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**PISa**

**Powered Two Wheeler Integrated safety**

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<b>Task Package</b>	Task 2.3 Derived driver assistance functions
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## Executive Summary

This report presents the processes used to select and prioritise the systems proposed by WP2 for development and testing in the PISa project. This deliverable combines deliverables D13 – Report summarising the selection and prioritisation of solutions and D14 – Report detailing the functions of the proposed systems, in order to simplify the presentation and avoid duplication of information in 2 documents.

This process of system selection and prioritisation was based on the accident data which was analysed in the in-depth case review of Task 2.2.1. Deliverable D10 – Report summarising the findings from the in-depth case analysis presents the list of functions that resulted from the case review process. Having determined the functions which could serve as countermeasure interventions for each in-depth accident, it was necessary to consider the possible technical system solutions that would contribute either to accident avoidance and injury avoidance or mitigation. The first step was therefore to define systems which fulfilled the functional requirements. This list of systems was constructed initially at a global level and then at a specific technological level. For example:

Function	Global System	Specific System
Avoid locking of wheels	Braking	Anti-Lock Braking System (ABS)

It was then necessary to establish a priority list of these systems which would enable the PISa project to select those systems which would have most positive effect on accident prevention and/or mitigation.

Two different sets of analyses were completed to determine the priority list of functions. The first was carried out on the in-depth accident cases, where a system of scoring and weighting was developed. This scoring was allocated based on expert team reviews, in which a common approach to the accident analysis and rating process was developed and validated in a series of inter-team workshops. The second analysis was carried out on the UK Fatal Database. Due to nature of the coded data contained within this database, a rule-based system method of analysis was used to determine which systems would and would not have positively influenced the accident.

The ranking of functions based on the scores provided by the case by case analysis was used as the main input to prioritising the systems. The system list used as the basis of the proposed system selection was the “all scores” assessment of the in-depth cases for which any benefit was predicted. The functions that were deemed to be outside of the scope of the PISa project or not within the capability of the PISa consortium were then removed to give a more relevant priority list. This proposed systems list is therefore the recommendation from WP2 to WP3 and an input for an initial benefit assessment which will assess the proposed list in terms of the monetary casualty benefit predicted for each system. The proposed system list was as follows:

- Stop PTW (autonomous braking)
- PTW to detect other vehicle and warn rider
- Special Fairings on PTW
- ABS
- Brake Assist - EBS (enhanced braking system)
- Brake Assist - CBS (combined braking system/linked brakes)
- ACC (adaptive cruise control)

The process of system selection and prioritisation was based on the accident data which was analysed in the in-depth case review. Having determined the functions which could serve as countermeasure interventions for each in-depth accident, it was necessary to consider the possible technical system solutions that would contribute either to accident avoidance and injury avoidance or mitigation. The first step was therefore to define systems which fulfilled the functional requirements. This list of systems was constructed initially at a global level and then at a specific technological level as illustrated in Table 1.

**Table 1: An example of one of the 43 function/global system/specific system combinations.**

Function	Global System	Specific System
Avoid locking of wheels	Braking	Anti-Lock Braking System (ABS)

It was then necessary to establish a priority list of these systems which would enable the PISa project to select those systems which would have most positive effect on accident prevention and/or mitigation.

Two different sets of analyses were completed to determine the priority list of functions. The first was carried out on the in-depth accident cases, where a system of scoring and weighting was developed. This scoring was allocated based on the expert team reviews, in which a common approach to the accident analysis and rating process was developed and validated in a series of inter-team workshops.

For the in-depth accident cases a matrix was constructed, consisting of the 43 functions/systems and the 60 accident cases in order to enable a score to be awarded to each system-case combination. A section of the matrix is shown in Table 2.

A score of 0 (white) means that the system in question would not have had an effect on accident prevention, mitigation or injury severity reduction in that accident. A score of 1 or 2 (blue) was awarded if it was believed that the system would have a low level of influence on the accident. A score of 3 (orange) refers to a system which was felt would have a medium level of effectiveness in that accident situation whilst a score of 4 or 5 (red) was given if it was considered that the system being analysed would have had a significant impact on preventing the accident or on reducing the injury outcome. The colour coding produced a pictorial representation of the results that enabled a quick initial analysis of the 2580 system-case combinations to see which systems were affecting more accident cases.

**Table 2: Illustration of the system-accident case matrix**

Function	System	Accident Case Number		
		TRL0001	VSRC0002	LMU0003
Prevent PTW from starting if BAL > 0.5mg	Alco-lock key	1	0	4
Improve PTW conspicuity	Active lighting	0	2	3
Prevent PTW wheels from locking	ABS	5	1	0



The second analysis was carried out on the UK Fataals Database. Due to the nature of the coded data contained within this database, a rule-based system method of analysis was used to determine which systems would and would not have positively influenced the accident.

The ranking of functions based on the scores provided by the case by case analysis was used as the main input to prioritising the systems. The system list used as the basis of the proposed system selection was the “all scores” assessment of the in-depth cases for which any benefit was predicted. The most important priorities for PTW crash reduction were warning the other vehicle of the PTW presence and automatically stopping that vehicle. However, these and other functions that were deemed to be outside of the scope of the PISa project or not within the capability of the PISa consortium were then removed to give the priority list relevant to PISa. This proposed systems list is therefore the recommendation from WP2 to WP3 and an input for an initial benefit assessment which will assess the proposed list in terms of the monetary casualty benefit predicted for each system. The proposed system list was as follows:

- Stop PTW (autonomous braking)
- PTW to detect other vehicle and warn rider
- Special Fairings on PTW (improve PTW conspicuity with special fairings)
- ABS (anti-lock braking system)
- Brake Assist - EBS (enhanced braking system)
- Brake Assist - CBS (combined braking system/linked brakes)
- ACC (adaptive cruise control)

In addition, a review of the data and a small sample of cases from India confirmed that there was broad agreement with the proposed systems chosen with relevance to the traffic conditions in India.