



D1.2: Innovation Management Plan

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Abstract

This deliverable present the Innovation Management process defined in optiTruck in order to follow-up the development and implementation of each of the 10 Innovation Elements proposed in optiTruck. New IE will also be considered as well as Patent issues.

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Glossary of terms

Acronyms / terms	Description
EFQM	European Foundation for Quality Management
CEN/TS	European Committee for Standardization/Technical Specifications

Executive Summary

The optiTruck Project has a challenging objective aiming to bring together the most advanced technologies from powertrain control and intelligent transport systems in order to achieve a global optimum for consumption of fuel (at least 20% reduction) as well as other energy sources and consumables while achieving Euro VI emission standards for heavy duty road haulage (40t).

In order to achieve this objective 10 Innovation Elements (IE) are considered to be implemented during the project timeframe. Each of these IE has its own contribution to the reduction of fuel consumption or CO2 emission.

It is therefore important to monitor during the Project cycle how all these 10 IE are developed and exploited to achieve the foreseen results in order to track the performance of these IE. In addition, during the development part of the project, optiTruck partners will also be opened to propose new IE as long as we stay within the budget of the Project.

The implementation of the proposed Innovation involves risks and needs to be monitored carefully according to innovation system monitoring rules. There are no established standards related to innovation monitoring, but optiTruck will use two guidelines to monitor the achievement of its innovation objectives and beyond:

- innovation system standards [1] proposed by the European Foundation for Quality Management (EFQM), and the
- draft standard on innovation management [3] proposed by the European Committee of Standardization.

This deliverable, “Innovation Management Plan“ provides a guideline for the project to:

- Keep regular monitoring of state-of-art & of project innovation under development
- Ensure favourable conditions for the 10 foreseen IE in optiTruck with an innovation process to monitor innovation within optiTruck
- Check and if needed take necessary actions to ensure that claimed innovations are being developed within optiTruck
- Identify and promote innovations arising during the course of the project work.
- Develop an innovation index to monitor the Innovation process for a visual follow up

Innovation Management will be conducted through a formal innovation process, monitoring defined performance indicators. Innovation monitoring team will be formed by optiTruck WP leaders and the progress will be monitored on a Monthly basis during the development phase of the project.

1. Introduction

1.1 Background

The OECD "Oslo Manual" [1] on the measurement of scientific and technological activities defines technological product and process innovation as follows:

“A technological product innovation is the implementation/commercialisation of a product with improved performance characteristics such as to deliver objectively new or improved services to the consumer. A technological process innovation is the implementation/adoption of new or significantly improved production or delivery methods. It may involve changes in equipment, human resources, working methods or a combination of these”

In optiTruck basic innovation will be carried out on the powertrain calibration and emission control systems integrated with intelligent real time and predictive systems, however to improve the effect of this innovative system related processes will also have innovation features. Therefore innovation elements is a combination of product and process innovation.

Innovation involves risks, therefore needs to be monitored carefully according to innovation system monitoring rules. There is no established standards related to innovation monitoring. EFQM has an innovation system standards [2]. European Committee of Standardization also has developed a draft standard on innovation management [3]. Therefore, in this project to achieve the objectives and to go beyond, these two guidelines will be used.

1.2 Purpose and scope

1.2.1 Objective

OptiTruck Project has a challenging objective aiming to bring together the most advanced technologies from powertrain control and intelligent transport systems in order to achieve a global optimum for consumption of fuel (at least 20% reduction) as well as other energy sources and consumables while achieving Euro VI emission standards for heavy duty road haulage (40t).

In order to achieve this objective 10 Innovation Elements (IE) are considered to be implemented during the project timeframe. Each of these IE has its own contribution to the reduction of fuel consumption or CO2 emission.

It is therefore important to monitor during the Project cycle how all these 10 IE are developed and exploited to achieve the foreseen results in order to track the performance of these IE. In addition, during the development part of the project, optiTruck partners will also be open to propose new IE as long as the budget of the project is not exceeded.

This document will be the guide to follow the realization of all 10 Innovation Elements and some new ones if there happens to be any.

To develop the foreseen IE and to come up with new ones a seamless integration and innovative environment also in virtual sense is necessary. Therefore the objective of the

“Innovation Management Plan“ deliverable can be described as a guideline to achieve the following objectives:

- Keep regular monitoring of state-of-art & of project innovation under development
- Ensure favourable conditions for the 10 foreseen IE in optiTruck and develop an innovation process to monitor innovation within optiTruck
- Check and if needed take necessary actions to ensure that claimed innovations are being developed within optiTruck
- Identify and promote innovations (with WP8) arising during the course of the project work.
- Develop an innovation index to monitor the Innovation process for a visual follow up

1.2.2 Innovation Monitoring Team (IMT)

The team is composed by the leader of each work package and is coordinated by Prof. Dr Orhan Alankus from Okan University.

The team is therefore formed by the following partners> ERTICO, FO, IAV, CERTH, ISMB, LEEDS and OKAN

The Innovation Team is responsible for the optiTruck innovation process, in particular to:

- Organise the optiTruck Innovation Management process
- Make and update regularly an audit of (external) state-of-art & of (internal) project work
- Check if conditions are favourable for innovation
- Check and if needed take necessary actions to ensure that the 10 claimed innovations are effectively being developed within optiTruck
- Identify any other optiTruck innovation arising during the course of the work.
- Report the optiTruck Innovation by answering to the EC Innovation Questionnaire related to optiTruck.

The Innovation Manager together with the team will also

- Be in charge of the production and signing of an agreement amongst partners in the consortium on the allocation and the terms of exercising the ownership of the proposed results and outcomes leading to joint exploitation after the end of the project.
- Be responsible to manage the knowledge produced during the project lifecycle with the goal of successfully implementing innovative ideas.
- Coordinate and supervise the preparation of the Exploitation Report, including detailed Business Plans
- Make recommendations to the SC on issues of exploitation, including warnings in case of inconsistencies with the market goals
- Assure the successful implementation of innovative ideas

1.2.3 Innovation Elements (IE)

The following Innovation Elements of OptiTruck Project were identified and detailed during the preparation of the Project. This list of IEs and foreseen achievements are given in table 1 below:

Table 1 List of Innovation Elements in OptiTruck Project

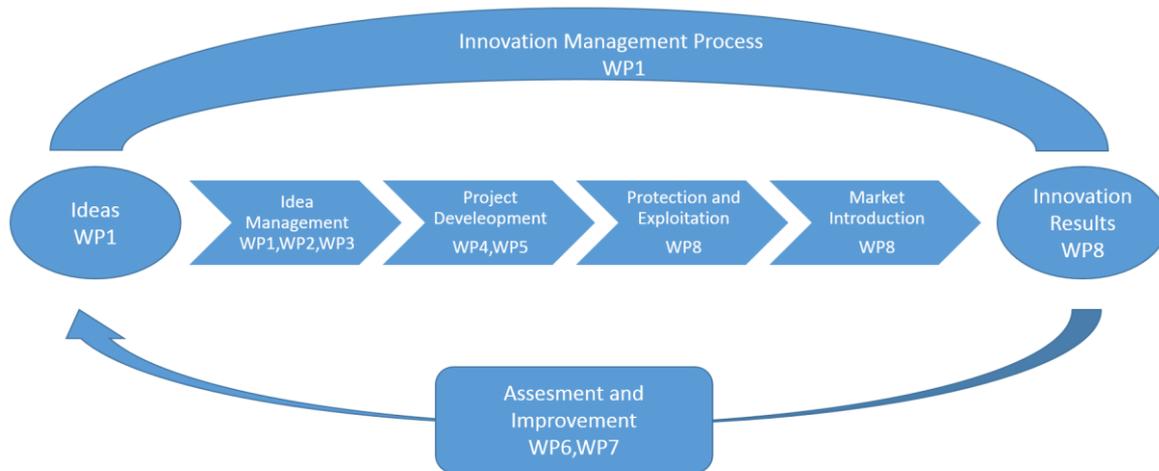
IEx	Innovation Element description	Foreseen Achievement
IE1	Optimization of powertrain control and calibration according to real world driving conditions	% 5
IE2	Prioritization of engine operating mode or continuous engine/combustion control together with aftertreatment coordinator function	% 5
IE3	Adaptation to dynamic changes in vehicle load and aerodynamic forces	% 3-5
IE4	Model based aftertreatment coordinator	% 2-3
IE5	Predictive management and control of auxiliary systems	% 1
IE6	Predictive management of the cooling system	% 1
IE7	Energy flow operating mode coordinator	% 1
IE8	Driving patterns of surrounding vehicles: in combination with first innovation action (IE1)	-
IE9	Driver support information system (ecoNavigation or ecoDriving for truck)	% 4-5
IE10	Definition of the transport mission and initial calibration of optimum points	% 5

The innovation team will keep track of the exploitation of the innovation elements and check that the contribution level as indicated on the table will be achieved. In case there happens to be some new innovation elements they will also be added to the table and followed up.

1.2.4 Technology Readiness Level (TRL) analysis

Technology Readiness Level monitoring is an important part of the Innovation Management Process. Innovation Management Process as defined by the CEN standard 16555 [3] is shown in Figure 1 and is adapted to optiTruck Project Workpackages.

During the innovation management process the products which are outcomes of innovation actions will be monitored to make sure that they arrive to the TRL levels as depicted on Table 2.



Adapted from CEN/TS 16555-1

Figure 1 Innovation Management Process as defined by CEN/TS 16555-1

Table 2 Technology Readiness Levels in OptiTruck Project

	Technology / Innovation Element	TRL for Previous & current projects	TRL After optiTruck
1	Predictive model based engine control function for fuel economy (IE1)	4	6
2	Upgraded Powertrain thermal management control function for optimum fuel economy with predictive mission data (Related to IE2)	4	7
3	Mission/route based embedded engine/aftertreatment calibration setpoint generator function (related to IE2)	3	5
4	Interface to integration of truck operational data (e.g. real-time powertrain performance and emissions, GPS data) with the external environment data (Traffic, weather etc) (Related to IE3)	7	8

	Technology / Innovation Element	TRL for Previous & current projects	TRL After optiTruck
5	Predictive model based exhaust aftertreatment control function for fuel economy (IE4)	4	6
6	Upgraded energy flow coordinator and auxiliary controls (air comp., batt. charging, AC, ...) function with predictive mission data (Related to IE5 IE6 and IE7)	4	7
7	Algorithms for modelling and predicting traffic conditions and driving patterns of surrounding vehicles (e.g. incident duration, short-term flow forecasting, as well as fuel efficiency, consumables and emissions) and software component to collect and integrate the different data sources (IE8)	4	7
8	Improved "Combined Predictive and Adaptive cruise control function" for Trucks (Related to IE8)	3	6
9	Updates to driver support / training system through in-truck HMI (IE9)	8	9
10	Software service for mission / route planning for best fuel economy. Dynamic routing optimisation for pre-trip planning and route selection during travel using transport assignment in conjunction with weather conditions and software component services for the acquisition, verification and integration of traffic and environment data (e.g. weather conditions) (IE10)	4	7
11	Integrated vehicle and powertrain simulation environment with actual realworld data feeds (to verify innovation elements)	4	7

1.3 Approach

The innovation management process proposed by the European Committee for Standardization was presented in Figure 1. This is a general process, however to enable and then monitor innovation a better and global approach is proposed by the EFQM which takes into account different areas.

In Figure 2, the EFQM Innovation Model and different aspects are shown. To form a good innovation model these different aspects are to be taken under control and key performance indicators are to be monitored carefully.

The relationship between optiTruck workpackages and EFQM Innovation Model is shown on Figure 2.

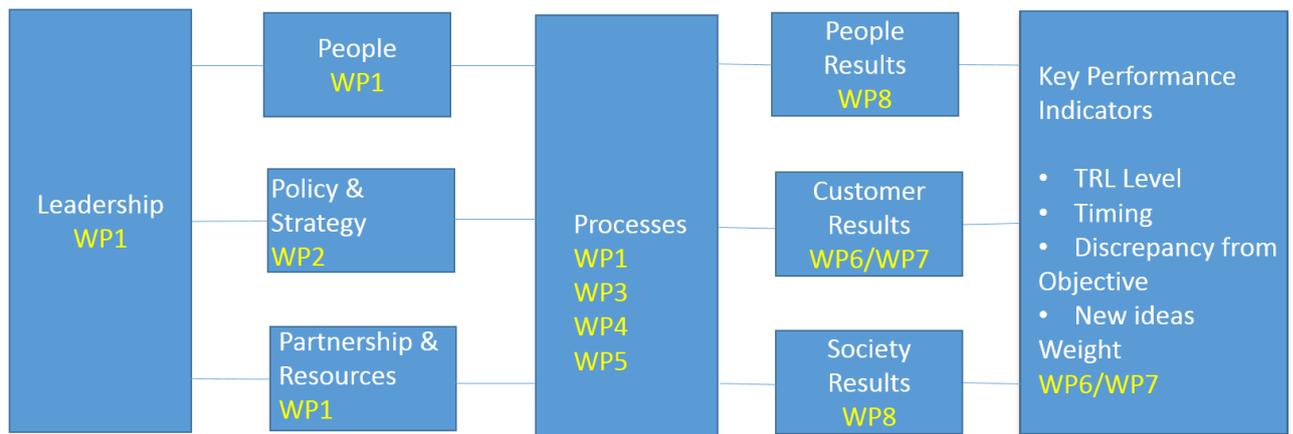


Figure 2 EFQM Innovation Model and Key Performance Indicators for OptiTruck Project

As mentioned above, for a successful innovation system enabling factors are to be existent, leadership is necessary and an innovation strategy is to be established. For the OptiTruck Project an Innovation Strategy already exists with the implementation of the 10 IEs. Objectives are clear, and Innovation Elements are determined.

Leadership will be facilitated through the “Innovation Monitoring Team (IMT)”.

This team together with partners form the innovation culture and abilitate innovation enabling factors to develop the Innovation Elements determined successfully and also to come up with new ideas and Innovation Elements.

Then monitoring the innovation results a system is to be formed and used rigorously. The following system will be the main process for monitoring the key performance indicators,

1. Keep regular audit of (external) state-of-art & of (internal) project work
 - 1.1- Form teams from experts to scrutinize the state of the art develop suggestions and feedback to working groups
 - 1.2- Make sure there is one responsible for each innovation element

2. Ensure favourable conditions for the 10 foreseen innovations in optiTruck and develop an innovation process to monitor the innovation within optiTruck
 - 2.1- Prepare an industrial rights sharing protocol, so that a favourable and transparent working environment is formed
 - 2.2- Form a system to resolve and eliminate any possible conflicts in a fast way.
 - 2.3- Form a virtual system for brain storming and exchange ideas (using for example the optiTruck sharing environment on Project Place)
 - 2.4- Reserve a certain time during each consortium face to face meeting for monitoring innovation elements and brainstorm on possible new innovation elements.

3. Check and if needed take necessary actions to ensure that claimed innovations are being developed within optiTruck

- 3.1- Get feedback from Innovation Actions responsible with adequate periods and follow up the development
4. Identify and promote innovations arising during the course of the project work.
 - 4.1- Use the virtual system for new ideas
 - 4.2- Innovation Management Team to evaluate the possible applications of the new ideas
5. Form an innovation index to monitor the process for a visual follow up
In order to follow up each IE development, firstly at least the simulation system is to be developed so that the possible impacts can be calculated,

2. Monitoring and Protecting Innovations

2.1 Monitoring System and Innovation Index

To monitor a process two main requirements are:

- the selection of the performance indicators and
- their measurement.

optiTruck project performance indicators given in Figure 2 are shortly described hereafter:

- TRL Level of innovation element during the progress of the project
- Timing as determined on the project time plan
- Level of impact to fuel consumption and discrepancy from Objective
- New ideas and their weight

The methodology to monitor each performance indicator is explained in the following section and an overall Innovation Index is proposed for a fast and effective evaluation of the innovation progress.

2.1.1 Monitoring of Performance Indicators

According to the project plan development of Innovation Elements will start after month 12.

So TRL level and level of impact will be monitored starting month 12. However, new ideas will be monitored after the second face to face consortium meeting which is foreseen to be in February 2017.

optiTruck Innovation monitoring will be performed mainly using the following tables,

IE No	Description	Delivery	TRL Initial-Final	Objective	Timing	TRL	Impact %
1					*	*	*
2							
3							
4							

Criticality will be given through colours and numbers



OK

Critical



Urgent Action Needed

2.1.2 Innovation Index

During the Innovation Management Process, it is important to have a visual monitoring system to see clearly the achievement level.

In order to derive the system parameters to be monitored the following elements need to be determined:

- a) **Timing:** measured as progress in line with the plan. This is characterised by the parameter
Timing Ratio (TR=Progress realized/Progress Planned)
- b) **Objective Achievement level:** achievement on simulation and validation test. Until Validation tests are done simulation test results will be used. This is characterised by the parameter OA = (ST or VT Result)/Objective
- c) **New Ideas Percentage:** Any additional ideas over the existing 10 innovation actions. This is characterised by the parameter NIA, New Innovation Actions, for which TR is equal to one.
- d) **Weight:** the weight of all the related innovation actions are to be taken into account. Weight (W) is in proportion to the contribution to 20 % Fuel consumption reduction.

All these parameters are linked by the following relation:

$$\text{optiTruck Inno_Index} = W1 \cdot IA1 (TR1 + OA1) + W2 \cdot IA2 (TR2 + OA2) + \dots + W11 \cdot NIA11 (1 + OA11) + \dots$$

Starting level of optiTruck Inno_Index is 10 since all the TR values are 1 and OA values are 0. When all the objectives are achieved it will be 20. If new Innovation Actions are developed it can be more than 20. If there are problems with the progress it will be lower than 10. Every month after this value will be checked by the innovation management team and the reasons will be analysed.

2.2 IPR Management

In the consortium agreement IPR are handled and therefore related points are clarified. Related possible patent applications will be reviewed by the “Innovation Management Team” and the rights distribution will be organised in line with the “Consortium Agreement”.

3. Conclusions and implications

3.1 Innovation Management Plan System

As emphasized above, innovation management has many aspects and it is not just enough to monitor performance indicators.

In optiTruck project different aspects will be taken into account, and leadership, innovation enablers and innovation culture will also be flourished and monitored carefully. Having the environment set for innovation, there will be the possibility of new innovations coming up and also an effective team work to achieve the established innovation elements.

There will be also be close monitoring of progress of each innovation element to make sure that the project objectives are achieved and even exceeded in a timely manner.

4. References

- [1] OECD, "the measurement of scientific and technological activities, OSLO MANUAL", <https://www.oecd.org/sti/inno/2367580.pdf>
- [2] EFQM(2012). An Overview of EFQM Excellence Model Title. etc.
- [3] CEN/TS 16555 1-7 (2015) Innovation System



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