provides a new scenario, as a use case, where SOFIA has proven its capabilities to manage complex situations with a high level of responsibility.

Threats: The platform has to be able to integrate many sources, and a very high number of messages and to deal with them without lags on the process. On the other hand, the amount of data to process can show weakness on the platform and devalue its prestige. That is why it is very important to show soundness and reliability

Europe is in an excellent position to become a global leader in IoT. The main strengths of European ICT are in business-to-business software and services (although with strong USA competition), embedded systems (including automotive and aeronautics), and in particular in applying ICT in complex system level solutions in various industrial and societal domains. In addition to this, the agile nature of the digital market and the relatively cheap deployment of competitive applications require active development and evolution of technologies via constant innovation and new iterations of products and systems.

4.1.1.2 Competitor analysis

Among others, the following are the most relevant initiatives which are considered competence as interoperable IOT urban platforms:

FIWARE (<https://www.fiware.org/>)

This **open platform, which provides a set of tools for different functionalities, is an innovation ecosystem for the creation of new applications and Internet services**. It is especially useful in terms of Smart Cities, as it ensures the interoperability and the creation of standard data models.

The platform provides enhanced **OpenStack-based Cloud capabilities and a set of tools and libraries known as Generic Enablers (GEs)** with public and open-source specifications and interfaces. These FIWARE GEs are distributed in different technical chapters and provide different capacities. For example, the Internet of Things chapter provides tools to connect sensors and other devices; while the applications' chapter offers powerful business intelligence tools and for the development of interfaces; or as the chapter for Advanced Interfaces allows to implement functionalities related to virtual reality, augmented reality or 3D.

FIWARE Lab is the **experimentation environment** where technology providers, solution developers and their stakeholders and data providers (cities) can identify problems, design and build solutions on the platform and experiment with them.

Another pillar of the FIWARE architecture is context management. Smart applications and services for cities do need information about everything happening at every moment. FIWARE provides a mechanism to generate, collect, publish or query massive context information and use it for applications to react to their context. This is a complex process, as this information may come from different sources: systems, mobile apps' users, sensor networks, etc. It is **Context Broker**, through a REST implementation of API OMA NGSI, which allows to shape and access it, whatever the source is. The use and management from data coming from "Things" (i.e. sensors, actuators and other devices) is also a complex process, as there are many different protocols in the IoT sphere, but **FIWARE provides a set of GEs allowing to access the relevant information through only one API (NGSI)**. It not only allows to read this sensor information, but also to act on some elements. Therefore, **Context Broker is an essential part of the architecture to collect data, analyse them on real time, consult archives and their analysis, as well as to publish them as open data from a city**. On the other hand, other functionalities such as business intelligence, web interfaces and advanced interfaces allow the creation of very powerful applications and solutions.

FIWARE becomes an important competitor in the infrastructures of Smart Cities, as the different GEs build an architecture that can serve most of their needs. More than 15 European cities and some Spanish cities such as Málaga, Valencia, Seville, Santander or Lleida are already working and experimenting with this platform. Among other initiatives to adopt FIWARE as Smart City platform, **31 cities from six European countries (Spain, Finland, Denmark, Italy, Portugal and Belgium) and from Brazil have recently announced at CeBIT 2015 (Hannover) the initiative "Open & Agile Smart Cities"**, There are various faces to the FIWARE initiative. The main one is FIWARE, the set of APIs that are there for developers to use to create prototypes of "smart city" apps. These applications can be developed at

FIWARE's various hackathons (with prizes that range from €56K to €145K) and winning participants will receive feedback from experts in the field and other developers that also use the platform.

i-scope (<http://www.iscopeproject.net/>)

i-SCOPE delivers an open platform on top of which it develops, within different domains, three 'smart city' services. These will be piloted and validated, within a number of EU cities which will be actively engaged throughout the project lifecycle. The services will address: 1) Improved inclusion and personal mobility of aging and diversely able citizens through an accurate city-level differently-abled-friendly personal routing service which accounts for detailed urban layout, features and barriers. 2) Optimization of energy consumption through a service for accurate assessment of solar energy potential and energy loss at building level. 3) Environmental monitoring through a real-time environmental noise mapping service leveraging citizen's involvement will who act as distributed sensors city-wide measuring noise levels through their mobile phones. All smart services will be based on already available technologies which will be integrated, deployed and made publicly available from a "3D smart EU cities" portal.

VITAL (<http://vital-iot.eu/>)

The VITAL project builds on these approaches and extends two main aspects to ensure the semantic interoperability of evolving Smart City IoT applications and projects. It uses the SSN ontology to model data and the OpenIoT as a common data management component. The first extension provides a much richer data model for Smart City applications, including city-wide information (e.g., demographics and stakeholder details) as well as city-specific Key Performance Indicators. The second extension provides interoperable access, not only for data coming from different IoT systems (e.g., OpenIoT) but also for services provided by these systems (e.g., discovery, monitoring and complex event processing). This allows for higher level services to be created which can then be integrated into a single federated service view.

VITAL will be tested in two Smart Cities, London and Istanbul, who are represented in the project consortium by the London Borough of Camden and the Istanbul Metropolitan Municipality, respectively.

VITAL will enable applications and service providers to integrate services and data streams stemming from multiple IoT ecosystems, architectures and middleware infrastructures. This will allow for existing sensors and IoT systems to be reused and repurposed, increasing the ROI on Smart City infrastructures. We hope this will reduce the costs associated with developing new Smart City applications for city authorities and the open developer community and bring time efficiencies, leading to a new wave of applications in cities across Europe.

VITAL is a three year joint European project, started in September 2013 by a consortium of ten partners from Ireland, France, Greece, Italy, Spain, the UK and Turkey.

4.1.1.3 Business Model for commercial roll-out

SOFIA: The SOFIA community is the responsible to continue with the development of SOFIA technology, once the project has finished. All results achieved during the project will be released as open source in the web of the SOFIA community, in order to attract developers, companies and other research project not only interested on using these results but also in extending them. The SOFIA community is categorized in 4 technical groups: Ontology, ADK, Core and Arquitecture, each technical group is leaded and managed by a group of experts, who will review any proposals, will offer technical support, and publish documentation/tutorials. These experts will manage other users approving their projects and giving them a role. Anybody can join to the SOFIA community creating their own project, and will take a role according to their experience and proposals to enhance SOFIA. In this way, eVACUATE can be considered as a new project for the SOFIA community, that mainly, will extend the core ontology of SOFIA adding new concepts according to the eVACUATE domains, and will define new connectors according to the requirements of eVACUATE Smart Spaces.

4.1.2 Crowd Management Solution- Evacuation Route

4.1.2.1 SWOT analysis

| | |
|---|--|
| Strengths <ul style="list-style-type: none"> Only real-time crowd model fully developed Validated crowd model Developed as a user-driven approach KPIs for 4 different venues types (Stadium, Metro, Airport, Cruise Ship) met Increase in safety and situational awareness is a valuable and topical selling point Created by Crowd Dynamics International – world known brand in crowd modelling Existing client base with global reach for generating awareness and potential direct sales Integration with existing systems possible | Weaknesses <ul style="list-style-type: none"> Requires complex input for best real-time functionality – without other eVACUATE components, further development required to integrate Behavioural component not used in real-time Current lack of awareness about available technology and benefits Cashflow a restriction for further development – requires paid-for development project No accreditation of safety/security bodies Small SME with no support functions – requires sales to generate cash flow for implementation No independent GUI |
| Opportunities <ul style="list-style-type: none"> Niche in market – no real-time prediction tools for crowds available Competitor focus is on planning, not operations Recent incidents and enquiries (e.g. Hillsborough review, UK; Hajj accident, Makkah, Saudi Arabia) is increasing awareness that technology can help operational management in emergencies Fastest real-time crowd model is a USP Government of Saudi Arabia is considering such a system for large scale over the Hajj pilgrimage. Implies initial high value paid-for development of the system to grow the business and product | Threats <ul style="list-style-type: none"> Research being undertaken on large scale at Kumbh Melor Hindu festival for a similar system (early stages of research) Trust by end users in a predictive model for practical use New product in an old market. But the old market is changing and adapting to new technologies Legacy systems may not have exacting requirements to provide data to the predictive system Inability to find partners advanced enough and at low enough cost to feed Recent loss of development staff means replacement staff have a lead in period before being able to develop further |

4.1.2.2 Competitor analysis

| | Oasys software | University of Greenwich | LEGION International |
|--------------------|----------------------------------|--|----------------------------------|
| Product | Mass Motion | Building Exodus | Legion Spaceworks |
| Application | Design/crowd management planning | Evacuation of buildings, pre-planning. Seeking real-time use | Design/crowd management planning |

| | | | |
|-----------------------------|--|--|---|
| Strength | BIM integration for model building, multiple features, part of ARUP = multi national contacts, cash flow stability | Different model scale integration, potential real-time development, academic basis of development and validation, integration with fire/smoke CFD models | Industry lead modelling software, Network Rail/ TfL approved, market monopoly on off the shelf products for 5 years |
| Weakness | No real time function, no sensor integration | Real-time development status unknown, no sensor integration, academic development, not strengthened by commercial success | No real-time function, no sensor integration |
| Current Strategy | Focus on building modelling for planning, marketed through magazine, targeting Network Rail in UK | Focus on evacuation, integration of model scales | Little development, maintaining market share for rail uses |
| Threats to us | None for real time implementation, potential for software integration for training use | Real-time software potential | None for real time implementation, potential for software integration for training use, partial move towards Saudi Arabia crowd modelling ability |
| Opportunities for us | Breaking isolated markets before us, e.g. Network Rail only accept LEGION, Mass Motion trying to add competition | Increased awareness of multiscale and real-time modelling | None |

4.1.2.3 Business Model for commercial roll-out

Key Partners

- eVACUATE consortium
- Camera counting solutions: Crowd Vision, AllGoVision
- Existing device counters such as turnstiles, airport check in systems, RFID solutions on venue by venue basis

Key Resources

- Software development team
- Sales and Marketing team
- Software Support

Channels

- Approach existing CDI client base
- Saudi Arabian technology partners currently searching for technology for Hajj
- Other client approach order: Stadia, Airports, Metro/Rail
- STX Cruise ships

Cost Structure/Revenue streams/Processes

- Commercial roll-out on case by case basis
- Modular approach with Crowd Modelling as centre component
 - Additional services provided by partners when required
 - CDI manage client contact
- Crowd Modelling module cost split:
 - Software Module: circa €50,000
 - Hardware required: circa €3,000
 - Consultancy set up costs: case by case basis
 - Training costs: circa €5,000, tailored to client requirements
 - Support and Maintenance package, including repeat training: circa €5,000 per annum

Rollout targets/timescales

- Hajj implementation ongoing as separate rollout
- Year by year breakdown of venue implementation, after pilot demonstrations
 - Year 1: Market ready development of module, GUI and interfacing
 - Year 2: Target 20 venues, uptake of 5 venues
 - Year 3: Target 100 venues, uptake of 10 venues
 - Year 4: Target 150+ venues, uptake of 10%
 - Year 5: Target 150+ venues, uptake of 10%
- From agreement to installation, lead time of 3-6months for all consultancy, system set up and installation

4.1.3 eVAMAPP application

eVAMAPP is a novel mobile application that uses state-of-the-art technologies (hybrid WiFi & BLE-beacons based location, mobile on board sensing) to offer location-based, custom, real time services and notifications about important safety incidents to ship passengers, especially in case of emergency.

4.1.3.1 SWOT analysis

Strengths: eVAMAPP is a smart phone application equivalent to the current “Evacuation Procedure Guidelines” that cruise ship passengers are provided when entering the ship. It makes use of state-of-the-art technologies (hybrid WiFi & beacons-based location scheme) to provide advance localization techniques, personalized, real time services and critical information to ship passengers especially in case of emergency. In an environment where the occurrence of accidents involving cruise ships (e.g. the Costa Concordia incident in Italy, the fire on board the Norman Atlantic in the Adriatic Sea) is a fact, the eVAMAPP application can assist the passengers and ensure their safety. eVAMAPP offers increased situational awareness to both the passengers and the crew with an innovative approach which is very crucial in the very sensitive field of passengers safety /convenience and that is the key strength characteristic of the application.

Weaknesses: In contrary to other safety measures that are readily available when needed, the eVAMAPP should be downloaded (free of charge) prior to entering the ship/ area) or once there, using a code/coupon as to identify the passenger and link him or his smartphone with his cabin. Passengers have so many new and interesting things to do and experience in the ship and they enjoy an increased feeling of safety in the advanced technological environment around them that might deem the application less important or useless.

This is why cruise companies must promote the other features of the app, as to increase its usage. It is suggested that the eVAMAPP app should be promoted as a mobile application which will overall serve as a concierge, attending to all the needs of the passengers, including services, navigation through the ship and ultimately safety. With the help of the app the passenger gets acquainted with living on board, plans his activities, makes reservations to popular shows on board, receive personalized messages concerning

his interests (e.g movies), receives coupons, offers, discounts for services/ products ("happy hour" special offers for passengers who like cocktails and pass near a bar of the ship) etc. Additionally, it should be clear to the passengers that their personal data are protected and will only be used for safety reasons and personalisation of services in a legally compliant manner while inside the ship or after their disembarkation.

Opportunities: IMO (International Maritime Organization) and flag (member) states have evaluated the possibilities to further increase the safety standards for large vessels with several thousands of persons onboard. For the passenger vessels the IMO goal is that *"Ship is the best lifeboat and in the event of any casualty persons can stay safely on board as the ship proceeds to port"*. eVAMAPP provides the passengers with concise, clear and easy to understand location-specific guidelines in order to evacuate the ship and minimize the occurrence of casualties in case of an accident. It addresses both the needs for passenger ship safety and promotes the image of the cruise operating company as a pioneer and as a technology adopter. eVAMAPP provides the opportunity of safer cruise vacations for all the passengers and the crew.

Additionally, apart from the cruise ship industry, eVAMAPP app has the opportunity to extend its usage and to other areas with crowd concentration like stadiums, malls, theatres etc and become a pioneer of its kind. Of course there must be improvements and adaptations for the new environment but the basic technological characteristics are the same, known and tested.

Threats: Location accuracy is a critical factor for the success of the proposed application as an emergency and evacuation aid. Indoor localization methods still concern the international research community. High levels of indoor accuracy (1-5m) would be welcome should the system be used for assisting in the rescue of a disoriented, panicked passenger. However no single system is yet available for offering such accuracies using a smartphone, for both outdoors and indoors. eVAMAPP infrastructure uses existing commercial BLE (Bluetooth Low Energy) beacons (Estimote ibeacons) and wi-fi solutions to provide a hybrid WiFi and beacons-based location scheme (part of the smart space). The proposed solution can and should be further analysed, calibrated and updated to meet the advanced needs of passenger's indoor localization.

4.1.3.2 Competitor analysis

Currently, the individuals on board regular passenger ships and ferries can rely on the safety leaflet attached to walls of their cabin or in public areas of a ship. Additionally there are fire and gas detection solutions for all kinds of ships and vessels (e.g Salwico, Nittan, Servoteknikk etc). Large passenger ships and cruise ships will also offer basic guidelines in 5 minutes video clips, played back in the early stages of their voyage, with seriously questionable outcomes as to their informative impact. In the case of cruise ships, it is normal that a 1hr safety drill takes place at the beginning of the voyage.

Apart from the above, the Fire Safety Engineering Group - The University of Greenwich has developed a software tool named "marineEXODUS" that performs simulations for the ship evacuation under specific conditions of e.g. fire, smoke, toxic gas. The software under predefined conditions evaluates the emergency movement & behaviour of passengers/ crew and predicts whether the passengers are likely to survive the effects of hazardous situations.

However none of the above safety practices can:

- provide real time information regarding safety conditions on board,
- allow to a smartphone application to be tracked with the smart spaces information,
- automatically provide personalized information in real time based on passenger's location,
- provide indications on how to get help,
- present the evacuation procedures (e.g. life jacket retrieval) at the time of need,

like eVAMAPP does.

The proposed innovation is unique in its kind, providing real time information about the current situation that will help and assist the rescue teams, to minimize the occurrence of casualties. Additionally the use

of the application as a “digital concierge” attending to all the needs of the passengers makes it even more attractive for cruise ship owners and passengers.

4.1.3.3 Business Model for commercial roll-out

The system will be offered as both an advanced SOLAS² safety tool and a "digital concierge" to assist the passenger with his life on board the ship. Thus it addresses both the needs for passenger ship safety and promotes the image of the cruise operating company as a pioneer and a technology adopter in the very sensitive field of passenger safety and convenience.

The eVAMAPP will be charged on a combined:

- Infrastructure costs that include beacons installation, a wifi network deployment (basically available in cruise ships) and a server to support independent operation of the eVAMAPP platform from other ship systems. The eVAMAPP platform consists of the smartphone application, as well as the “Control Room” functionality, used to send messages to the passengers with the emergency status, and the “Monitoring Room” functionality for the display of ship map & of passenger messages (if any).
- SaaS model for the installation/use of eVAMAPP platform, whereby the ship is charged a basic fee and then will be charged according to its use by the passengers (number of downloads).

The cruise operator has the option to sell the application to the passengers via one of the application markets but it is not a recommended tactic. The application should be free, easy to find and download in order to be more attractive to the passengers.

Primary target market: Passenger ships / cruise ships. The primary target market of eVAMAPP as a result of the project, is the cruise ship industry where a clear regulatory framework exists (IMO/SOLAS) and clear advances can be expected, relevant to the actual needs of the industry. The application should be promoted not only as a safety-related technology, but also as a complete “mobile concierge” to attend the needs of the passengers before and during their trip.

Priority market: Stadia. Stadium security provides a very big market opportunity for manufacturers and integrators, and it's growing by nearly 8% each year (ESPN, 2015). A total of 2 Billion€ is invested from cities, teams and schools worldwide in security globally (ESPN). Especially in emerging sports markets in Asia (including the Emirate states), cities are hosting more and more large sports or cultural events. Furthermore, as stadiums come to be threatened by extremists, there will need to be investments in security from the state security budget. Stadia represent facilities that routinely host events that gather tens of thousands of spectators and have recently become targets of extremism and terrorism.

Ambition: Our ambition is to extend the eVAMAPP scope, to serve all types of urban soft targets such as shopping malls, large hospitals, underground stations etc. According to the market research report, "Global Homeland Security and Emergency Management Market, 2013–2018" (Markets and Markets, 2014), the capital expenditure for Homeland Security market is expected to reach \$86 Billion by 2018 with a CAGR (Compound Annual Growth Rate) of 5.54%. **Transportation infrastructures such as ports and airports**, where specific regulatory requirements exist (for example in airports, ICAO rules influence the evacuation process), as well as **railway and underground rail** systems, a market that we will approach after the tests with Metro Bilbao, as well as Metro of Athens that already expressed their interest in the project. **Large commercial and recreational public spaces including entertainment venues**, would appreciate a complete system that coordinates their human resources, connects to facility infrastructure, etc. and could easily assess and operate safely any arrangement of space in the building. Taking into account the emergency and safety situation that nowadays is facing Europe, the evacuation of venues with crowd situations is one of the relevant topics for every single city, and involves several markets because of its widespread approach:

² Safety of Live at Sea

-
- Public Administrations and public infrastructures
 - Private sector to provide solutions for Shopping Centers, etc.
 - Associations and other entities related to Sport and Cultural events
 - Maritime Industry for enhanced safety and security

Thus, it involves relevant markets, as Security and Emergencies, Industry and Tourism, Public Administration, Culture and Sports, and even Urban Planning.

4.1.4 Predictive Video Analysis Module

4.1.4.1 SWOT analysis

| Strengths | Weaknesses |
|--|--|
| <ul style="list-style-type: none">• Unique sets of crowd behaviour experimental scenarios in confined spaces were generated in the project• Unique good quality set of crowd behaviour data, generated in the project and using multimodal vision observations in real confined spaces• Good performing crowd behaviour detection algorithms at multiple scales. In particular, the meso-scale detection algorithm with a breakthrough capability on detecting multiple meso-scale crowd clusters tracking (groups within the crowd with similar behaviour, therefore specific tracks and intentions within the macro-crowd• Successful transmission of crowd behaviour output messages through SOFIA for enabling rapid visualisation of crowd behaviour at given scene with advanced situation awareness in the COP in context of distributed software component and cloud architecture | <ul style="list-style-type: none">• The crowd behaviour modules processing speed performances are not fully yet optimised• There is an associated necessary cost (not necessarily substantial) for retraining the algorithms at specific venues with mass gatherings of crowds. This is done once through tailored experimental crowd behaviour scenarios together with accessed knowledge on the operational, spatial and temporal as well as cultural characteristics of the venue. |
| Threats | Opportunities |
| <ul style="list-style-type: none">• Deterring complex administrative processes for approving on specific crowd behaviour experimental scenarios at critical venues• Prohibitive legal procedures for accessing to good quality experimental data for advancing and validating our crowd behaviour algorithms• New research funds for further progress enablement on crowd intentional behaviour predictions by competitors | <ul style="list-style-type: none">• Exploitation of the crowd behaviour algorithms in security sectors involving large crowds in mass gathering events• The automated detection of crowd behaviours will reduce the cost of 24/7 surveillance in critical venues by making the work of surveillance managers more efficient and less tiresome• The automated detection and crowd analytics behaviour enables back tracking investigations and auditing against safety and security management standards compliance by the security sector industries.• Participation in future multidisciplinary research programmes in partners Member states and H2020 programmes. Example: UK Research Council and Innovate UK programmes on crowd safety and security |

4.1.4.2 Competitor analysis

Early analysis of competitors/competition which may be encountered by WP3 and others research partners specializing on crowd behaviour detection research and development is summarized below:

- Large research funds to further targeted understanding of crowd behaviour in confined spaces by competing groups in USA and Japan particularly
- New inaccessible proprietary experimental crowd behaviour data generated by specific competitors with links to cooperative countries with relaxed legal procedures for pursuing their experimentations.
- Existing low cost software on crowd management commercialized by industrial organizations within a closed circle on safety and security.

4.1.4.3 Business Model for commercial roll-out

There is a potential for commercializing our crowd behaviour detection modules with the following business models:

- Use of crowd behaviour detection modules as a consultancy service with given spaces under study
- Partnership with one or more eVACUATE partner(s) to provide an overall consultancy service concerning studies of optimized crowd evacuation from confined venues.
- Partnership for a spin-off company on crowd behaviour with one or more eVACUATE partners
- IPR licensing for software commercialization with an industrial security partner.

4.1.5 Communications Gateway

4.1.5.1 SWOT analysis

| STRENGTHS | WEAKNESS |
|--|---|
| <p>Communication Gateway and Operator/PPDR gateway functionality:</p> <ul style="list-style-type: none">• Reduced complexity and improved productivity: supporting object-oriented distributed information modelling• Improved performance: Due to the variety of QoS supported e.g., reliability, availability, timeliness, best effort etc.• Fault Tolerant: Due to the broker-less and decentralized architecture with no single point of failure and fallback mechanism• Interoperability: Works on different operating systems, support different programming languages, interoperability among various implementations• It supports content awareness, security and data prioritization• Suitable for real-time systems• Supports different communication protocols data formats• Is based on the international standard Data Distribution Service for Real-Time Systems (DDS) of the Object Management Group (OMG) | <ul style="list-style-type: none">• Scalability of the communication gateway highly depends on the number nodes to be connected.• Latency can grow with increased number of connections and subscribers• Security standard of DDS has been released recently and its implementation is available only in some commercial implementations.• Open Source Implementation have some limitations in supporting the whole range of features of the DDS standard. Furthermore, stability and reliability needs to be validated in order to gain advantage against commercial Implementations of DDS |

| <ul style="list-style-type: none"> • Application Examples: DDS is mature, stable and robust and is used in various civil, military and commercial applications (e.g. industrial process control, air traffic management systems, naval combat management systems etc.) • It is based on open source implementation of DDS, which provides flexibility to choose suitable solutions based on market needs and user requirements, offers greater market penetration opportunities and has lower cost for marketing and logistical services • Suitable for IoT supporting, Device to Device, Device to Cloud and Cloud to Cloud communications • Suitable for large and complex systems, high scalability • Supports integration with legacy systems • Supports integration with Emergency Operation Centers • Its functionality has been demonstrated in the lab as well in real-environment and pilot demonstrations | |
|---|---|
| OPPORTUNITIES | THREATS |
| <p>There is a growing demand and work by standardization bodies towards IoT standards and machine to machine communications such as the oneM2M standardization activities. DDS usage in oneM2M system has already being considered in some working groups, which opens market opportunities for the communication gateway in future IoT systems</p> <p>There are very few solutions that are addressing the needs for evacuation systems for large venues combining the integration of legacy systems and novel sensing platforms.</p> <p>The growing trend in introducing novel sensor systems and ICT products in large venues and infrastructures (e.g. Transport, Energy, Water) increases the demand for suitable technologies and communication solutions. This trend potentially opens new market opportunities in several domains</p> <p>The use, extension and further research on suitable communication solutions based on the communication gateway developed raises opportunities to participate in EU funded projects</p> | <p>Market-up take may be slow due to the fact that the developed solution is not in the state of commercialization which needs extensive tests, validation and optimization</p> <p>Since ICCS is a research institute and its development are not purely market driven, exploitation capabilities and exploitation channels for commercialization are limited compared to industrial organizations</p> <p>Since IoT standardization landscape is very active in publishing new standards and recommendations, the developed solution might need to be extended and adapted to possible new standards developed in the near future</p> |

4.1.5.2 Competitor analysis

| | |
|-----------------------|--|
| Name | EmerGeo Fusionpoint |
| Description | EmerGeo Fusionpoint is an integration platform built on the latest web fusion and open mapping technologies. It uses web services to connect to customer's existing systems to consume and publish data. |
| Type / Model | Software |
| Manufacturer | EmerGeo Solutions Worldwide, Inc. |
| Specifications | <p>Simple Event Logging and Reporting Resource Management Geo-based Alerting Open Web Mapping and Hazard Models Interfaces to:</p> <ul style="list-style-type: none"> Crisis Management Software Mapping (GIS Systems): <ul style="list-style-type: none"> ESRI ArcGIS®, Google Maps®, Microsoft Bing®, OpenStreetMap (free wiki world map) Vehicle & People Tracking Systems Notification Systems IP Cameras/Video Surveillance Systems <p>Live Data Feeds: GeoRSS, RSS, WMS, KML, ArcGIS Services Service Oriented Architecture</p> |
| Applications | <p>Critical Infrastructure Protection Emergency Management Safe City</p> |
| Link | http://www.emergeo.com/solutions/fusion-point |
| Name | VueTOO Situation Server Manager |
| Description | VueTOO Situation Server Manager is a SaaS hosted service or onpremise based solution that securely lets you get any content from anywhere into a common or situational view. |
| Type / Model | Software |
| Manufacturer | VueTOO |
| Specifications | <p>Software as a Service, cloud or on-Premise based license Content securely accessed via LAN/WAN and/or public Internet Digital sign formatting and Wide Screen LCD & DMP support (Cisco) Included content options Visual wireless content fusion Sources:</p> <ul style="list-style-type: none"> Any IP addressable content from inside or outside a LAN or WAN and the public Internet Any standalone application program Media content from wireless devices <p>Content type:</p> <ul style="list-style-type: none"> RSS Streaming Media Images Maps Widgets Standalone software applications Other web pages Wireless |
| Applications | Situational Awareness |

| | |
|-----------------------|--|
| Link | http://www.vuetoo.com/local.asp |
| Name | EdgeFrontier |
| Description | EdgeFrontier is an integration platform that enables rapid, affordable interface development tailored to the needs of an organization. It provides a lightweight yet powerful infrastructure for integrating business processes and sharing data. It reduces the total cost of ownership for interfaces and integrations, improves business performance, and enables new capabilities. |
| Type / Model | Software |
| Manufacturer | Hexagon Safety & Infrastructure |
| Specifications | Quickly integrate new applications, systems, and workflows to improve performance and enhance organizational capabilities. A central platform to manage and implement interfaces. Build, test, and deploy from a single screen. Features a business rules engine, supports all major integration methods, and enables robust data transformation. Promotes reusable, loosely coupled interfaces, and features extensive support for Microsoft .NET environments. Can be deployed on its own or in a hybrid approach alongside custom development or ESBs. |
| Applications | Emergency Management |
| Price | |
| Link | http://www.hexagonsafetyinfrastructure.com/products/application-integration/edgefrontier |
| Name | GEMMA |
| Description | GEMMA™, a scalable, modular, and interoperable global emergency management solution, has been developed from over 20 years of experience in implementing emergency management and co-ordination projects across Europe. |
| Type / Model | Software |
| Manufacturer | Atos SE |
| Specifications | Telephony integration—with automatic call distribution, automatic number identification, and automatic location identification. Communication with first responders—through telephony (GSM) or radio networks (TETRA, Tetrapol, P25, DMR, etc.), and devices. First response management—from panic buttons, automatic fire or intrusion alarms. Public warning messages—based on specific emergency planning and through sound (sirens), voice (pre-recorded messages), and text (SMS, fax, email). Integration with third-party databases and systems, including legacy system. |
| Applications | Emergency Management Public Warning Systems |
| Price | |
| Link | https://atos.net/content/dam/global/documents/your-business/atos-emergency-management-whitepaper.pdf |

4.1.5.3 Business Model for commercial roll-out

As a research Institute ICCS targets mainly the research community; PhD, M.Sc. students and researchers. The business model is based mainly in increasing its collaboration with other research and

industry partners. This would permit an increase of knowledge exchange that will strengthen ICCS' position in the research domain and augment its knowledge database. ICCS, has already capitalised such knowledge by participating in a newly-started H2020 Security project. In the future and after successful and extensive testing, adaptation and extension of the scientific work it could open the way for a commercial future exploitation through spin-off company activities. For all above reasons there is no specific business model for commercialization and a relevant cost model that is foreseen in the near future.

4.1.6 Common Operational Picture & Simulations Tool (COPSI)

4.1.6.1 SWOT analysis

| | |
|--|--|
| <p><u>Strengths:</u></p> <ul style="list-style-type: none"> • Innovative system for new approach of operational surveillance. • Ergonomic 3D Common Operational Picture • Use of innovative technologies (COP, touch screens, tangible objects, geolocation) • Diversity in the addressable markets | <p><u>Weaknesses:</u></p> <ul style="list-style-type: none"> • People are used to old fashioned systems, are not willing to change • No resources management • Network layer is not very versatile |
| <p><u>Opportunities:</u></p> <ul style="list-style-type: none"> • Digital breakthrough : Current security systems are mostly old fashioned, use of new technologies brings a lot of new possibilities. • Scalability of the system enables the integration in unequipped small venues to fully equipped places. • Surveillance equipment is far more common nowadays, innovative visualisation systems are required to maintain a good level of legibility of all the data coming from multiple sources. | <p><u>Threats:</u></p> <ul style="list-style-type: none"> • Competitors are renown companies • Security systems is a conservative market |

4.1.6.2 Competitor analysis

- **Egidium ISAP** (<http://www.egidium-technologies.com/en/isap-2/>)

Real-time 3D situational awareness software.

Offers a lot of different connections based on its plugin architecture :

- Video Management Systems
- Geolocation
- Cameras & encoders
- Access control
- 3D & GIS Data
- Voice
- Fire detection
- Intrusion detection
- Video Recorders
- Cyber probes
- Specialized sensors
- Video analytics

- **Thales** <https://www.thalesgroup.com/en/worldwide/security/security>

Thales is offering several systems addressing security and safety challenges, targeting :

- State
- Cities
- Critical Infrastructure
- Critical information systems and cybersecurity

Thales operates with a custom project based business strategy. Given the size and targets of the company, it is clear that their objectives overlaps with COP ones and even more. However, it is hard to analyse their solutions, since it is not COTS products.

- **Engie Ineo** (<http://www.engie-ineo.fr/en/clients-2/defense/overall-safety-and-security>)

ENGIE Ineo's "Asphales" solution displays decision-support scenarios and provides reactive means for going from prevention through to action. The solution is cross-discipline, ergonomic, intuitive, and fully scalable, adapting to all kinds of risks and systems.

- Video-protection and video-surveillance
- Intrusion protection
- Movement detection and alarms
- Access control (badge and biometric)
- Remote surveillance
- Call centers
- Geolocalisation
- Risk-situation detection
- Fire detection
- Protection against lightning risks
- Secure information and communications systems

4.1.6.3 Business Model for commercial roll-out

See 6.15 section entitled as **Error! Reference source not found..**

4.1.7 eVACUATE Emergency Operation Center Solution (EOC)

4.1.7.1 SWOT analysis

| | |
|--|--|
| <u>Strengths:</u> <ul style="list-style-type: none">• Can deal with collecting, tracking and reporting real-time information regarding a number of emergencies or crisis situations• Can easily display information (reports, observations, alerts, location finder, points of interest) in several formats; for example, video films, audio recordings, text messages, links, and maps.• Strengthens dialogue between first responders, pre-responders, and decision makers. Enhanced situation awareness capabilities• Improves opportunities for coordination with the larger public since alerts and messages can be displayed and distributed. Enhanced situation awareness capabilities• Big data technologies compatibility.• Interaction with Social Media in terms of displaying in real time all incoming tweets and generating relevant alerts based on these incoming social media data.• Fully management capabilities to any deployed sensor / actuator located inside end-users premises.• Provision of big data analysis and system statistics capabilities through integration with other peripheral sub-systems (MobiMesh Solution) (e.g. Traffic, network speed, current status)• Support of historical data for training purposes• Advanced data fusion capabilities based on big data architecture design• Easily extendable and easy to use• Compatible to any mobile device through the provision of a light version <p>Cost effective solution</p> | <u>Threats:</u> <ul style="list-style-type: none">• Getting first responders to use the EOC when they already have their own systems. Therefore, it is important to identify and actively market EOC's competitive advantages to other existing systems and tools.• Organizations and agencies may not have the financial resources to adapt or to invest in a new system or components which will need to be integrated into their existing operations. |
|--|--|

| | |
|--|--|
| <p><u>Weaknesses:</u></p> <ul style="list-style-type: none"> • Lack of 3D visualization capabilities • No significant innovation in H/W and S/W level but re-usability and merging of already existing technologies currently commercially available. • Open for more advanced development and incorporation of new end-user specific functionalities • Security aspects (incl. secured communication) needs further investigation and development. | <p><u>Opportunities:</u></p> <ul style="list-style-type: none"> • Great potential to engage general public, and more specifically first responders, in crisis management activities • EOC can be used as one integrated system or the individual components can be integrated with other existing systems • Ideal for government agencies/response organizations who want this kind of solution but do not have the internal expertise to develop it themselves. |
|--|--|

4.1.7.2 Competitor analysis

The competition in this domain exceeds EU boundaries in a worldwide level and is considered as one of the hardest since:

- Numerous companies from private/public sector across the world already possess and/or are currently developing advanced state of the art Command Centers (C2) /decision support systems³⁴ either for military or civilian crisis management operations. (.e.g NATO, EDA, HITACHI, DHS, etc..)
- Large research funds ⁵⁶have been devoted for research into this specific area for further development of more advanced, interoperable and interactive with end users/citizens C2 (IT) systems towards a more coherent crisis and disaster resilience management.

4.1.7.3 Business Model for commercial roll-out

In regard to the business model for commercial roll-out, our approach is based on EXUS Innovation best practices. EXUS Innovation portfolio is organized around two main axes:

- **Top Line-Fostering value creation:** A customer oriented, consolidated, modular portfolio of global offerings to drive business growth and to sustain our leadership position in the global competition.
- **Bottom Line:** Industrializing and reuse: Industrialized “production” of high quality offerings, to be sold and delivered in a repetitive manner will have strong positive impact on bottom line.

These two strategies are called outside-in and inside-out and are exemplified in two innovation support functions that complement each other: business development and technology transfer.

- **Outside-in: From clients, market and business challenges to executable solutions.** Here the objective is to complement the existing offerings and to build on our strength. The emphasis is on complementarity and fit-to-purpose approach. The goal of this process is to ensure that the relevant technological needs, market trends or strategic directions are correctly translated into research &

³[http://www.europarl.europa.eu/RegData/etudes/etudes/join/2008/381408/EXPO-SEDE_ET\(2008\)381408_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/etudes/join/2008/381408/EXPO-SEDE_ET(2008)381408_EN.pdf)

⁴ http://www.hitachi.com/rev/pdf/2014/r2014_05_104.pdf

⁵http://ec.europa.eu/dgs/home-affairs/financing/fundings/pdf/research-for-security/security_research_catalogue_2014_en.pdf

⁶http://ec.europa.eu/dgs/home-affairs/what-we-do/policies/industry-for-security/docs/828s_catalogue_h2020_exe_en.pdf

innovation requirements and are transferred from service lines or markets to Research & Innovation department.

▪ **Inside-out:** The most mature research results are filtered, packaged and channeled to our sales team, as well as the external clients. The emphasis is on highly innovative assets and solutions that might generate superior customer benefit or experience and build clear differentiation. This part of business development and technology transfer is facing challenges that research projects, and in particular EU-funded projects, are facing, such as: fragmentation of ownership, non-realistic user requirements that cannot be translated into the business case, non-realistic assumptions, verification of performance only in lab environment, lack of estimation of maintenance costs etc. The goal of inside-out process is to ensure that scientific and technological developments from Research and Innovation projects are accessible for either direct commercialization for the further development and integration. In this process, the following principles are adopted for the selection of research results that enter the process of technology transfer:

- **Modular:** the potential asset should be pluggable, where EXUS component and IPR is clearly identified, as well as dependency on the other partners and modules.
- **Open Source based:** if the external components are used, these should be based on open source.
- **Complementary and cost-effective:** they should not overlap with the existing EXUS offerings and if there is some overlap in certain functions, it should be more competitive either by lower cost or by superior technology.
- **Strategic:** it should be strategic based on an analysis of emerging and future technologies, as well as the existing budget for further development.

Preliminary Business Sustainability Model: In order for eVACUATE's value proposition to be delivered to the market, a suitable business sustainability model will be defined. The main aspects of this will be:

- **Technology.** Revenues stemming from selling the eVACUATE integrated platform.
- **Project Implementation Services.** Deliver turn-key solutions to agencies across Europe.
- **Maintenance and Support Services** (for Software/Hardware components). Recurring revenues coming from the support services to the procured components/solutions.
- **Training.** Training of personnel for using the platform and configuring the different components

5 MARKET ANALYSIS

eVACUATE project End Users represents a valuable source for information to address a market analysis. Target business organizations are in the field of emergency management and civil protection and security agencies. Also local and national authorities are potential targets and need all instruments necessary to manage crisis.

Effective Market Analysis will be analysed even after the project conclusion due to the rapid evolution of the market. Market Analysis also requires an extensive analysis of concurrent solution and, for effectiveness, should be prepared in a short time to market to clearly understand current requirements and other solution on the market.

Market Trends:

Especially for the stadiums case, Stadium security provides a very big market opportunity for manufacturers and integrators, and it's growing by nearly 8% each year (ESPN, 2015). A total of 2 Billion€ is invested from cities, teams and schools worldwide in security globally (ESPN). Especially in emerging sports markets in Asia (including the Emirate states), cities are hosting more and more large sports or cultural events. Furthermore, as stadiums come to be threatened by extremists, there will need to be investments in security from the state security budget. According to the market research report, "Global Homeland Security and Emergency Management Market, 2013–2018" (Markets and Markets, 2014), the capital expenditure for Homeland Security market is expected to reach \$86 Billion by 2018 with a CARC of 5.54%.

Type of market and market size assumptions:

During recent years, the stadium security market has gained significant growth mostly because of stadia emerging as potential terrorist targets, both because of the presence of large crowds, and also because they may be considered popular and may be cultural symbols. The following is a consolidated overview of the stadia and large facilities market outlook, as presented in various reports. The primary targets for the system are the stadia that regularly host football matches, attracting large crowds. Out of the 319 stadia in Europe (according to the Stadium Guide⁷ and Wikipedia European Stadia by Capacity⁸) with a capacity exceeding 25,000 spectators, the majority of them (56 stadia) are located in 4 countries – France, UK, Italy, Spain and Germany. All countries have been on high alert for terrorists and extremist threats. We may consider **France, UK, Greece and Italy** as primary target countries, since we already have partners from these countries. We also consider **Spain** as an interesting market, as we have already proven the concept in "Estadio Anoeta" in Spain and it may be considered a previous reference.

| Market Report | Revenue/market size (M USD) | Most growing segment / main revenue driver | CAGR (%) | By |
|--|--------------------------------|---|-------------|------|
| Markets and Markets Homeland Security | 86,000 | Homeland Security | 5.54% | 2018 |
| ESPN Sport Events Security Market | 2,000 | Stadia | 8% | 2016 |

5.1.1 SWOT analysis definition

Generally speaking, a SWOT analysis measures a business unit or proposition, whereas a PEST analysis measures the market potential and situation, particularly indicating growth or decline, and thereby market attractiveness, business potential, and suitability of access - market potential and 'fit' in other words. In

⁷ The Stadium Guide, www.StadiumGuide.com

⁸ List of European stadiums by capacity, https://en.wikipedia.org/wiki/List_of_European_stadiums_by_capacity

this light, SWOT and PEST analysis must be studied together to achieve a clear conclusion and evaluation of the eVACUATE solution commercialization strategy.

SWOT analysis is a strategic planning method used to evaluate the Strengths, Weakness, Opportunities and Threats involved in a project. This analysis is about to define the challenges of the project and identifying the internal and external factors that are favourable and unfavourable to achieve that challenges. SWOT analysis must include:

- Strengths: characteristics of eVACUATE initiative that give an advantage over others in the current market. (Internal factors)
- Weaknesses: are characteristics that place eVACUATE at a disadvantage relative to others companies. (Internal factors)
- Opportunities: are chances to make greater sales or profits in the environment. (External factors)
- Threats: are elements in the environment that could cause trouble for eVACUATE business. (External factors)

5.1.2 SWOT Analysis of eVACUATE integrated Platform

The analysis of the **eVACUATE Integrated Platform** through a SWOT, is reflecting the state of the art of the project in the actual market:

Strengths: The biggest strength of this Project is the high innovative component service that will be offered by eVACUATE. Besides the low competitiveness that will be found in the market owing to the ability of adaptability of the product at all of its versions. Another strength that should be considered is the composition of the Consortium, given that the partners have a wide experience in the sector, which is proved in the historical trajectory of each one, all this joined to an international recognition of each brand. The consortium has a high level as a knowledge terms need to the development of the project and generate a feasible product, as a proved experience in the commercialization of product and services. This consortium has had the capacity to see a market niche in one of the latest sectors, as well as providing to the market with different solutions adaptable to the conditions and needs of the costumer.

eVACUATE is a powerful solution tested in several and very differentiated use cases spread around Europe and around different market cases.

Also, the participation on the CEN/CENELEC standardization process will help the project to define or to adapt the arising standards within the framework of the project.

Weaknesses: Difficulties are foreseen derived from the amount of partners involved in the project and in the exploitable products and services and therefore, the management of different IPR regarding each component by the different partners. One additional weakness which the consortium should have to take into account is the probable need of private or partners' investment in order to achieve the constitution of a company which commercialize the product. Having into account that it is important to point out the existence of a huge crisis situation throughout Europe, this unstable situation involves that some partner might not enjoy of the financial resources to face the go-to-market phase, this may cause an important budget constriction.

Opportunities: eVACUATE is an Open Source solution based on a different and holistic approach, that could face the real needs of the market having a different approach than the other market solutions. Although there are competitors, the market is covering if we break the concept down, but in this moment it does not exist a great number of companies which provide such an integrated solution. This supposes the consortium will have to take into account this fact in order to define the strategy position. By analysing the external environment and eVACUATE internal environment, it is possible to consider future strategies in a short term.

Threats: The actual market solutions are design and deployed by big companies with a very strong position on the security market across Europe.

Although the security sector will be the primary market, this market has shown a high development level due to the market which is framing in the developing of new technologies following an industrial development faster than the traditional markets.

On the other hand, there are very similar markets in the United States, which are able to generate synergies with other actors than in the European market (e.g. Japan, China, India, etc). This might cause the increase of the potential competitors in the area of Smart Evacuation Solution and Crowd Management systems which might prefer to incorporate to this niche. Furthermore, there is a great capacity to imitate the products framing in the security and ICT markets, becoming an important risk that the consortium will have into account at the moment

5.1.3 Preliminary analysis of eVACUATE integrated platform Competitors

After a preliminary analysis of the market we have discover several solutions that are addressing somehow the focus of our project and their results.

The main competitors identified are:

- ATOS and IBM. Both, somehow, have evacuation systems for large events (for example, those provided for the Olympics).
- Bosch(https://us.boschsecurity.com/en/03_solutions_2/07_stadia_2/stadium_convention_center)The product portfolio includes video surveillance, intrusion detection, fire detection, for evacuation systems, as well as access control and management systems. It seems to be the most advanced product comparable with the proposed eVACUATE solution.. Main weakness is that Real time evacuation only uses Public Address and CCTV, no crowd modelling component are foreseen in the solution.
- TOPVenue (<http://www.topvenue.org/>): Simulation of crowd movements for Stadiums and schools. Strengths: 3D modelling, includes obstacles in training mode. Weakness: evacuation route is predefined or precalculated, No real time crowd modelling component, training not interactive
- SAIP (On June 2016, the French government launched a smartphone app called SAIP (Système d'alerte et d'information des populations), that alerts users to possible terror attacks and provides information on how to stay safe inside or around the football stadiums of the UEFA Euro 2016 in France). <http://www.interieur.gouv.fr/Actualites/L-actu-du-Ministere/Lancement-de-l-application-mobile-SAIP>
- Other solutions that are in the market without this specific approach but with several solutions close or in development, are:
- VigilyS (SYS Technologies) <http://vigilys.com/>
- ADMS (ETC Simulations) <http://www.trainingfordisastermanagement.com/>
- Genetec <https://www.genetec.com/solutions/industries/stadiums-and-open-spaces>

On the other hand, some events that had occur during the last years, regarding security and terrorism are increasing the awareness of the Public Administrations on the protection of some of their potential threatened buildings. As a reaction, some companies that were focused on CCTVs and perimeter security services are starting to develop services and solutions to deal with mass events as evacuate is doing. On their actual stage, this products are not a commercial solution, but the competition will be strong taking into account the importance of the matter and the societies awareness.

5.1.4 Market Strategy

An adequate marketing strategy will increase the opportunities of raising the level of sales. Alerting citizens of emergency situation's sector is still a new market among European companies, but the market is covered by companies which offer many different technologies, so it is necessary to position correctly the company on the market. To achieve this proper positioning is necessary to determine a marketing strategy that is held on three questions:

- Competitive price

-
- Distribution strategy
 - Strategic partnerships

Competitor's price will be analysed along the project. All this input will be continuously compared with estimated price for eVCAUATE solution, after financial plan is developed.

Distribution is the activity directed to get products from manufacturer to end users. This section will analyse the distribution channels chosen to deliver the product to the final consumers. To establish a distribution system is important to determinate two points:

- Distribution channel
- Type of distribution

The sales strategy of the eVACUATE integrated solution shall consider two different channels to reach end consumers. The two options discussed are on one hand, sales through intermediaries and on the other hand, direct sales to end users partners of the consortium or stakeholders.

Selling through intermediaries is the most common and useful option as it has many advantages: The first advantage resulting from the use of a sales strategy based on intermediaries is referred to the level of economic resources committed. Infact, it is possible to reach a wider market without being physically present at all the points of sale, so that the investment required starting to operate decreases dramatically. On the other hand, this strategy enables entering and exiting certain markets with low entry and exit barriers. This gives high flexibility to the company to reorganize its target market at bearable costs. In short, this sales strategy is the most appropriate for a new company which does not have the necessary infrastructure for direct sales.

Another advantage associated with this strategy is the protection of the technology. In the market where eVACUATE is going to be focused, technology is a critical success factor. Using direct channels the company can avoid copies and imitations of the technology that reduce the profitability and harm the image.

Strategic partnerships. An important part of the company's indirect sales strategy are the figure of the intermediaries or Product Reseller. An adequate management of these product resellers is a relevant task for the success of the project commercialization and market penetration.

eVACUATE must consider companies which might cooperate as partners, as fundamental external asset. This implies a mutual active and cooperative attitude and role to bring crowd management in the public domain within Europe on a higher level.

For these reasons eVACUATE should consider working with relevant reseller partners to expand their commercial network to new end user customers. Partners would have to be seen as an extension of eVACUATE organization, playing an essential role in the go-to-market strategy and activities.

eVACUATE would actively encourage the distribution of the product through the reseller channels. Product supply and sales information to help the reseller to provide their customers with the highest quality service will have to be provided by the start-up.

5.1.5 Business Models analysis for the eVACUATE integrated platform

Supporting activity is considered any task that aims at disseminating the results of the project, promoting the eVACUATE concept, increasing the visibility of the project and supporting the exploitation of the results achieved. The Supporting Activities for eVACUATE are taking place during the entire duration of the project and are organized in several tasks based on: Raising Users Participation and Awareness, Web-based dissemination, Printed dissemination material, Workshops and Conferences, Publications, Radio interviews, Exploitation planning, Clustering with other projects, Market analysis, Exploitation plan, Coaching, Training and knowledge transfer, Production of training material, Organization of training events.

On the other hand, the consortium will organize an end-user workshop to evaluate and disseminate the technological output of the eVACUATE project. An intensive end-user workshop that will bring together both practitioners and academics studying crisis management. In addition, conferences were and will be organized with academic partners in crisis management research.

Regarding exploitation, efforts are to be generated and their viability, integrity, complementarity, and consistency. eVACUATE follows a stepwise approach to ensuring maximal exploitation of project results based on six main steps:

- Step 1 : Investigation of all relevant background including legal and privacy protection, procedural, and security issues and business model taking into account international and national directives and European strategies to provide first response work, individual processes within the various players involved and the civil protection partners, and carrying out complementary primary research where required.
- Step 2: Analysis of complementary and competitive services and relevant shortcomings that need urgently to be addressed at a global level in order to safeguard security, effectiveness, support and proper monitoring of the first response work and crisis management, identification of emerging best practice across the civil defense domain as well as the wider involved public and private domain internationally.
- Step 3: Setting up of deployment scenarios, market and business models for individual exploitation and joint exploitation, specifying collaboration roles, costs and revenue flows, specifying as well necessary law enforcement and other conditions that need to apply in order to make such scenarios feasible;
- Step 4: Validation of business models and deployment scenarios within the feasibility analysis with the help of the partners' complementary expertise and assessment of the effectiveness of the eVACUATE approach to provide a leap forward in the area of first responder support, safety and operational effectiveness.
- Step 5: Organization, planning and execution of wide impact dissemination activities to create full awareness of eVACUATE activities, its approach and results in the academic community, the Security Priority, and general RTD community, among public authorities, civil protection agencies, service and solution providers as well as all other peers along the Safety of Citizen domain; establishing contact with key third parties for exploitation.
- Step 6: Regular review, revision and refinement of partner-specific exploitation plans and joint /collaborative business plans in the light of interim project results; formalization of service level and other appropriate agreements for joint exploitation among partners and third parties;

6 PARTNERS EXPLOITATION PLANS

This section describes the partners' exploitation plans that may or may not involve other partners. Those are utilization of research, technology, tools and components developed within the EVACUATE project.

6.1 *INDRA EXPLOITATION PLAN*

Indra Exploitation plan is align within its defence and security department as well as the public administrations, in line with the new solutions for the so called Smart Cities. As an integrator technology company, Indra will also define strategies to integrate several market solutions into the framework of the project to provide new capabilities.

The exploitation plan will be aligned with the Public Sector Strategy in Spain, but also with the European Union opportunities.

At the local level, connections with local authorities are planned, in order to present the capabilities of the project and to define possible strategies to include this type of solutions as part of a new regulation to improve evacuations and to increase safety conditions.

On the other hand, several national agencies could be interested in the evolution of the solutions towards specific uses cases, as for example: tourism, etc., and several contacts will be taking place to evaluate these new possibilities and their approach.

6.2 *EXODUS EXPLOITATION PLAN*

Commercial chances of success: EXUS is planning to use the project results, especially the developments in data fusion and management in its product portfolio. The main product of EXUS is EXUS Financial Suite (EFS) that is an integrated solution for Credit Collection, Recovery and Scoring. The EFS product is tailored to fit the needs of organizations active in the Banking or/and Telecommunication industry domains. At the core of EFS a data management and fusion engine resides responsible of managing the various data of the platform. The eVACUATE development will enhance the functionality of the product by enriching the data management and complex event processing used within EFS.

Moreover, EXUS will use the project's results to enhance its mobile products portfolio including the mobile applications for First Responders and security personnel. The applications will be demonstrated to First Responder organizations within Europe. In addition, the additional sensor classes are valuable especially in the emerging Internet-of-things space. Certain cases, such as personalized healthcare, smart-cities, etc. require the interaction of computing systems and mobile devices with sensors, on-body wearable in the case of personalized healthcare or dispersed in a metropolitan area. The generalization of the sensor classes will enable faster sensor data harvesting and fusion of this information to deliver added value such domains. These new classes will be used strengthening the SW libraries of EXUS already used in the context of R&D in the Personalized Healthcare domain, enriching the technical infrastructure of EXUS.

In cooperation with all industry partners, EXO will perform and coordinate market studies regarding the new technologies, devices and systems designed in eVACUATE. EXODUS will use its partner network to disseminate the knowledge and achievements of the eVACUATE project and raise awareness, while at the same time investigate the potential of new end- products and services, of the developed security platform and data analytics engine developed within the project

Scientific and technical chances of success: Speed up the integration of new sensors to the developed data management/fusion engine and EOC back-end through the adoption of eVACUATE's gained knowledge/new techniques/technologies developed. In this way the developers will be able to build faster and easier new applications on top of this infrastructure.

Scientific and commercial follow-up activities: EXODUS explores new fields of activity, or ways of enhancing its up and running products. The eVACUATE project will enhance EXODUS knowledge in data integration technologies and business portfolio. Furthermore, the platforms that will be developed are

going to be innovative state of the art systems, giving EXODUS the opportunity to gain an appreciable market share. Under these frames, EXODUS is currently planning to initiate different research project proposals that deal with advanced security systems solutions, including sensor data integration and intelligent data management. Those are currently in preparation and will be submitted in the frame of Horizon 2020 (e.g., ICT, FTI, PHC and Secure Societies calls). The eVACUATE project results will be reused and further developed within these projects (e.g., within the context of the FP7 projects INACHUS and ZONeSEC and H2020 project FLYSEC) and other initiatives.

6.3 IT INNOVATION EXPLOITATION PLAN

IT Innovation Centre is an integrator of software systems that can be exploited for operational decision support in industries, government departments and defence market sectors. As part of the University of Southampton we offer a breath of capability for deploying bespoke humans behaviour detection for improving safety and preparedness for evacuating crowds from confined spaces. The spaces could cover stadia, train stations, airports, concerts arena, shopping malls and so forth. The security industries and government agencies are in need for our advanced automated crowd behaviour systems for improving their crowd management approaches. IT innovation Centre has been in discussion with various defence sectors organisation in the UK and Europe. This is summarised below:

- UK Home Office, the Association of Chief Police Officers as well as UK City Councils security deaprtments for adopting eVacuate Technology on automated crowd behaviour detection.
- We connected our research in the successful DESURBS project (www.desurbs.eu) with that of eVacuate research for coupling crowd perception of safety in order to advance situation awareness in the evacuation process with knowledge of crowd behaviour. This coupled capability from the two projects brings in a solid offering of the new generation of surveillance systems in the security and defence sectors particularly in urban environments with critical infrastructure.
- We initiated advanced discussion with UK cities in connection with potential UK research councils and Innovate UK funding programmes on smart cities and citizens well-being and safety. Currently we are developing a proposal for funding by EPSRC concerning the modelling of the propagation of unusual behaviour in city catchments applied to the City of Glasgow and Lancaster
- We have been invited to present and show case our capability on automated multiscale crowd behaviour detection in spaces at the prestigious UK Security EXPO event on November 30th, 1st December 2016 (<http://www.uksecurityexpo.com/conferences>) and discuss it with the defence sector industries.
- Evacuate research is also being exploited in the synergetic ZoneSEC project (www.zonesec.eu) with regards to understating humans illicit behaviour near widezones (also critical infrastructure) through improving context knowledge modelling for understanding behaviour, which has been pioneered in eVacuate. The latter was pioneered using multi-modal computer vision, statistical mechanics which are coupled with theories of crowd typology and behavioural psychology in context of spaces and scheduled human activities in spaces.

6.4 ICCS EXPLOITATION PLAN

As an academic partner and non-profit research institute, the Institute of Communication and Computer Systems (ICCS) being strongly linked with the National Technical University of Athens (NTUA), Greece intends to exploit the results gained by its research activities towards increasing its collaboration with other research and industry partners. This would permit an increase of knowledge exchange that will strengthen ICCS' position in the research domain and augment its knowledge database. ICCS, has already capitalised such knowledge by participating in a newly-started H2020 Security project. In parallel, the results will be exploited by PhD, M.Sc. students and researchers that are currently participating or will be triggered to during or after the generation of relevant research results.

ICCS will focus in increasing research innovation capacity and competitiveness by promoting novel technologies in the area of communication technologies and Service Oriented Architecture (SOA) and middleware for security applications and systems, ICT and smart systems in the era of IoT, and computer

vision and machine learning techniques for crowd, object and flow detection using hyperspectral and thermal imaging techniques for security and mission critical applications.

In more details, the exploitable components researched and developed within eVACUATE can be summarized as follows:

- Interoperable communication gateway implementation (supporting the integration of different communication protocols, sensing/actuating/end user devices), able to be integrated with existing legacy systems
- Communication middleware based on SOA and publish subscribe mechanism, that can be incorporated with IoT platforms including but not limited to decision support systems
- Computer Vision Module with hyperspectral and thermal imaging techniques using advanced machine learning algorithms for object, crowd and unusual behaviour detection for application where advanced surveillance, precise detection of crowd flows and moving objects is of major criticality

The developed modules and technologies, will be implemented and demonstrated in real environment of eVACUATE end-user venues (football stadium, airport, Metro station, cruise ship).

Furthermore, special effort was given to integrate the developed technologies/modules with existing legacy systems, so as to proof interoperability and seamless integration, thus build the baseline for adaptation by industry stakeholders. This includes the integration with mission critical communication technologies used by PPDR agencies such as TETRA, Building Management Systems and Public Address systems.

To help companies to develop products based on the work performed in eVACUATE, ICCS used open source SW, widely accepted international and open standards focusing in interoperability, scalability and resilience. At a business level, a successful open source based scientific work could open the way for a commercial future exploitation through spin-off company activities.

ICCS has identified the following targeted stakeholders (authorities, organizations and industries) to exploit the project results.

- Operators/Owners of large venues where safety and security of mass gathering is of critical importance such as airports, football stadiums, train stations, large industrial Buildings, hospitals etc.
- Providers of decision support systems
- IoT system and service providers
- Smart systems and ICT system integrators
- Governmental agencies and public authorities dealing with citizens safety and evacuation procedures for mass gathering at public spaces

6.5 HKV EXPLOITATION PLAN

HKV will exploit three different outcomes of the eVACUATE project, first among stakeholders in the Netherlands and later also in other countries. HKV will focus on the marketing of:

- Assessment of requirements and needs related to evacuation planning for different end user groups: stadiums, airports, shopping malls, amusement buildings, theatres, etc.
- Risk analysis with the above mentioned stakeholder groups. We might combine or enlarge this risk analysis with flood risks. We will indicate the risks and the possible solutions to diminish those risks. Using parts of the eVACUATE systems is one of the possible solutions. Training and exercises with the above mentioned stakeholder groups. We will be able to train personnel and volunteers in different evacuation situations and make them familiar with different strategies (on or over the edges of their own evacuation plans).

6.6 TEL EXPLOITATION PLAN

Telesto is an SME that develops and commercially exploits innovative applications and services that involve M2M communication. Since 2015, it has developed a complete stack of functionality for IoT applications that build on information acquired from sensors in our proximity (wearable devices, smartphones), environment (weather sensors, soil sensors) and the structured environment (structural sensors in buildings, bridges, roads), which is termed the “Cloud4Smart” platform. Its unique characteristics include the use of standards across the layers (MQTT for accessing raw data, OGC models for structuring data and services on the data, etc) which ensures a high degree of interoperability. It also allows the visual representation of data according to the ISO 37120 data to structure Dashboards for analytics.

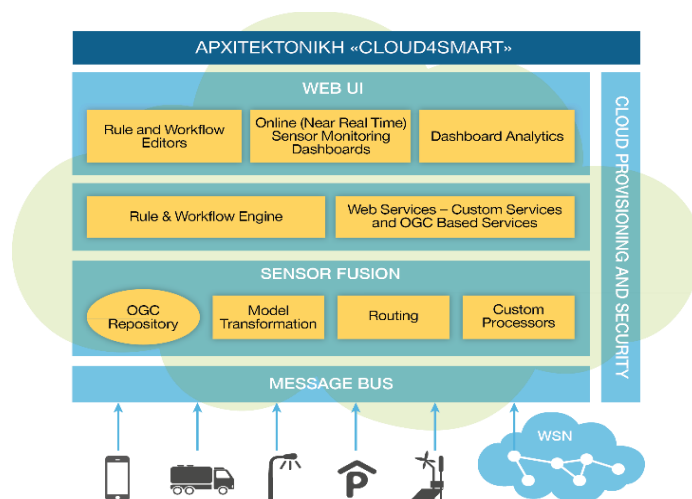


Figure 1 – The Cloud4Smart architecture by TELESTO

Through its involvement in R&D projects it exploits the foreground research in the form of vertical market-specific applications that build on the aforementioned Cloud4Smart platform, indicatively

- a cloud-based asset and fleet management
- a smart city framework based on ISO 37120
- a mobile (smartphone) based citizen engagement platform we call CityAPP

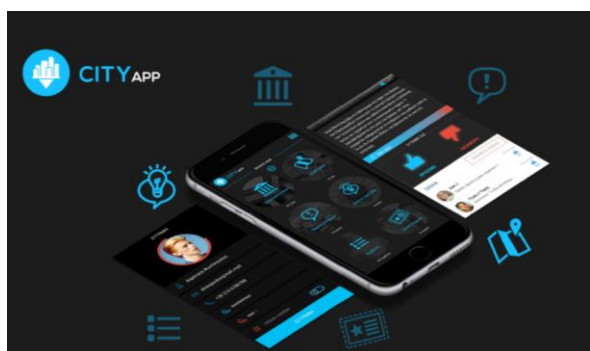


Figure 2 – The TELESTO CityAPP is a citizen engagement platform

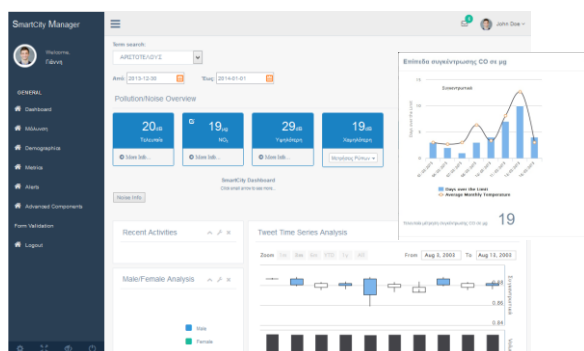


Figure 3 – Based on Cloud4Smart a Smart City framework has been created

The company - being an SME - has moderate resources with regard to direct selling its products to the different end users in the vertical markets. Thus we may recognize the alternative sales models:

The Direct Sales model, where the company sells its platforms without intermediaries to selected end users, mostly has to do with the municipalities, the city authorities and the utilities. The company directly sells all or parts of its IoT platforms, namely Fleet Management, Citizen engagement apps, Management solutions as well as conventional Digital Solutions (including eGov)

The Indirect Sales model, whereby the company sells to project integrators who in turn offer our solutions as part of their portfolio in a combined service/product offering. Particularly for the eVAMAPP solution, Telesto will seek to partner with non-competitive security vendors from the digital economy who don't have safety management solutions of their own (e.g. CISCO, HP).

Exploitation of eVACUATE results

In the context of eVACUATE the company has developed a smartphone application framework (temporarily called the "eVAMAPP"), that offers significant benefits to both the facility operators and the visitors. The development of a native (not web-based), mobile (smartphone) application in eVACUATE, aims to offer the visitors with valid, up-to-date information about the crisis, indications on how to get help and indicate active evacuation routes.

Additionally and in accordance to the contractual guidelines, an additional goal is to acquire more information about both the emergency scene and assess the safety of the person holding the smartphone, as measured by onboard sensors, in real time, as well as to support the individuals in identifying threatening situations.

The eVACUATE Mobile Application (eVAMAPP) will be usable in 3 different cases, i.e. "before an event/venue", "During the event/ venue" as well as "During Crisis". There will be two variants of the application framework, one is specific for passengers of cruise ships, the other is generic for facility visitors.

Apart from the eVAMAPP, Telesto developed a Social Network Management platform that allows finding and evaluating the conversations that take place in Social Networks (e.g Facebook, twitter) and are related with a particular subject (name, place situation, event etc). The platform provides statistics for a defined subject, with graphical representations based on e.g historical, geographical data, as well as sentiment analysis. The developed platform incorporates Business Intelligence characteristics that is able to find: local extremes that might constitute an anomaly or the occurrence of a term in correlation with others etc that could lead to useful assumptions. The platform can be very useful to offer alerts based on events of statistical importance i.e more mentions/ posts/ tweets than average on a specific venue or mentions about smoke/ fire in the area of proximity of a facility etc, that can depict a critical situation.

Specific exploitation of eVAMAPP in Cruise Industry

The system will be offered as both an advanced SOLAS safety tool and a "digital concierge" to assist the passenger with his life on board the ship.

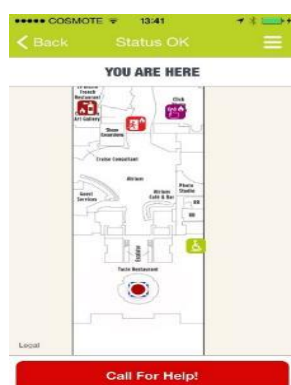


Figure 4 – The “You are here” display shows the passenger’s current

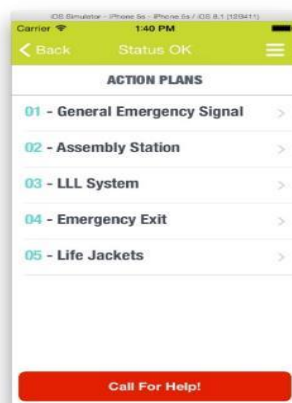


Figure 5 – The Action Plans displays all the practical information relevant to safety on board



Figure 6 – Action Plan details, here the passenger can play back the

Thus it addresses both the needs for passenger ship safety and promotes the image of the cruise operating company as a pioneer as a technology adopter in the very sensitive field of passenger safety and convenience.

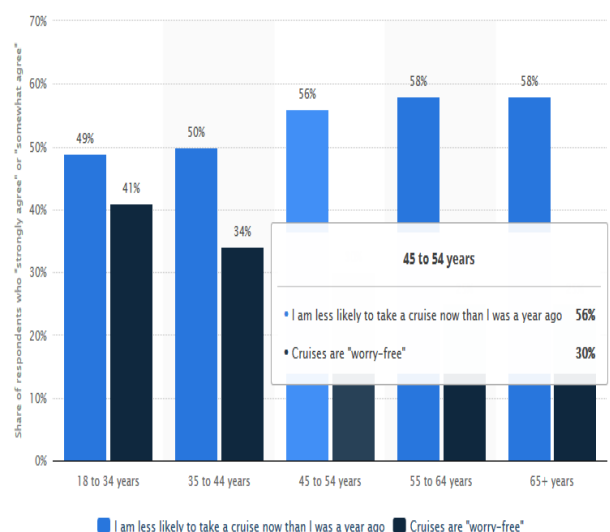
The application will be charged on a combined installation costs and SaaS model whereby the ship is charged a basic fee and then will be charged according to its use by the passengers. An alternative model is for the cruise operator to sell the application via one of the application markets.

A further monetization means is the exploitation of analytics for offering insight on customer needs and thus for actuating real-time cross-selling strategies. Such strategies will need to be combined with advertisement campaigns.

Market size

The total worldwide cruise industry is estimated for 2015 at \$39.6 billion (a 6.9% increase over 2014) with 22.2 million annualized passengers carried (a 3.2% increase over 2014), according to Cruise Market Watch. This means that the average expenditure per passenger is no less than €1783/passenger, and the rate of increase of the revenue per capita is more than double than the rate of the increase of passengers. About 20% of this amount is spent shopping and consuming on board the ship. It is also widely believed that this market has the potential to grow significantly in the medium term as demonstrated by the number of cruise ships being built (the demand is booming, shipyards are building new ships and it is worth mentioning that the backlog is so significant that new ship orders will not be delivered before 2020).

The market analysts indicate that the market could boom, however incidents like the “Costa Concordia” which ran aground and capsized in Italy, and the “Carnival Triumph”-which was carried adrift by the currents in the Gulf of Mexico for 3 days, increased the negative image about the cruise industry in the general public. In a survey among US and Australian audience members by Statista, all age groups between 45 and 75 showed that more than 56% was “less likely to take a cruise than a year ago” (after the incidents of 2013 and 2014).



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The proposed innovation initially targets the cruise ship and passenger ship market that will lead to a better customer perception of the importance of safety to the companies.

Additionally Telesto will further exploit the capabilities of the eVAMAPP application and extend its usage to other critical infrastructures (hospitals, malls, stadiums etc). Of course there must be improvements and adaptations to cover the needs of the new environment, but the basic technological characteristics are the same, known and tested under the project.

6.7 TEK EXPLOITATION PLAN

As R&D centre, and following the company’s mission of helping the industrial sector to increase its innovative capacity by means of generating and applying technology and knowledge in order to be more competitive, the exploitation plan is based in the transference of Internet of Things technology knowledge

(on sensors/actuators, deployments and integration with higher layers) to industry, SMEs and Public Authorities.

eVACUATE project allow IK4-Tekniker to improve its experience on the deployment of Wireless Sensor Networks on real environment, aligned with the strategic line of the company on the Internet of Things world. By the end of the project, it will be tested in four different pilots the dynamic signalling solution developed within the project and it will be contrasted the interoperability of the system, the easy deployment capabilities and the reliability of the solution.

These deployments will allow IK4-Tekniker to:

- **Improve the commission tools for an easier deployment:** Based on the experience of the deployment, several tools used to assess the status of the network will be updated and improved, nodes association protocol to the master and sniffer capabilities to assess the status of the network during the deployment.
- **Demonstrate the consistency of the wireless communication and the overall system, and the flexibility in the deployment:** The active exit signs will be deployed in different environments, a metro station, an airport, a stadium and a cruise-ship, with different characteristics for wireless and wired communications.
 - In the cruise-ship, for instance we will face serious difficulties in the deployment when using wireless communications (WSN), and the interoperability of the different communication interfaces will be essential in order to ensure the communication with all the exit signs under any circumstance. This is due to the nature of the cruise-ship construction materials, mainly steel, and the procedures they follow when an evacuation should be performed, because they close and separate different zones with hermetic steel doors.
 - In the other venues we will have the opportunity to analyze the better performance of the system depending on how many signals are connected wirelessly and how many using wired communications.
 - Moreover, in all the venues we will have to deal with the interoperability with other wireless networks (WiFi, and other WSN), and these pilots will give us the opportunity to demonstrate the compatibility of our WSN with other wireless technologies.
- **To increase the TRL of the deployed devices from 5 to 7**, demonstrating the system prototype in an operational environment.
- **To increase the scope and offer for Wireless Communications Networks:** IK4-Tekniker has already finished another development based on Wireless Sensor Networks for energy monitoring in buildings within FP7 Tibucon project and Street Lighting System control (Smart City) within FP7 Urbgrade project, and this experience allows to widen the scope to other possible relevant environments in the security field.

As was stated before, IK4-Tekniker, as a research centre, is seeking for the transfer of its technological knowledge on Internet of Things technology to the industrial sector. In this sense, the organisation can help industrial companies to develop products based on the work performed in eVACUATE (Dynamic Exit Signs, Agents development and interoperability). Thus, the experience of working on eVACUATE:

- Will enhance the core activity of the department on WSN.
- Will provide interoperability tools between the WSN and other communication interfaces.
- Will create opportunities for consultancy on Internet of Things product developments to industrial partners.
- Will help to develop Internet of Things products and license them to industrial partners.

6.8 AIA EXPLOITATION PLAN

As an end user partner, Athens International Airport is particularly interested in addressing the challenge of efficiently and effectively evacuating parts, or the whole of the airport terminal, in order to protect and safeguard the lives and the safety of the tens of thousands of passenger using the airport every day.

This challenge has to take place, while at the same conforming to the national regulations and the operational plans that have been compiled for situations leading to evacuations and have been developed with the state authorities .

As the recent incidents in Brussels and Istanbul Airports indicate, the risk profile of Airports regarding security incidents is drastically increasing, while at the same time the Airport has to manage the inherent challenge of providing a safe and secure environment for passengers to travel in a seamless manner with an increased customer satisfaction .

In order to cope with the challenges above, the Airport needs to have in place those processes and framework that will enable the mitigation of these risks. AIA must correctly decide and execute the established mitigation plans, provide the support tools that will provide for the timely and accurate information from multiple sources, provide a common operational picture to all airport stakeholders (e.g. state authorities) that are responsible for responding to incidents and assist in the decision making by providing advise based on the inputs of the platform from the sensors.

The solutions developed within the eVacuate project will enable the gathering of additional information and the early detection of events developing at the Airport , fuse these information and provide a common operation picture to the authorities responsible for the decision making. The solutions provided by eVacuate project will allow, the authorities responsible, to assess the effectiveness and the progress of the execution of these plans, advise for the best possible mitigation plan and by continuously providing updated information to allow stakeholders to dynamically adjust their plans as these are being executed. In these manner secondary events or additional threats can be quickly evaluated and the emergency operation plans can quickly adapt to the evolving situations.

Upon the execution of the validation tests, AIA will consider and decide upon the integration and use of the solutions developed within the eVacuate project and adjust its operational and emergency procedures accordingly, in cooperation with airport stakeholders responsible for the execution of the evacuation processes.

6.9 METB EXPLOITATION PLAN

Metro Bilbao as an operator of a system of urban mass transport, metro type, is constantly facing with situations where the influx of people in stations and venues managed is very high, forcing them to adopt and implement specific operative procedures to manage this such situations safely.

Evacuating a station with a large number of customers inside (crowd) often becomes a difficult challenge due to the decision making speed required at that moment and due to the architecture of the facilities.

These situations may be generated by own motives to the operation itself, as well as breakdowns or incidents on trains and other facilities, and are also sometimes generated by outside reasons such as sports, cultural events or demonstrations. And nowadays we must bear in mind the terrorist threat which is recently affecting this type of transport in other European cities and the consequences which are already known.

The proposed and developed solutions in the project will contribute to improve our evacuation and management processes of crowds of customers, providing higher safety and efficiency in decision-making. They will help predict and improve the processes of detection of situations that can lead to the evacuation of a station. In the phases of evacuation management process will complement our actual evacuation protocols, providing dynamic signaling and transmitting important information to customers and to the people who have to coordinate the incident.

Overall, it will be improved information flows as part of the solution will be the implementation of a tool that integrates all communications that take place in the evacuation process both with the devices installed and the people involved.

Once the completion of the project and its results have been evaluated, Metro Bilbao will conduct an assessment of the solutions, to decide whether to implement these systems in other stations and the feasibility of the integration our centralized control system.

6.10 ASRS EXPLOITATION PLAN

As the end user Real Sociedad de Fútbol, S.A.D. participates in the Consortium eVACUATE with the desire to strengthen the tools available to improve the safety of the spectators of a football match.

The Royal Decree 203/2010 requires sports entities to comply with procedures and protocols that ensure the safety of spectators. However this is not enough. In the coming years, the stadium is going to remodel to increase capacity and obviously, to improve security.

The project allows to the Real Sociedad de Fútbol, S.A.D. access to a broad set of integrated technologies to provide more means of Control Unit.

We want to help the entities responsible for the safety of football new tools. We want that many followers and fans feel safer in the stadium. We want to provide more value to our customers through security.

6.11 TUC EXPLOITATION PLAN

TUC has collected much experience in the field of printed electronics during the last 15 years. The findings of these investigations have been published in different ways, e.g. by scientific papers and conference presentations. Furthermore, the topic printed electronics was strongly involved in education programs for students. As one example, the study program “Print and Media Technology” gives the opportunity to achieve a masters degree with deep knowledge about printing technologies and the combination of these technologies and electronic devices like organic field effect transistors, organic solar cells or piezoelectric loudspeakers.

The work made within the project eVACUATE will be used to be integrated in the education of the students. E.g., within the course “Printed Electronics” given by Dr. Georg Schmidt, the eVACUATE project is presented as a whole and in detail regarding the printed chipless RFID tags as alternative solution for low-cost tags. Additionally, students of TUC have the opportunity to write their bachelor or master thesis within the research topic of chipless RFID systems.

In close collaboration with TUD, the results of the eVACUATE project have been published in several ways at conferences and in scientific journals. TUC and TUD want to continue this successful route during the ongoing duration of the project.

6.12 TUD EXPLOITATION PLAN

In the context of the eVACUATE project, TUD, in close collaboration with TUC, has been developing the chipless RFID system. This system provides to the eVACUATE’s framework the number and type of persons that have crossed through a particular point into a venue and actively helps to maintain the so called *Active Evacuation Route*. The system contemplates two main components: a tag and a reader. In particular TUD is responsible for the design and testing of the tags as well as for the development of the reader and the final chipless RFID system integration.

The experience collected by TUD in the field of printed electronics not only by the participation on eVACUATE project but also in similar EU projects have paved the way to positioning the University and in particular the Professor Ellinger’s Chair (CCN_TUD) as an international reference in this technology. The

topic in flexible printed electronics and chipless RFID will be used as academic content into specialized lectures and can be offered to students to develop bachelor or master thesis. Furthermore, TUD exploitation plan includes participation in further research activities, addressed to exploit the accumulated know-how on this technology and with the involvement of appropriate stakeholders. Finally, in close collaboration with TUC, the results of the eVACUATE project have been published in well-known conferences and in prestigious scientific journals. Our outlook is to continue this path during the development of the eVACUATE project.

6.13 STX-FR EXPLOITATION PLAN

Since the last twenty years the number of cruise ships has ever increased having as consequence the growth of incidents and accidents. International Maritime organisation (IMO) regularly adopts new rules relevant to cruise ships and onboard passengers safety.

To comply with these rules, cruise ships are nowadays equipped with various systems which are more and more complex providing a huge number of information to the ship safety crew.

In case of incidents or accidents this huge number of information becomes quickly unmanageable by the safety crew, who has to take quick decisions in order to respond to the various situations that may occur.

The last major accidents of cruise ships highlighted this issue of crew reactivity facing crisis as well as communication concern towards the passengers taking into account the multi-language issue.

The results develop within eVacuate project will therefore contribute to enhance the safety onboard passenger ships providing through the “Common Operational Picture” interface the information strictly useful to guide on one hand the passengers to the right muster station and on the other hand to help safety crew take the right decision to lead the passengers out of the dangerous areas and find missing people.

This new solution has been presented internally to STX technical department to check the integration within crisis management platform developed by STX. It has also been presented to ship owners to prepare the future commercialisation of this innovating concept. Moreover, investigations are ongoing to assess the integration of eVacuate results within existing evacuation management procedures and software used onboard existing ships to enhance the evacuation management process.

6.14 POLITO EXPLOITATION PLAN

Politecnico of Torino (POLITO) is a Technical University with high level experience in training students in different fields of engineering at the level of bachelor, master degrees, and PhD Programs. Master and PhD Programs in Mathematical Engineering are one of the challenging engagements of the Department of Mathematical Sciences where the Team POLITO operates.

Participation to European Projects positively affect the aforementioned programs in two ways:

- Education of a new generation of mathematical engineers. Indeed, education in mathematical sciences is often developed on a theoretical ground while a more practical knowledge is increasingly required by the needs of our Society.
- Interaction with Security forces and Governments. Such interaction permits to improve the quality of the products which can support decision making in complex situations where a very short time is left to elaborate safety actions.

Team POLITO has an important past experience in European projects, including the coordination of European Networks. This activity is documented in the WEB page of Nicola Bellomo (<http://staff.polito.it/nicola.bellomo>), who has been ranked in the WEB of Sciences within the world-wide 1% influential minds in the field of mathematics.

Within the Project EVACUATE, Team POLITO has developed a sophisticated model of crowd viewed as a complex heterogeneous system. In particular, stress during evacuation in danger conditions and overcrowd have been properly accounted for, in accordance with the requirements of the Project.

Moreover, a new computational approach has been designed and a code has been developed which can provide real time simulations in complex venues even when the walking area is modified by the onset of incidents.

In order to contribute to the exploitation of the aforementioned results generated by POLITO (according to the consortium agreement IP rules), POLITO is interested in performing further research activities, addressed to end-users and with the involvement of appropriate stakeholders since their participation in future research initiatives is important, as well as their influence in decision making.

POLITO exploitation strategy then includes firstly a stakeholders identification and analysis. This analysis starts from the wide relations POLITO has with international institutions, companies, local governments and other associations. POLITO has links with the most prestigious research entities in Europe and it is part of some of the major European networks. These contacts are also born within the participation to many international projects.

These contacts will allow POLITO to integrate project results with the contribution of a wider number of entities and institutions.

The stakeholders which could be directly affected by the EVACUATE project results and already connected to POLITO are:

- Research networks and European Technology Platforms: SERIT Platform for security research in Italy, Torino Living Lab, SmartCities Stakeholders Platforms
- SmartCities: Città di Torino
- Public Safety responsible groups: Police
- Innovation agencies: SITI “Advanced Institute for Territory and Innovation”
- National, regional and local actors: Compagnia di San Paolo (national no-profit foundation), regional and municipality councils
- Security private and public actors: security agencies

Each group of stakeholders will look for different relationships and goals, in accordance with their position or involvement level. In the same manner stakeholders shall be affected and profited from the project and vice versa. For instance, Local and regional actors will look for employment prospects, safeguarding citizens and their environment, quality of services, efficient use of resources and employees, contribution to society and their economy, social and ethical acceptance.

With the aim described above, the research activity carried out by Team POLITO has been already brought to the attention of the several stakeholders and also to end users like operators in the field of security.

In fact, in the framework of the dissemination activities, during the project Scientific papers have been published in journals with high reputation and invited keynote lectures have been delivered at International Conferences held not only in Europe but also across other continents, as the opening keynote lecture at the CROWD DYNAMICS conference in Tokyo, Meiji Institute for Advanced Study of Mathematical Sciences, January 2015.

Additional invited Lectures have been delivered in Dundee (Scotland), Paris (France), Granada (Spain), and Istanbul (Turkey).

Moreover, results and possible future research scenarios has been presented at national level to Security forces of Città di Torino with the contribution of SITI “Advanced Institute for Territory and Innovation”, a non-profit association set up by Politecnico di Torino and Compagnia di San Paolo (<http://www.siti.polito.it/>).

Now POLITO is working on the design of a predictive engine to support decision making based on simulations of evacuation dynamics properly stored in a database. This tool is the main exploitation results measure adopted by POLITO as it is a bridge to future activities and supports the design of the new generation of surveillance and security systems needed by European (and not only) countries.

6.15 DXT EXPLOITATION PLAN

The industrial exploitation of the results of the work on the COPSI components will be carried out by DIGINEXT. This commercialisation will rely on the company's own commercial forces as well as on its mother CS Group commercial network, which is present in about 40 countries worldwide with a strong activity in America and Asia. DIGINEXT's business development is based on intense Research and Development activities that enable the company to develop innovative and differentiating products. Since its creation, DIGINEXT has been involved or is still involved, as a coordinator or as a partner, in several EC funded projects that have produced most of the products the company is currently commercially exploiting.

COPSI developments are integrated into COTS product such as VirtualGeo or Inscape. VirtualGeo is designed to create and interactively visualize massive 3D geographic environments by indexing, assembling and optimizing all the relevant sources of available data. COP developments broaden VirtualGeo scope by adding indoor context to existing capabilities. Inscape is a solution to develop custom and powerful training content, allowing the creation of rich and interactive applications with extraordinary simplicity. Simulation developments add specific tools to simulation conditions definition and user interface metaphors. Moreover, the integrated developments pushes the development of higher level systems derived from COTS DIGINEXT products such as next-generation COP and C2 systems used in the Control Centre of the next generation of French Earth Observation Satellites or DIGINEXT Crisis management solution : CRIMSON.

6.16 K.U. LEUVEN EXPLOITATION PLAN

The main focus of the exploitation plan for KU Leuven is the dissemination of the ethical and legal research results. The main focus of these results is the ethical, privacy and DP analysis of and recommendations to Information and Communication Technologies (ICTs), which are designed in the eVACUATE project in the broader context of emergency management. These recommendations, while specifically targeted at the eVACUATE technologies, could have a broader application to other ICTs that are used in emergency situations, e.g. to improve the evacuation of people. In order for such technologies to become operational and for these tools to be accepted by the end users in the European Union, they should comply with the EU data protection and privacy framework, amongst other legal requirements.

The recommendations aim to mitigate potential risks associated with unlawful data processing and abuse of collected personal data. Besides ensuring the legal compliance of these tools, this framework of recommendations also has an ethical merit in that it documents actions taken to mitigate potential negative outcomes. It also enables predicting the consequences of actions of the involved actors and assessing the societal acceptable of the system of technologies developed within eVACUATE.

More specifically, the public deliverables, such as reports and tables summarising and assessing compliance with the data protection requirements as well as the increased awareness of data protection issues could be leveraged in future projects dealing with disaster management.

Highlights of these results include the extensive study of the data protection and ethical recommendations to the eVACUATE technologies aimed at supporting them in their further developments (D11.1 'High level ethical and legal framework, formulating ethical and legal requirements for eVACUATE' and D11.2 'Ethical and legal requirements analysis and specifications'), the analysis of specific elements of the solution such as RFID, eVAMAPP etc. (D11.3 'Ethical and legal requirements analysis (specifications, proportionality, implementation and evaluation') and the recommendations, guidance and templates of agreements and consent forms dealing with real work with personal data during the research and validation phases (D11.4 'Ethical and legal evaluation report and recommendations').

In order to ensure the sustainability of these results and to encourage their further use, it is essential that the privacy and data protection analysis is disseminated. Dissemination could increase the likelihood of improving other technologies' compliance and could advance the academic knowledge and debate on the application of the data protection and privacy requirements to new technologies.

The dissemination of these results has been taking place through submission of research papers to conferences and journals, as well as presentation at workshops and conferences, which target technology experts. In 2017, a panel would be organised at the annual Computer, Privacy and Data Protection (CPDP) conference. The panel would be devoted to issues such as the role of privacy and data protection in disaster management and the key challenges of translating the GDPR into the practices of information sharing in disaster management. Another dissemination aspect is the possible consideration and/or inclusion of the privacy and data protection debate in the standardization work of such technologies, as carried out by CEN/CENELEC, with which the project has been granted a liaison status.

6.17 CDI EXPLOITATION PLAN

CDI is a world leading consultancy in the field of crowd modelling and transport planning. The crowd model developed for the eVACUATE project has already been useful in a number of internal consultancy projects, and there is a clear opportunity for further leverage in the future.

So far, 3 projects have benefited from the crowd model developed for eVACUATE:

Medina Mosque expansion, Saudi Arabia

The Prophet's Mosque in Medina, Saudi Arabia, is due to undergo a large expansion to accommodate a much larger number of pilgrims, and CDI have been consulted to help with planning such a large space, in relation to the movement of crowds within it. A model was created to simulate the huge numbers of people on the site, and show the projected movements and densities of the crowd during the peak prayer hours, as the crowd dispersed away from the main area.

Southampton University

CDI was approached to advise on a new faculty building at Southampton University. The crowd model software developed for eVACUATE was used to model circulation throughout the building, and also output statistical data for the usage of key routes and exits during an egress scenario.

Neo Conference Centre, Brussels

CDI created a model to assist with the planning of the Neo Conference Centre in Brussels. Specifically, ingress and egress scenarios were created to predict optimum flow in relation to a desired timescale. The results were convincingly used to argue for a change in the position of stairs and escalators within the building.

Future Exploitation

In addition to the work already undertaken, there are already plans in place to exploit the crowd model to help with advising on the crowd management during the Hajj pilgrimage in Mecca, Saudi Arabia. This will consist of modelling the city streets and roads, and showing how areas of high congestion can be managed and/or avoided. Active leads are being pursued through KSA ministries and private technology companies that cannot be named here due to privacy agreements.

The crowd model developed during eVACUATE will be integrated into CDI's CrowdIQ software, which will allow the sophisticated crowd modelling algorithms to be used by event planners and crowd safety experts around the world, and upgrade the functionality of the package at little cost. This is in line with CDI's business strategy, targeting UK and European users of the software (Local councils/Authorities, venue owners/managers, event planners, security companies and local enforcement agencies).

These customers also form the target market of the CDI exploitation plan for the real-time crowd modelling component of eVACUATE, and the eVACUATE system as a whole. Each of these stakeholders will be actively pursued to promote the eVACUATE system, to discover their needs and to propose eVACUATE where a state of the art solution would be beneficial. This will be done through ad hoc private meetings, conferences and exhibitions.

6.18 VITRO EXPLOITATION PLAN

Vitrociset is a prominent integrator of complex systems for the security and defence sectors. In these areas Vitrociset is offering large-scale turn-key integrated solutions, which usually employ multi-sensor systems in order to provide advanced situation awareness (including COP generation capabilities).

The concept developed in the frame of eVACUATE Project is in-line with the company's business strategy towards providing intelligent, multi-sensor and integrated systems for advanced situation awareness and Common Operational Picture generation for emergency management in critical infrastructures.

Vitrociset views the crowd management and analysis as an integral component of its future products and solutions portfolio. Therefore, it intends to exploit technologies and insights developed in the project in order to enhance the functionality and generally the added value of the solutions that it offers to its customers. VITRO will exploit several outcomes of the project including individual components for multi-sensors data fusion, behavioural models and policy simulations, as well as the eVACUATE Smart Spaces architecture, given that all these results can become valuable add-ons to its situation awareness and information fusion solutions.

In line with this exploitation strategy, VITRO will pursue and facilitate synergies between eVACUATE and other sensor fusion and emergency management projects (e.g. Vitrociset is coordinating another FP7 Project based on the usage of social sensors for emergency management, the SUPER Project) in order to systematically explore the added-value stemming from the combination of physical and virtual sensors in defence, security and emergency management applications.

eVACUATE framework represents an advanced platform and is intended for understanding citizens' reactions against emergencies or public events and to collect useful information, while at the same time empowering security forces and civil protection agencies: for this reason Vitrociset, starting from 1st Quarter of 2017, will start promoting and presenting the experiences, know-how and capabilities matured in the frame of the eVACUATE project to a dedicated group of stakeholders who can probably be very interested in using the integrated solution and/or some components.

The identified group of stakeholders are composed by the Football Clubs Companies who will be responsible, together with the local administrations, of the design and construction of the new private Football Stadiums in some of the most important Italian cities: Vitrociset will try to pursue this opportunity trying to propose, together with the video-surveillance, access control and security systems (which are the core elements of Vitrociset's offer) also the opportunity of integrating in these complex systems the crowd and evacuation management solution developed under the eVACUATE project.

This is completely in line with Vitrociset's product policy driven approach lead by technological innovation. Its main way for achieving commercial impact is to define and implement technology roadmaps to bring "innovative concepts" toward "innovative capabilities" through the integration of technological and scientific excellences coming from academia, R&T centres and high-tech SMEs. Vitrociset security and crisis management offer covers all of the areas associated with the Civilian and Military sectors. Within the years, Vitrociset has become an important partner of the Italian Ministry of the Interior with projects for Citizens' Security by successfully completing several PON contracts (2000 to 2006) and other relevant projects in Homeland security and particularly in Critical Infrastructure Management during crisis events. In this vision, eVACUATE represents a relevant perspective to analyze and draft the evolution of this Vitrociset market area and will enable the integration of not only the National Police Forces ("Polizia di Stato", "Carabinieri" and "Guardia di Finanza") but also the Italian first responders (Italian Civil Protection and Fire Guards) and of other European Police Forces and Security Organization, according to CIMIC (Civil-Military Cooperation) approach.

The principal channel for market exploitation of the eVACUATE project outcomes will be through the Vitrociset targeted customers listed before. In a second phase, through partners and stakeholders networking, the results shall be advertised to similar European and International Organizations, specifically through: (b) Presentation of the project's outcomes in workshops and events organized by VITRO and Other Stakeholders, (c) Participation in exhibitions and public demonstrations, (d) Utilization of distributions and resellers worldwide to promote and include the solutions in offers and commercial bids.

6.19 JOINT EXPLOITATION PLAN

The eVACUATE consortium partners are interested to carry out also a joint exploitation of the overall eVACUATE system. Naturally, the industry partners will be driving this exploitation avenue, especially those Partners whose core business is related to security and emergency management domain.

To prepare for this kind of joint exploitation sample planning and discussion among partners is taking place to make clear the IPR claims to the produced foreground, while defining the commercially viable eVACUATE light system, and conducting a market analysis, and draw up a business plan for the period following the official end of the project. The most of these tasks are already reflected in this deliverable, as a result of all the exploitation activities carried out along the project.

Finally an Exploitation Agreement will need to be negotiated and signed after the project has ended in order to formalise the future exploitation. According to the Joint exploitation plan already established in the EVACUATE Document of Work, the six steps defined, are already accomplished:

Step 1 : Investigation of all relevant background.

Step 2: Analysis of complementary and competitive services and relevant shortcomings that need urgently to be addressed at a global level in order to safeguard security, effectiveness, support and proper monitoring of the first response work and crisis management.

Step 3: Setting up of deployment scenarios, market and business models for the exploitation.

Step 4: Validation of business models and deployment scenarios within the feasibility analysis with the help of the partners' complementary expertise and assessment of the effectiveness of the eVACUATE approach.

Step 5: Organisation, planning and execution of wide impact dissemination activities to create full awareness of eVACUATE activities.

Step 6: Partner-specific exploitation plans and joint /collaborative business plans;

In the same vein, , we are investigating the possibility of defining a join minimum system that will respond to the broader interests, and allow us to look actively for potential customers with a single product and business plan. The consortium partners' commercial expertise will help us to address not just the components of the project but also this light system to the Potential Market Segment, as for example: Ministries of Interior, Civil Protection Bodies, Homeland Security Departments, NGOs, Centres for Security Research, Fire Brigades, Police Authorities or Medical Teams. But also to a potential strong market segment, such as: control rooms of stadiums, airports, festivals and other large semi-public buildings. Thanks to the definition of the light version, and the definition of a clear business model behind it, we will have a powerful tool to seek for business opportunities all together. However we have to state clearly here, that we cannot guarantee the actual delivery/success of this stage, since the specific task (light version of eVACUATE platform) is outside the eVACUATE agreed and contracted deliveries (as those described in eVACUATE DoW) and therefore no budget has been foreseen to cover the development expenses of all partners at the moment. However since the eVACUATE consortium is willing to continue the highly innovative and qualitative work within eVACUATE, it is seriously considered and is under discussions the opportunity after the end of the eVACUATE project to investigate and exploit new available EU funding schemes to continue this work.

Also due to the competitors state of the art and the actual needs on this market field a more detailed analysis will have to be performed to identify the actual needs, affected by recent events, regarding safety and security awareness, that are taking place all over the world, and the fact that authorities of all countries are defining new strategies to be ready to overcome these situations.

This international situation is placing our solution as a great product to exploit, but it is also increasing the global competence and probably undermining the business viability of a light version of the evacuate system in front of the exploitation of the evacuate products separately.

eVACUATE consortium is therefore checking the possibilities if this is feasible (and from the cost perspective) to organize another workshop taking place at the end of the project with the stakeholders in order to provide us more information about the interests of the potential customers in the products, understood as the different components of the evacuate system or the system as a light exploitable version.

7 CONCLUSION

The document provides a description of the exploitation strategy for the EVACUATE project, service, technologies and products that have been developed within the project, both individually per partner and as a joint exploitation plan within the consortium.

A market strategy and stakeholders analysis has been produced and the SWOT analysis is provided together with the final joint exploitation plan.