Incorporating stakeholder input in EU projects

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Abstract

Motivation and introduction

Horizon 2020 (H2020) is so far the biggest EU Research and Innovation programme with nearly € 80 billion in public funding available over the period of 7 years (2014 to 2020) [1]. The programme is expected to attract private capital adding even more resources to fund innovative discoveries by taking the ideas from the research laboratories to the market. It is a financial instrument aimed at securing Europe's global competitiveness. Seen as a means to drive economic growth and create jobs, H2020 has the political backing of Europe's leaders and the Members of the European Parliament. By coupling research and innovation, H2020 is putting emphasis on excellent science, industrial leadership as well as tackling societal challenges. The goal is to ensure Europe produces world-class science, removes barriers to innovation and makes it easier for the public and private sectors to work together in delivering the much needed innovation.

Typically, technological and research teams from different countries and preferably with heterogeneous backgrounds form a consortium and apply for H2020 funding. The output of the project should, however, have a direct impact on the end users, cities and their residents. While such outcome is required by the European Commission, typically it is delivered just by the technology-oriented partners who are not always closely aware of the real world needs.

In order to improve the situation, we find it vital that a good consortium should also include at least one representative of the municipality or local resident organizations.

In this paper, we propose a solution on how an input from different stakeholders (typically municipality representatives) can be captured and incorporated into the system engineering processes within EU projects, mainly with respect to project objectives, its scope, requirements as well as a measurement of its real impact.

The proposed methodology is demonstrated on an example of a H2020 project called **MAVEN** - Managing Automated Vehicles Enhances Network [2] (Grant Agreement No. 690727) that was launched on 1st September 2016. This three-year project has nine partners from four EU Member States. The project aims to provide solutions for managing automated vehicles in an urban environment with signalized intersections and mixed traffic. It will develop algorithms for organising the flow of infrastructure-assisted automated vehicles, and structuring the negotiation processes between vehicles and the infrastructure. Platooning is an evident example of a technology in this domain. The MAVEN approach will substantially contribute to increasing traffic efficiency, improving utilisation of infrastructure capacity, and reducing emission.

The next section focuses on so-called system engineering, an important approach to improve quality of delivered products and results. Its drawbacks with respect to the EU projects are discussed and a solution is proposed.

System engineering processes

Systems Engineering (SE) denotes a general approach of how to describe projects with emphasis on planning and a project work over time, which often includes technical innovations [3]. SE is an interdisciplinary approach focusing on how to design and manage complex engineering systems over their life cycle. The Standish Group has done a research over many years to collect statistics on the success rates and success criteria for information technology (IT) projects, so called CHAOS Report [4]. The results clearly identify the lack of proper management and relevant methodologies as one of the main reasons for project failure.

Of course, many different methodologies and approaches have been developed over the years to address the SE. The so-called Systems Engineering Management Plan (SEMP) focuses on a technical plan of a project and SE processes to be used in the project. Its main purpose is to provide detailed information on the used processes, deliverables, roles and quality gateways. The SEMP is represented by the V model. A version adopted from [5], which aims at pragmatic application of the general SEMP Framework is depicted in the Fig. 1**Error! Reference source not found.**.

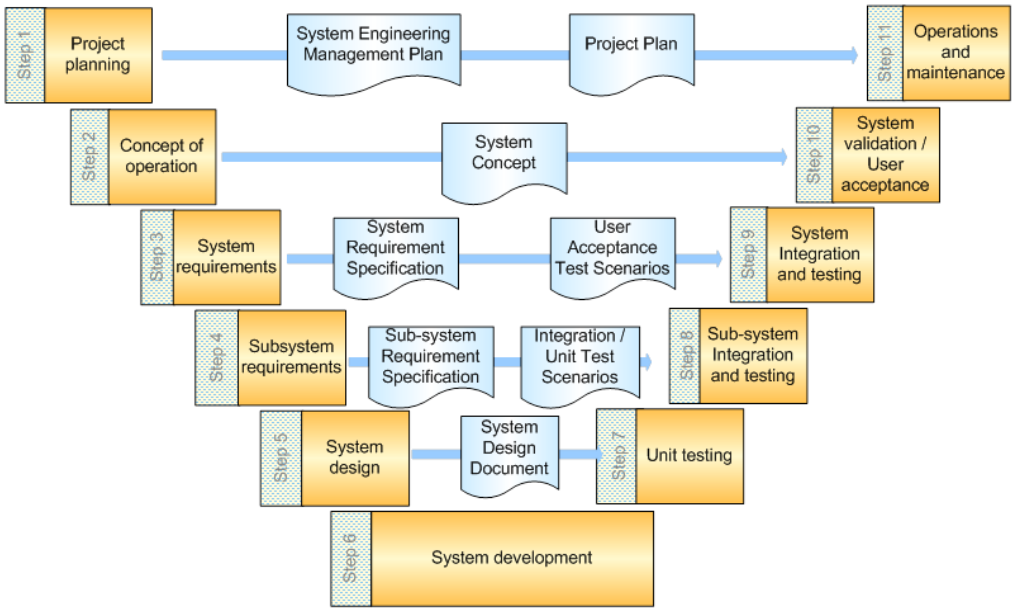

Fig. 1: The Systems Engineering Management Plan Framework [6]

The SEMP defines not only the particular steps, but more importantly also the deliverables of the particular steps as well as the quality requirements and checklists.

This SEMP has several advantages, among others clarity, the fact that it is understood by different stakeholders and in the way in which the customer is involved: first through requirements management which form basically a contract between the customer and the developer and at the end of the process through user acceptance testing proving meeting of the customer expectations.

The SEMP approach as well as all other methodologies focus strongly on the solution provider perspective with clear deliverables (project outputs) that are presented to the customer, in our case the European Commission [7]. However, in EU projects it is important that the end user of such new and innovative solutions, i.e. municipalities or city residents are not only presented with the new solution, but that they have the opportunity to influence the development. Their views and perception must be taken into consideration during the project duration.

Typically, this is done through requirements collection. However, to expect that municipality representatives can significantly contribute to definition of technical and system oriented use cases is not realistic as they cannot reach such a low level of details while keeping the necessary project overview. This would require an extensive study which is well out of the scope of most projects.

For such reasons, a stakeholder consultation workshop can be a good way to collect the necessary input (not only requirements) for the different project phases, among others:

1. The project coverage (Use Cases) and boundaries (Project Scope)
2. Project requirements (mainly resulting from the use cases defined)
3. Expected project impact – which is one of the most important input from the perspective of municipalities

The next section describes the structure of the workshop within project MAVEN as it can serve as a suitable proof of concept and a template for future projects. Selected workshop results are presented as well.

Stakeholder consultation workshop

The stakeholder consultation workshop took place in Barcelona on 15 November 2016. Local authorities and other urban road stakeholders were invited to share their views on the role and impact of increasingly automated vehicles on urban roads and traffic management. Feedback was gathered through an online real-time voting tool to engage the audience – Mentimeter (www.mentimeter.com) [8]. It allowed the participants to answer the questions or express own opinion by using any device connected to the Internet (i.e. mobile phone, tablet or a laptop).

The workshop was attended by 34 registered participants, of which some two-thirds were representing local government.

More than half of the workshop participants who responded to the first question on the online voting system said they were attending the MAVEN workshop to have a better understanding of technical aspects regarding automation whereas around one third said they wanted to have a better understanding of the policy impact. Another important objective of the workshop from the project participants' perspective was to gather input for the different project deliverables.

Workshop structure and tools

In order to satisfy these expectations the workshop was structured into thematic blocks mixing lectures from project participants by discussions with the audience and questions:

1. Recent developments in automated driving – summarizing the current state and achievements in this field.
    - Presentation by Jaap Vreeswijk, MAPtm
    - Discussion and Questions

2. Introduction to MAVEN project – discussing the scope of MAVEN, putting it into perspective of the state of the art.
    - Presentation by Robbin Blokpoel, Dynniq
    - Discussion and Questions
3. The perspective of a city authority – the expectation from MAVEN project and in general from the field of autonomous driving by city representatives.
    - Presentation by Phil Williams from the Royal Borough of Greenwich, London & Gert Blom from the City of Helmond
    - Discussion and Questions
4. MAVEN use cases & high level requirements – discussing the different high-level functions of the project and its major requirements.
    - Presentation by Ondrej Pribyl, Czech Technical University in Prague
    - Discussion and Questions

The combination of the building blocks of different and heterogeneous activities (presentations, questions, and others) with the online interactive tool ensured that the participants managed to keep attention and interest to the different topics. At the same time, the tool directly recorded the different feedback from the participants and allowed project members to incorporate the input into the project deliverables.

Selected results for the different project steps

The objective of this paper is not to discuss and present all results of the stakeholder consultation workshop. Rather, a selection of the input used in the different project phases will be provided.

Input into the project scope and coverage

The first important area where the input from stakeholders was needed was the scope of MAVEN. Here, probably the biggest discussion took place. The stakeholders were very keen in discussing the different use cases that a project like MAVEN should cover.

Among the most critical issues in cities related to mobility and infrastructure, parking and congestion are high on the agenda. Car parks can be already upgraded with cameras but not to level 5 automation. Other critical issues include vulnerable road users, cyclists and pedestrians along with liveability and public space. On the contrary, funding and costs were considered less critical. This aspect nonetheless raised the concern about who is going to pay for automation.

The stakeholders identified the most critical issues in their cities related to mobility and infrastructure (Fig. 2). Considering automated vehicles operating in normal traffic, the key issue is safety (Fig. 3). There is a need to have guarantees on safety. Security, liability, traffic regulations, and human factors were equally pointed out to be important aspects to be considered. Public awareness, infrastructure investment and identification of automated vehicles by inhabitants were identified as being the least important relatively speaking.

Fig. 2: The most critical issues in the cities related to mobility and infrastructure as identified by the stakeholders.

The stakeholders also identified the importance of different parameters of the project from their perspective (see Fig. 3). Here, clear focus on safety in general as well as inclusion and safety of so-called vulnerable road users (such as pedestrians or cyclists) was identified.

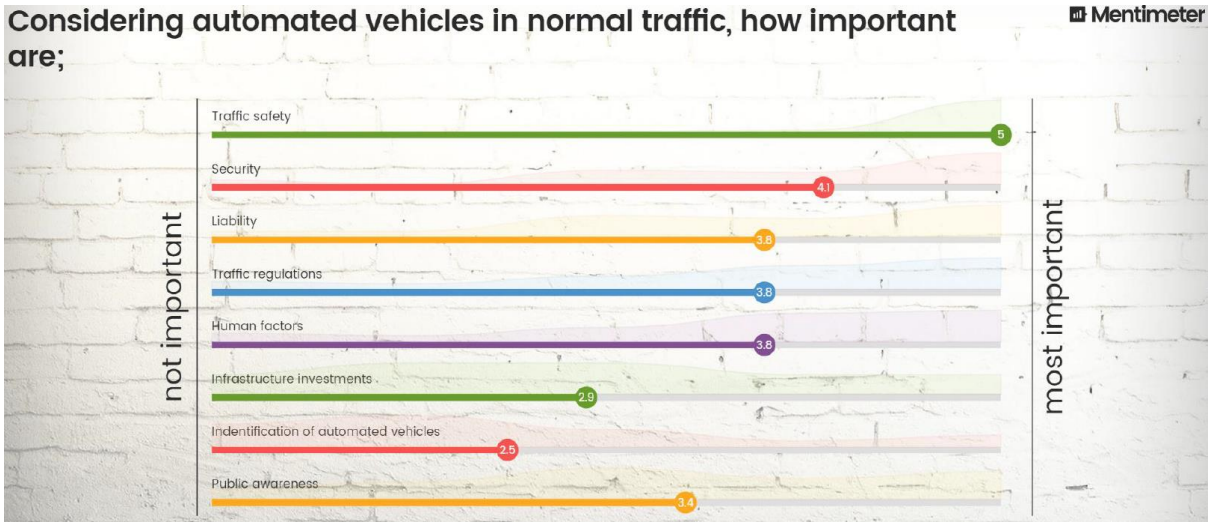

Fig. 3: Importance of different parameters in the field of automated vehicles.

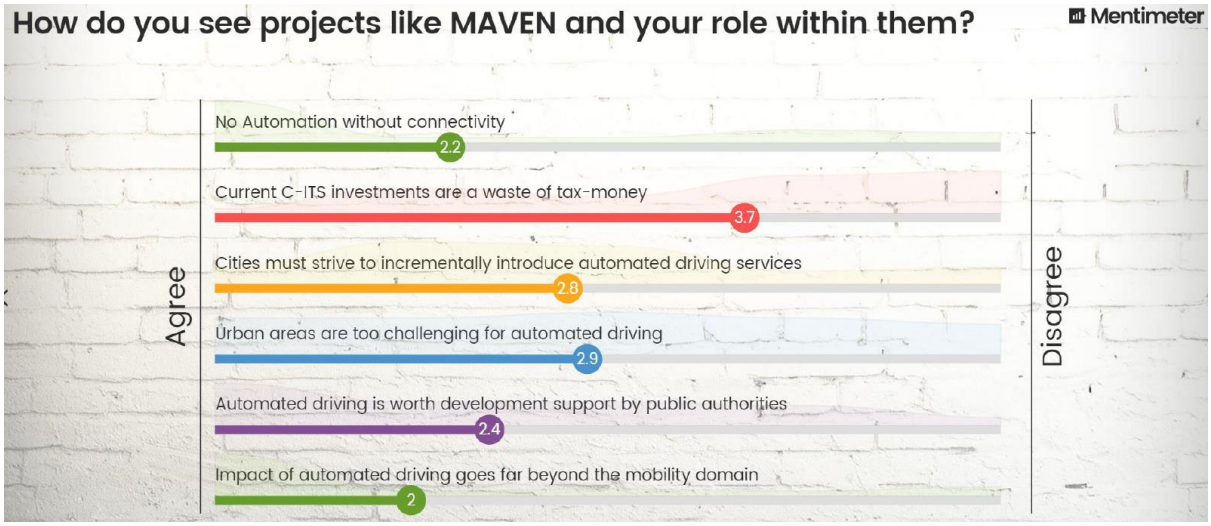

Fig. 4: The role of the city representatives within EU projects related to automated driving.

The city representatives were also very sensitive about their (or traffic managers) role within cities with automated traffic. They realized that it is important for them to be involved in different projects (see Fig. 4). Many agreed that a traffic manager should be able to communicate directly with an automated vehicle and give directions. Opinions were more cautions on road authorities having an active role in investing to facilitate automated driving as a form of traffic management and on the need for traffic management to become simpler and requiring less interventions. Nearly everybody agreed that the traffic manager will still be needed despite the fact that automated vehicles may manage themselves as a system.

Additionally, it was observed that traffic management is becoming a strategic tool for delivering a whole range of transport policies, and the ultimate goal of becoming a liveable city, which is a qualitative rather than quantitative notion, i.e. it is more of a personal perception (less congestion, better air quality, walkable city). Overall the group supported the assertion that traffic management will become more strategic in the future, translating policy goals into operations, and that while more operational decisions will be made by systems, these will be guided by policy. This realized in MAVEN project through a policy relevant use cases and requirements.

The stakeholders also expressed their general perception of the MAVEN use cases, as depicted in Fig. 5.

Fig. 5: Level of agreement with use case related questions.

Expectations and project impact

Many agreed that the impact of automated driving goes beyond the mobility domain, notably toward the freight sector and land use, and that automated vehicles will have a major impact on safety, efficiency and air quality. The audience considered that the number of vehicles trips and kilometres driven are less likely to be impacted by automation.

There cannot be automation without connectivity. Opinions were diverging when asked if automated driving is worth development support by public authorities or whether cities must strive to incrementally introduce automated driving services. Nonetheless, the majority seemed to agree that current Cooperative, connected and automated mobility (C-ITS) investments are not a waste of money.

The impact on society will largely depend on which automated services are being introduced and for whom. It is assumed that the cost of automating public transport will be met by the cities in terms of the vehicle fleet, infrastructure and loss of drivers. But there is a shared concern that cities will not have money for a new fleet and unemployed bus drivers. Other concerns were raised regarding the health effect of introducing automated driving which may lead to a reduction in walking and cycling, and increased isolation because people will interact less once they are in an automated vehicle. What is the social effect of these developments? We still want to create pedestrians and cycling communities. It is imperative for cities to understand what the needs are and what behaviour they want to change.

The reality of what cities want to happen and what will happen is quite different, i.e. automated private cars will be on the road on a larger scale than public transport and technology will develop quicker than cities have time to react and quicker than they can adapt their infrastructure. Market forces will push cities down a route faster than they can follow.

On MAVEN's impact assessment, stakeholders are interested to learn about:

- Costs and gains for users as well as infrastructure (cost benefit analysis)
- Impact on safety, on car use, time or reliability
- Efficiency with respect to travel time, emissions, or for example energy savings

- Transition phase into the operation (best/worst use case, infrastructure requirements, capacity, restrictions, replicability, guidelines)
- Robust results backed by numbers
- Guidelines for cities and manufactures
- Applicability

While all these issues are considered by MAVEN, it was clear, that they have to be presented in more end user oriented way. The good intentions were often not communicated to the stakeholders prior to the workshop.

Input and clarification of requirements

Also a whole set of new or newly specified requirements was collected at the workshop. An example of such direct new requirements is provided in Fig. 6. Additionally, the discussions and other questions from the questionnaire could be used as requirements input as well.

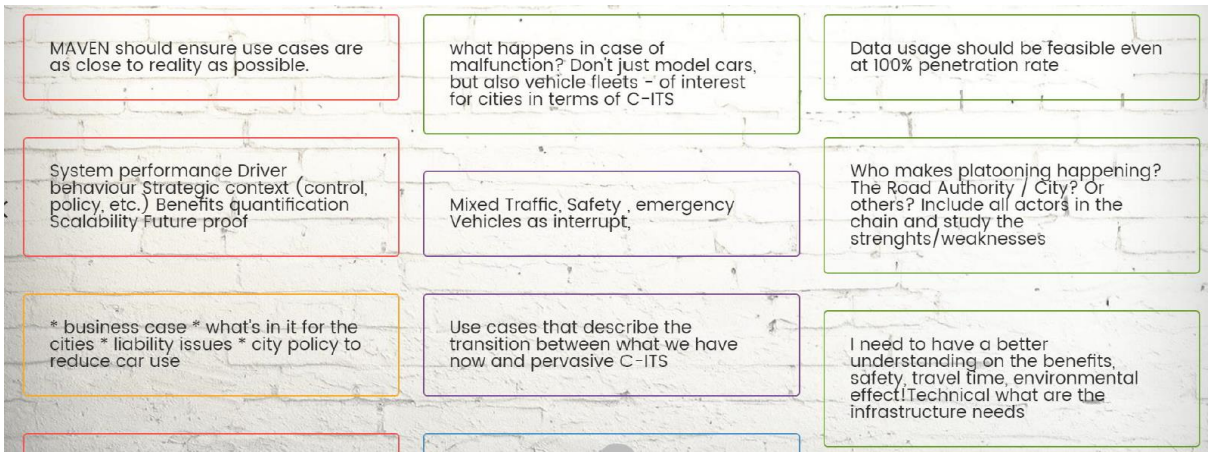

Fig. 6: An example of new requirements provided by the stakeholders.

The transition phase from the current state to a state with high level of automation shall be better taken into consideration, looking into the different penetration rates of automated vehicles.

Standardisation is a slow process. Cities cannot wait forever but they do worry about the lack of standardisation. They are concerned about making investments now and having to upgrade their systems later. In terms of the direct effects of MAVEN, they are looking forward to having a good overview of the impacts of fully automated vehicles on the road network. They suggested that the city model used for the simulation and assessment be based on a representative network.

In terms of infrastructure, the assumption is that the MAVEN services will build on the C-ITS infrastructure that is already installed. This is the case in Helmond, which already has some C-ITS infrastructure from previous projects.

Conclusions

In this paper, we demonstrated the importance of involvement of stakeholders in EU funded projects on a particular H2020 project - MAVEN. We also proposed a structure of a workshop that along with the utilization of a proper tool can ensure involvement of a large group of stakeholders. Without such a workshop, only a very limited number of stakeholders is typically involved in the requirements gathering phase only.

The presented results demonstrate the importance of stakeholders input into different project phases starting with definition of scope and coverage of the project through the expected project impact up to the requirements.

One of the clearly identified results was, that technical project teams tend to focus on the technical aspects of the project while the demonstration of the benefits to the non-technical end user is often underestimated. The stakeholders also proposed to repeat similar session regularly during the project duration. Their proposal was incorporated into the MAVEN project plan.

The pilot evaluation of the proposed workshop structure was positive and can be recommended to be used in projects similar to MAVEN.

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