

A framework for Total Apron Safety Management (TASM)



Personal background

EDUCATION AND TRAINING:

2004-2009 MSc IN AIR TRANSPORT AND TRAFFIC ENGINEERING, UNIVERSITY OF BELGRADE FACULTY OF TRANSPORT AND TRAFFIC ENGINEERING, SERBIA

2010-2011 TRAINEE AT THE FORECASTING AND TRAFFIC ANALYSIS SECTION AT EUROCONTROL, BELGIUM

2011-2015 PHD IN SAFETY OF APRON OPERATIONS, CENTRE FOR TRANSPORT STUDIES, IMPERIAL COLLEGE LONDON, UK

2015-PRESENT RESEARCH ASSOCIATE, CENTRE FOR TRANSPORT STUDIES, IMPERIAL COLLEGE LONDON, UK

RESEARCH INTERESTS:

- AIR TRAFFIC MANAGEMENT
- SAFETY IN COMPLEX SOCIO-TECHNICAL SYSTEMS
- RISK IDENTIFICATION AND ANALYSIS
- AUTOMATION
- PILOT WORKLOAD ANALYSIS
- AIRPORT SURFACE SAFETY ANALYSIS
- DELAY ANALYSIS
- AIRFRAME UTILISATION

LANGUAGES:

SERBIAN, ENGLISH, FRENCH, UNDERSTANDING OF SPANISH

OTHER:

TRAVEL, PHOTOGRAPHY, FITNESS



Outline

↗ RESEARCH BACKGROUND

- THE IMPACT OF TRAJECTORY-BASED OPERATIONS ON ATM SYSTEM BOUNDARY
- EXISTING SESAR CONCEPTUAL IMPROVEMENTS ON THE APRON

↗ RESEARCH AIM

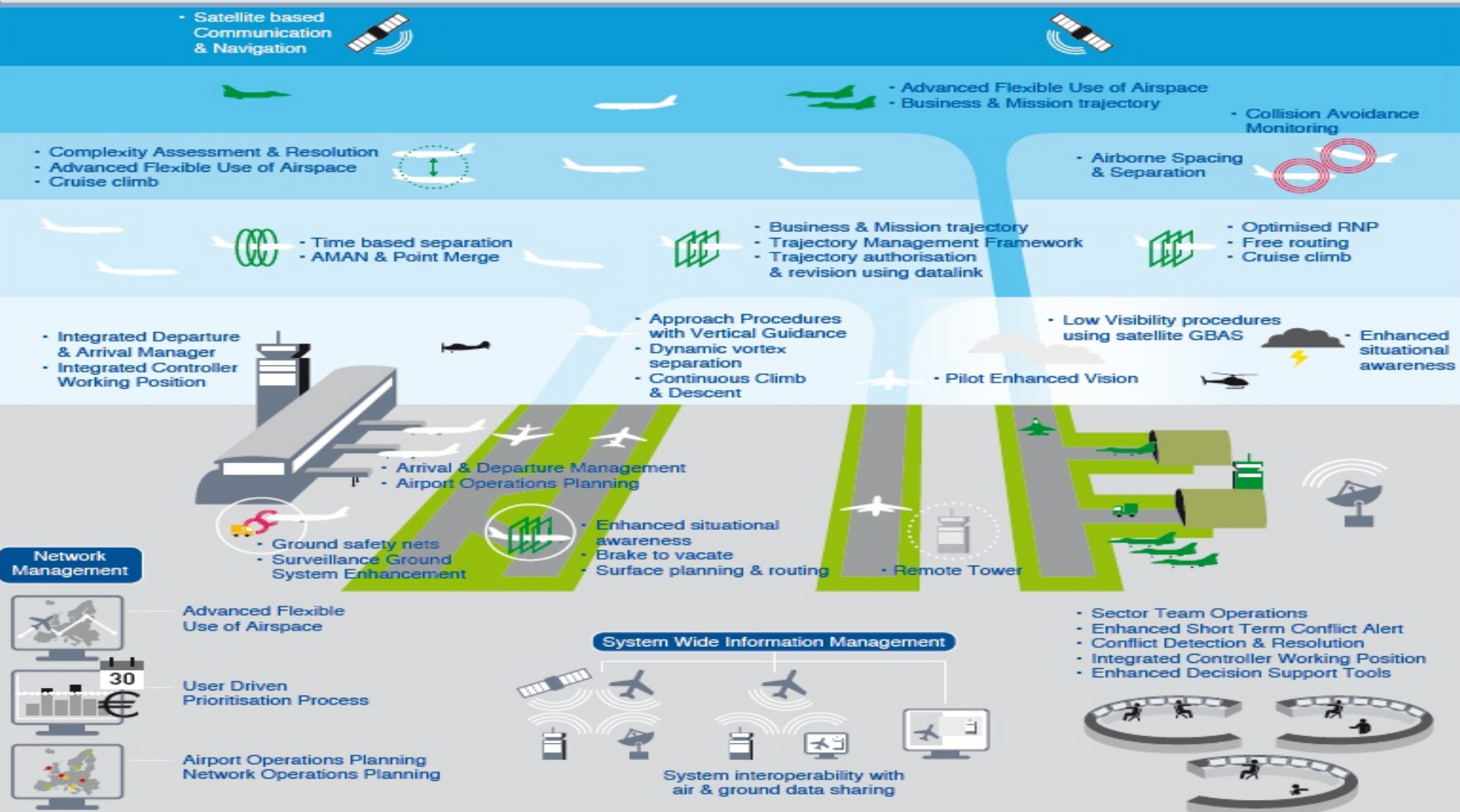
↗ METHODOLOGY

↗ FINDINGS AND RECOMMENDATIONS

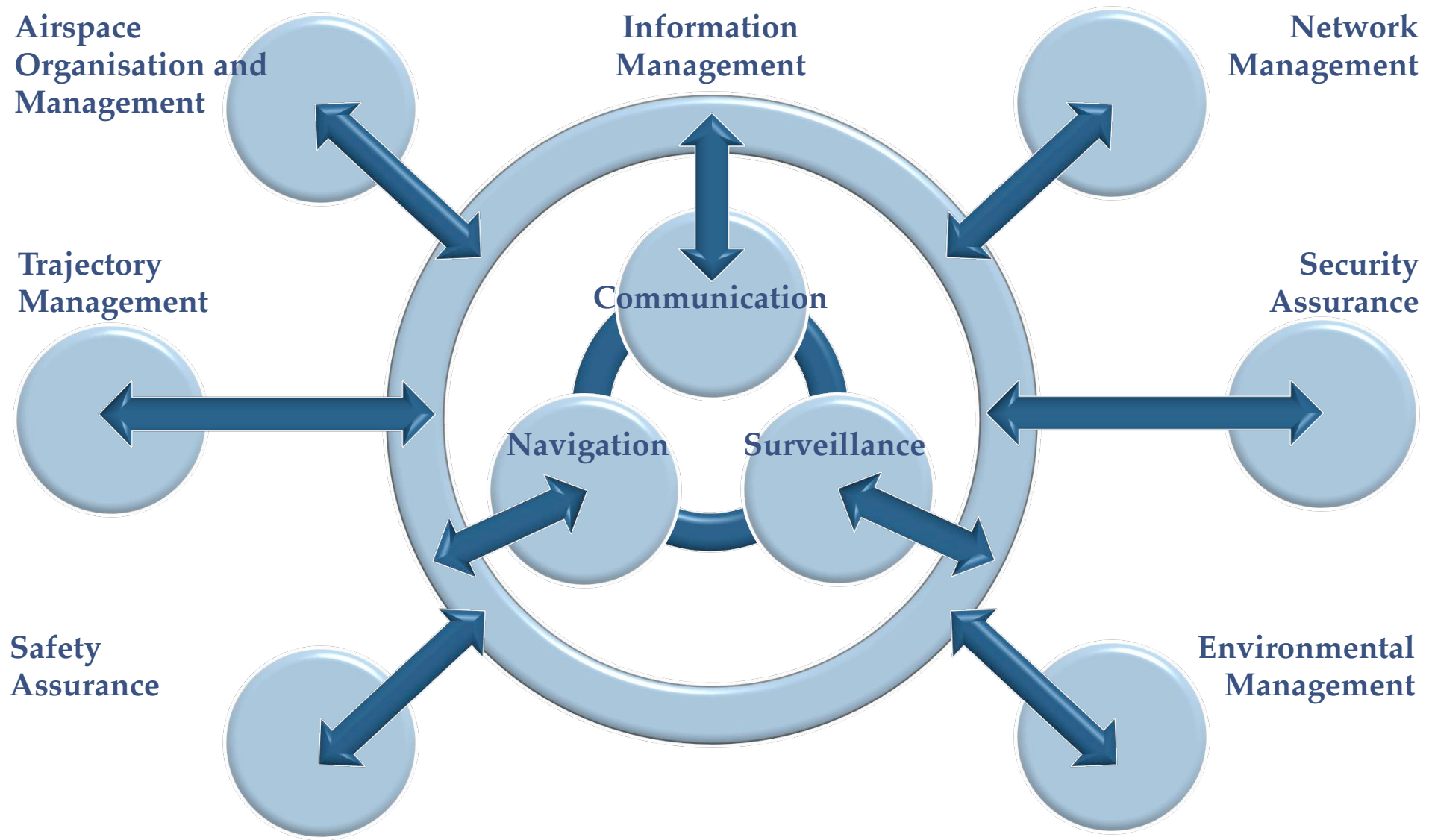
↗ INDUSTRY APPLICATIONS



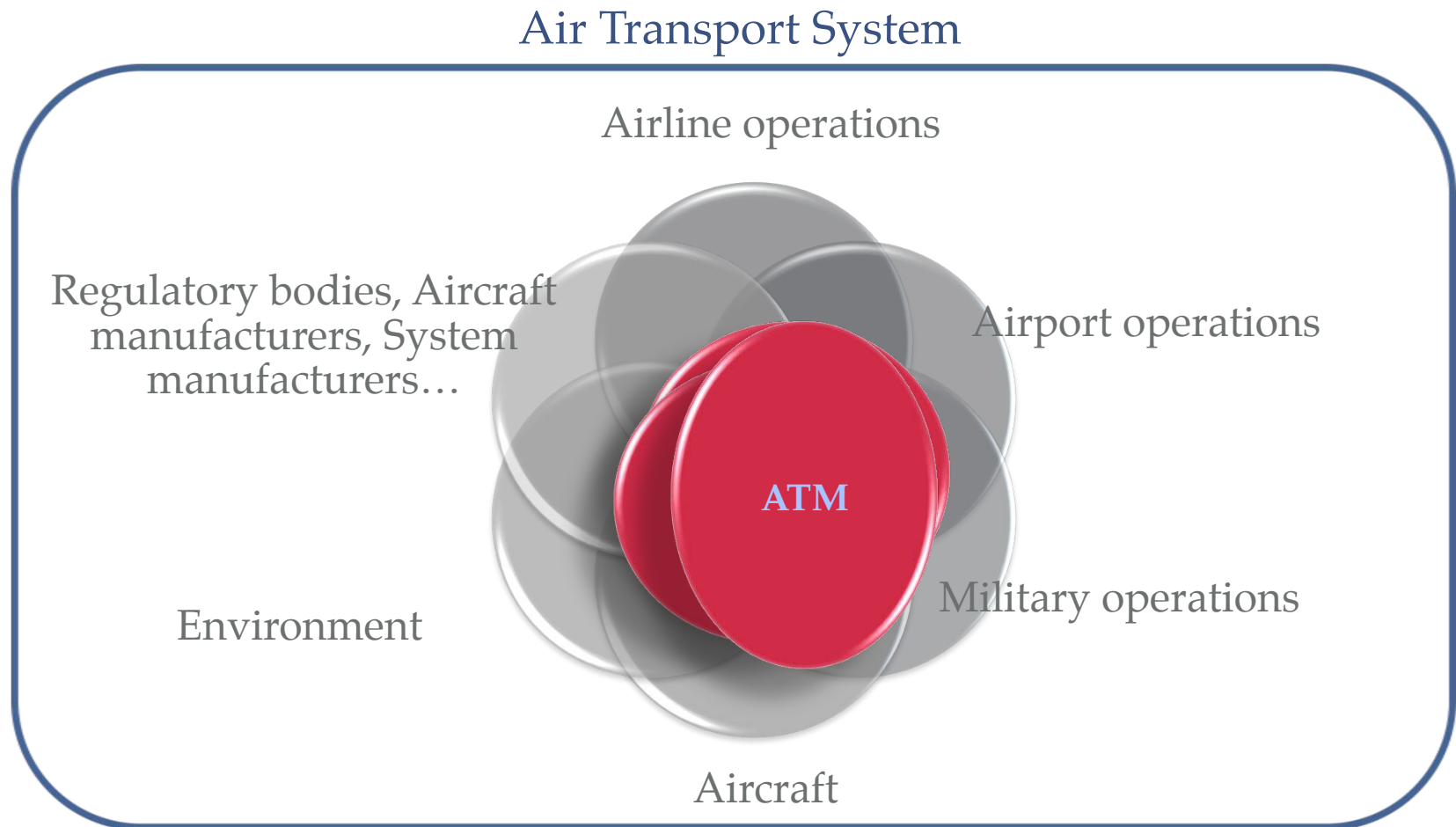
Research background



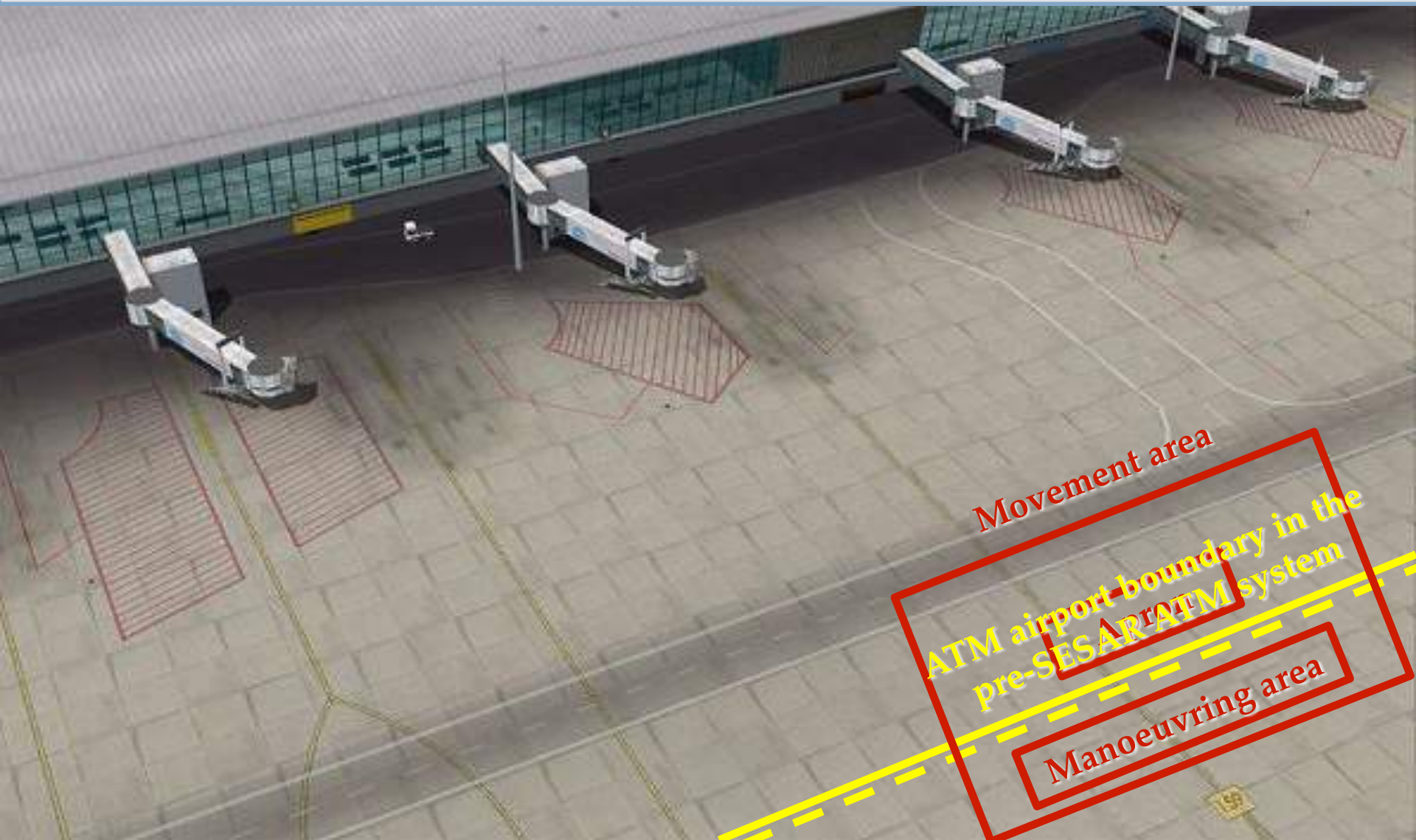
Functional invariance of the ATM system



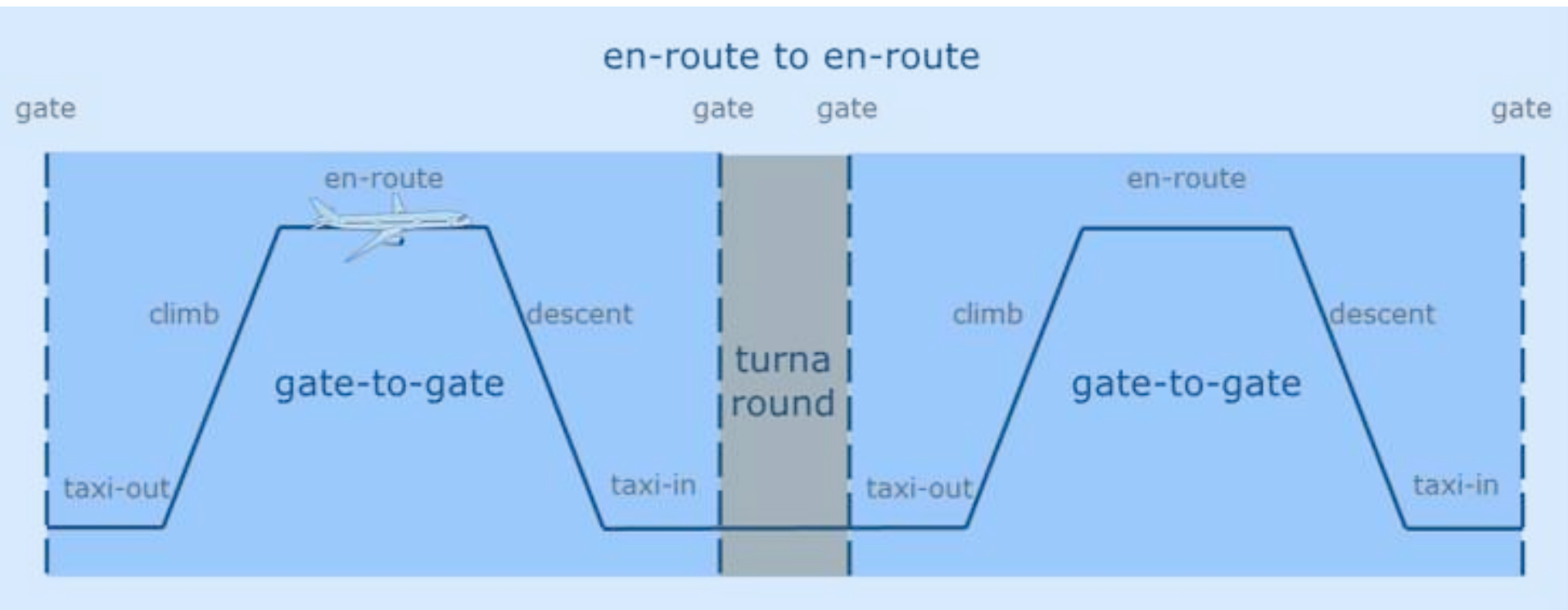
Shifting boundary of the ATM system



ATM boundary at the airport level



Transition from a gate-to-gate to a en-route to en-route concept



Adapted from SESAR (2007)

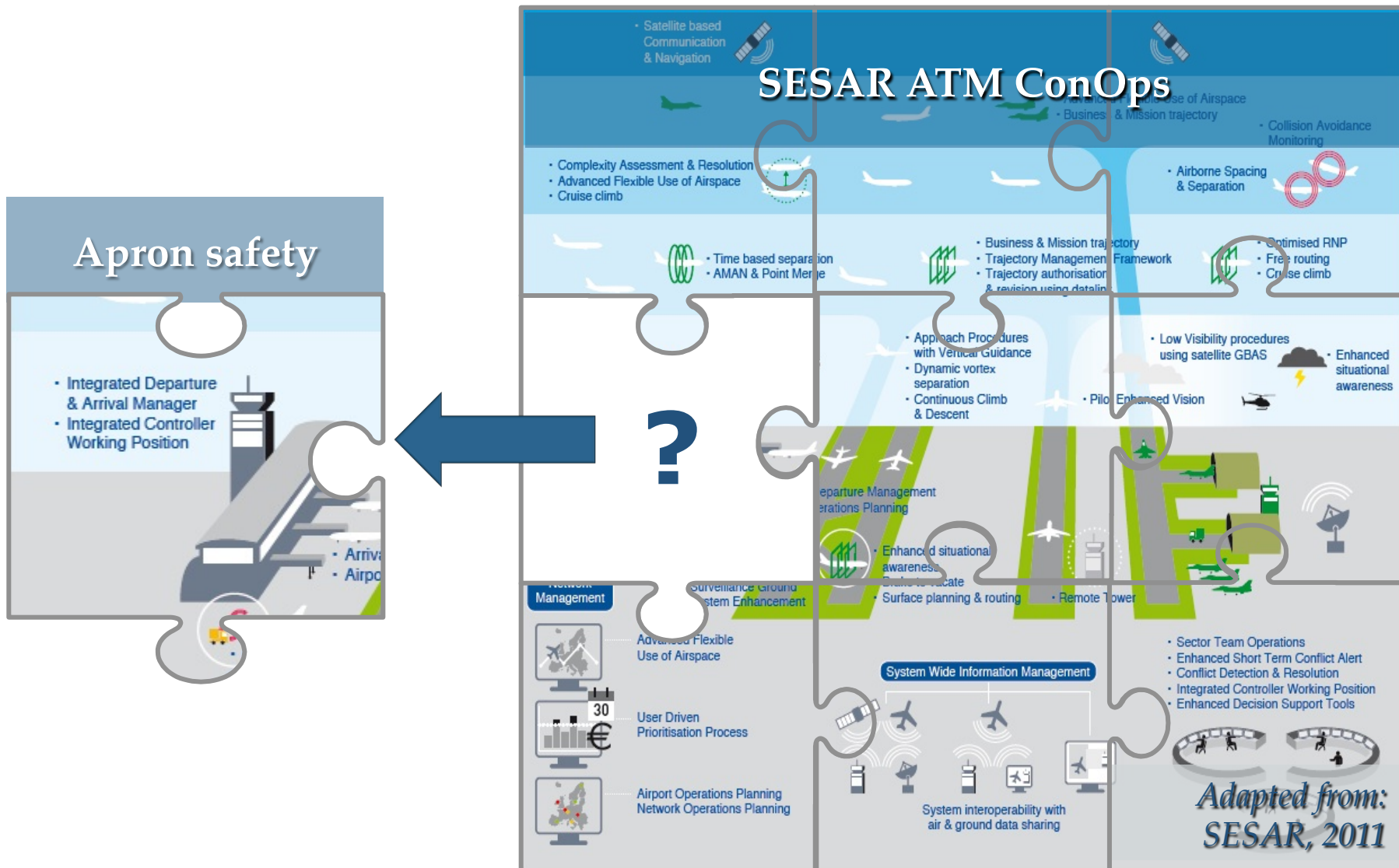
Existing SESAR conceptual improvements on the apron

	Conceptual improvement in the SESAR ConOps for the apron						
KPA	A-CDM	DMAN	AMAN	A-SMGCS	AAS	TITAN	TAM
Cost-effectiveness	✓	✓	✓	✓	✓	✓	✓
Efficiency	✓	✓	✓	✓	✓	✓	✓
Flexibility	✓	✓	✓	✓	✓	✓	✓
Predictability	✓	✓	✓	✓	X	✓	✓
Punctuality	✓	✓	✓	✓	X	✓	✓
Safety	X	X	X	X	✓	X	X

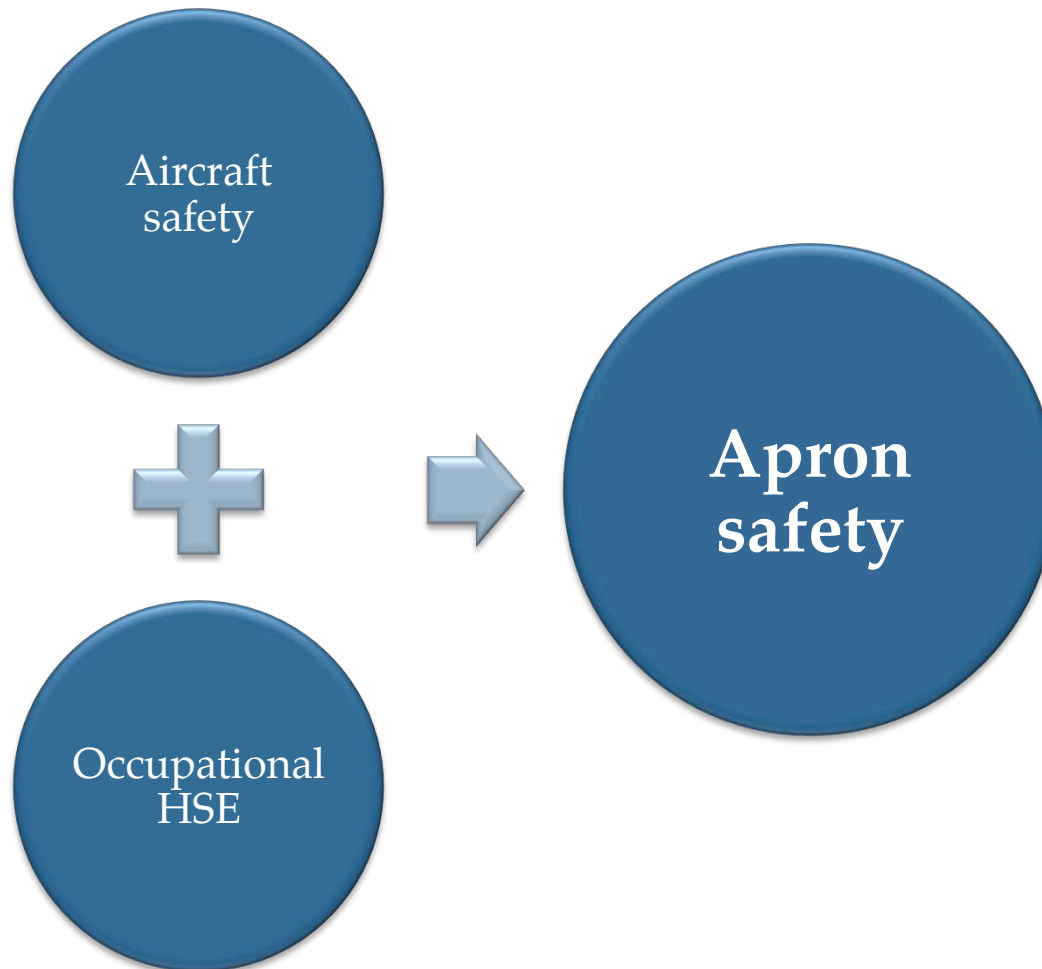


Focus on punctuality, capacity and efficiency improvements...
What about safety?

The missing piece of the SESAR ConOps...



Aircraft safety VS occupational safety



Motivation

...“accident rates for ground handling and airport workers exceed those of the construction industry and the agricultural sector”(HSE, 2000)

...“accident risk induced by the operations on the apron is around 6 times higher than the risk induced by the ATM system” (Studic et al., 2013)

...“one accident occurs per 5,000 movements” (ACI, 2007)

... safety occurrences on the apron cost the aviation industry in excess of “\$10 billion every year “ (Flight International, 2005)



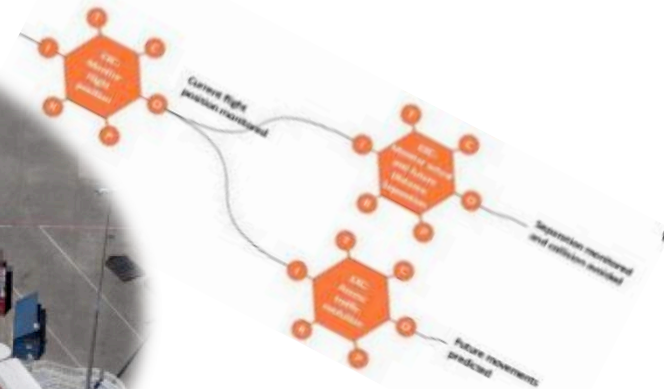
Aim of research

Develop a novel generic framework for a robust, systemic, systematic, retrospective, prospective and system design analysis to improve safety management and efficiency in apron operations.

Robust



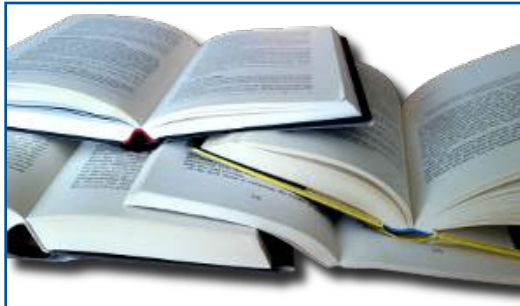
A Novel Idea



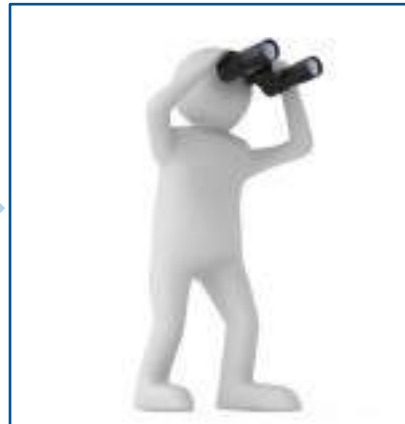
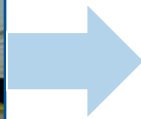
Safety management & Efficiency



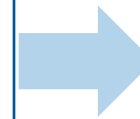
Research methodology



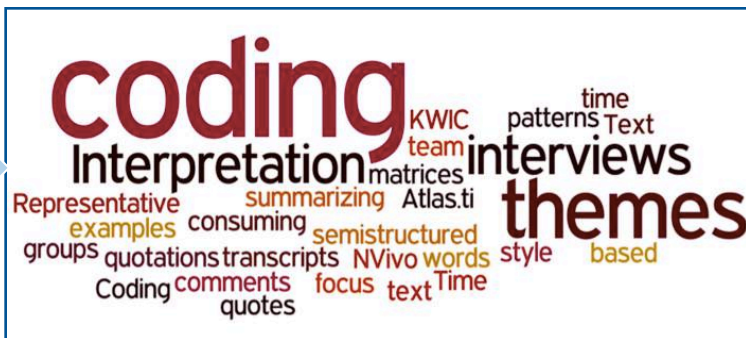
*Critical review of the
literature*



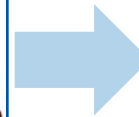
Observations



Interviews



Qualitative data analysis

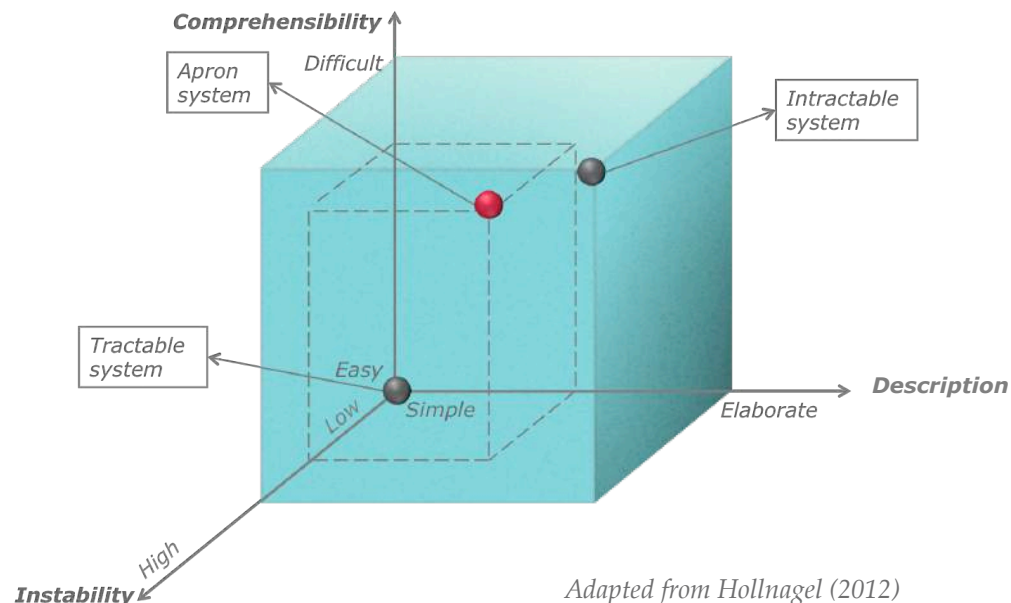


Quantitative data analysis

Derivation of the best theoretical approach for the TASM framework

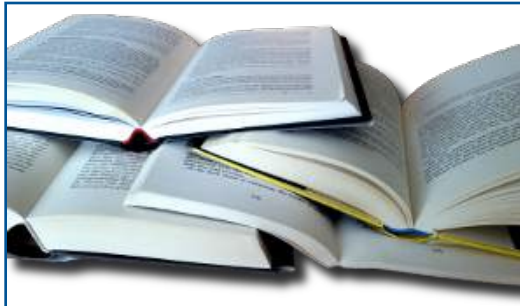
	Tractable system	Intractable system
Number of details	Description are simple with few details	Description are elaborate with many details
Comprehensibility	Principles of functioning are known	Principles of functioning are partly unknown
Stability	System does not change while being described	System changes before description is completed
Relation to other systems	Independence	Interdependence
Metaphor	Clockwork	Teamwork

EUROCONTROL (2009)

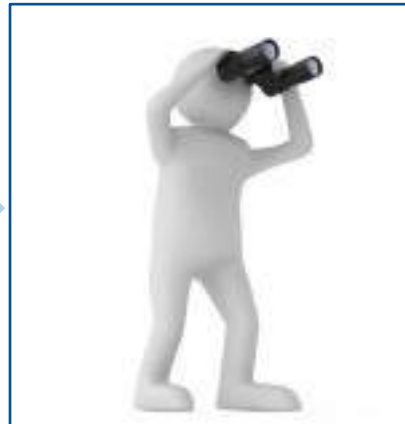
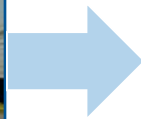


Adapted from Hollnagel (2012)

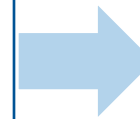
Research methodology



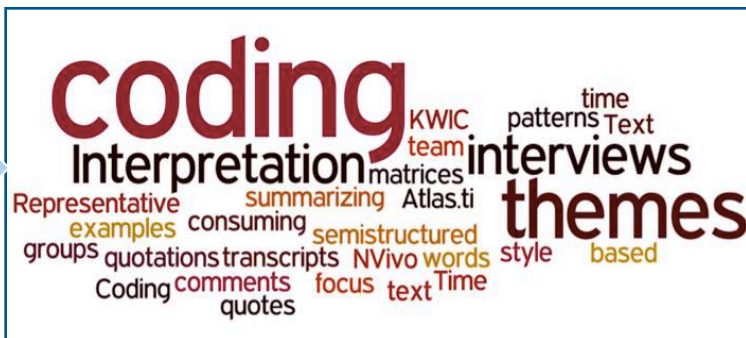
*Critical review of the
literature*



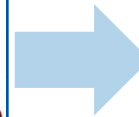
Observations



Interviews

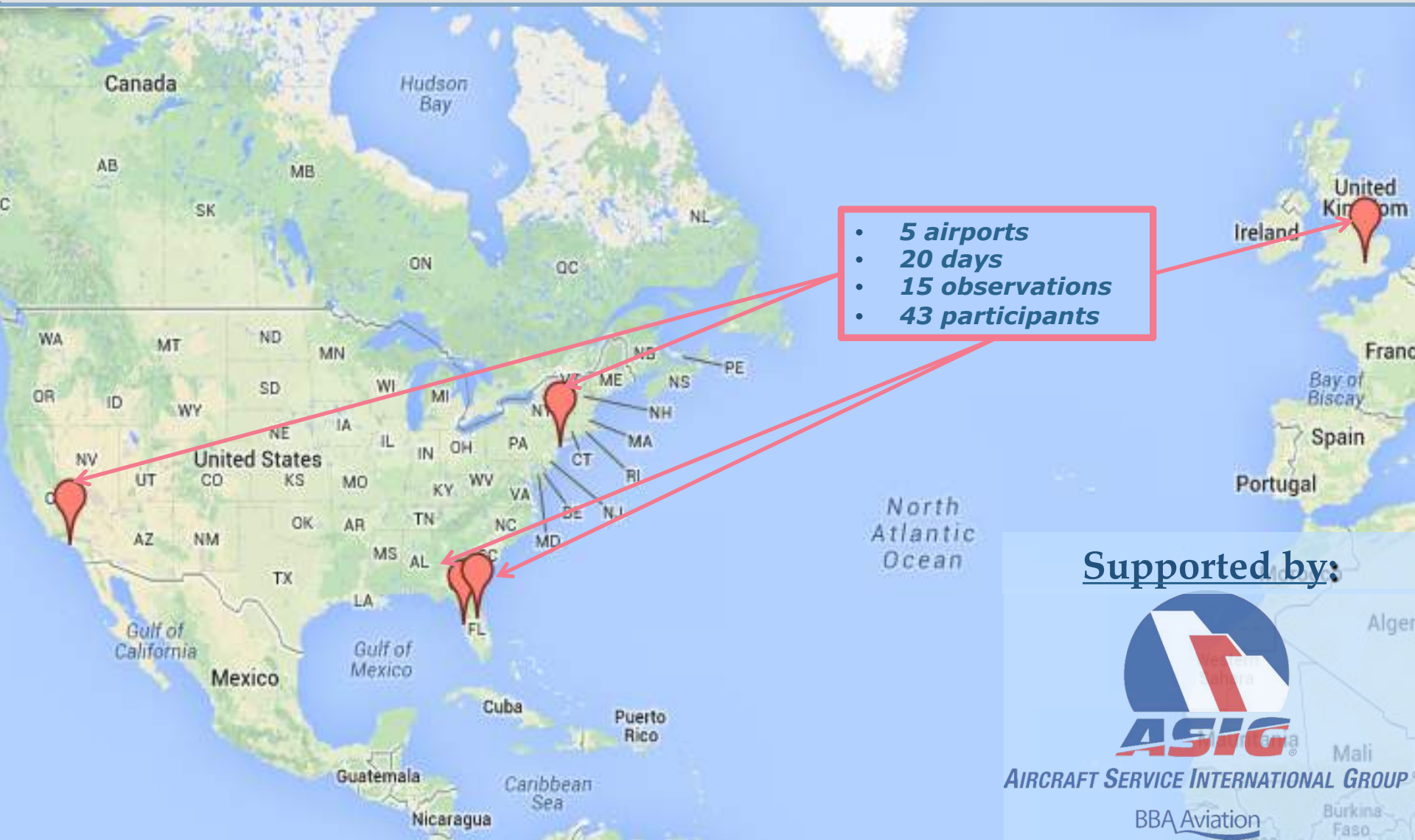


Qualitative data analysis



Quantitative data analysis

Data collection



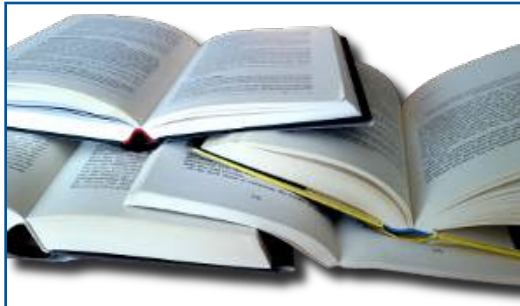
Supported by:



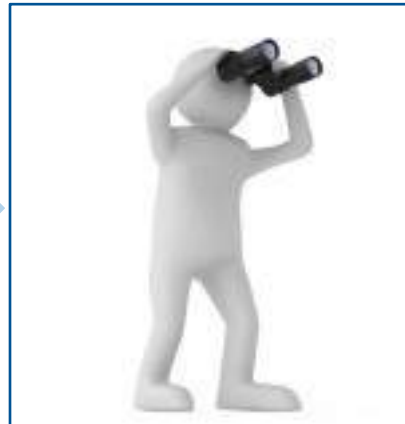
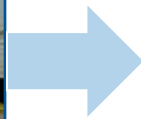
AIRCRAFT SERVICE INTERNATIONAL GROUP

BBA Aviation

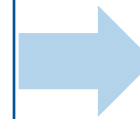
Research methodology



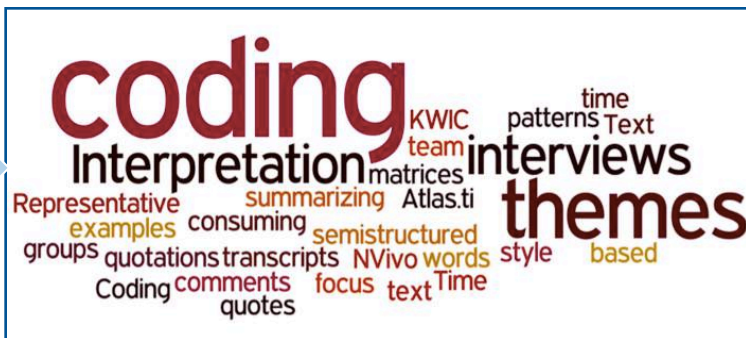
***Critical review of
the literature***



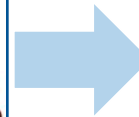
Observations



Interviews

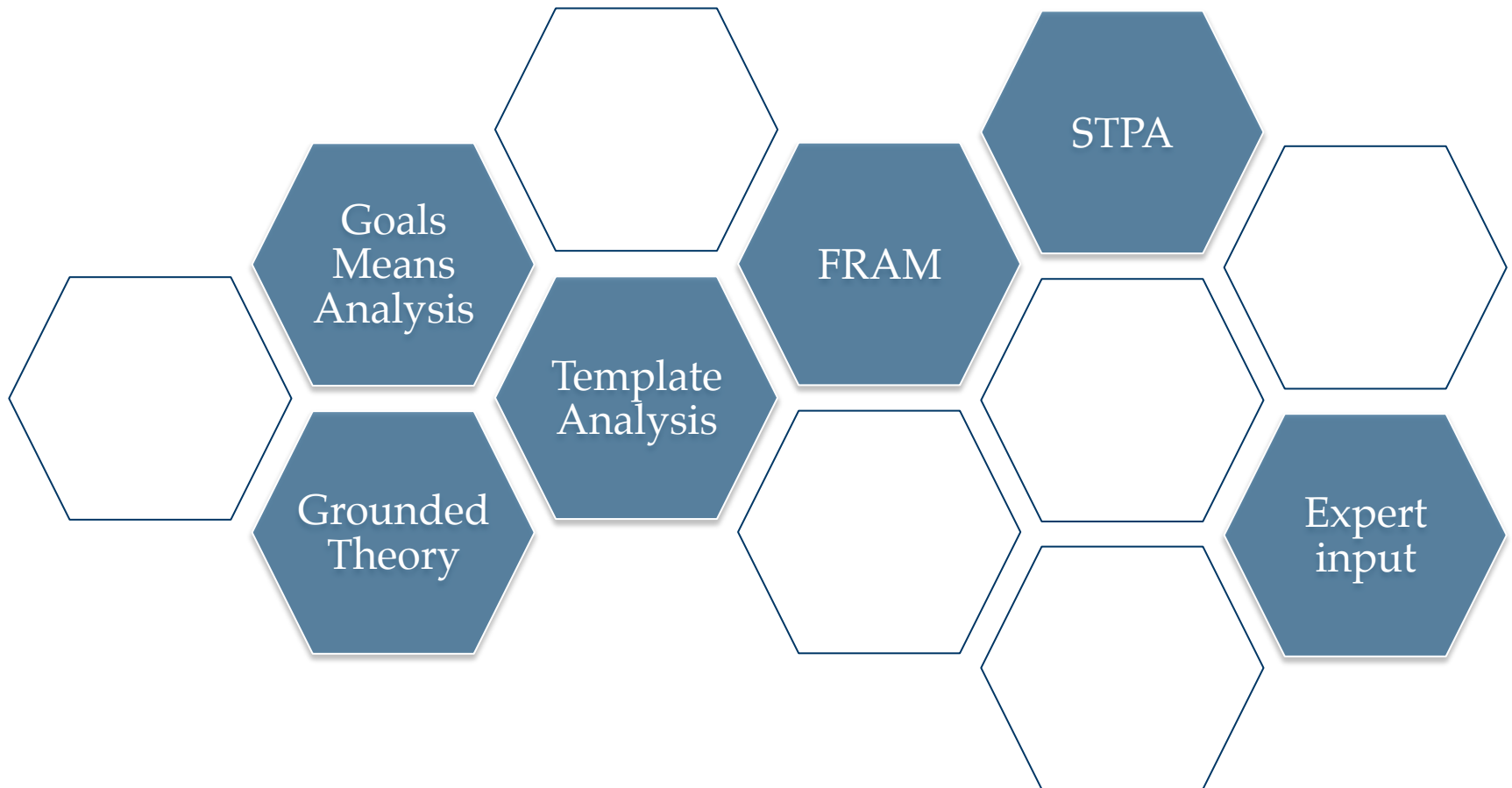


Qualitative data analysis

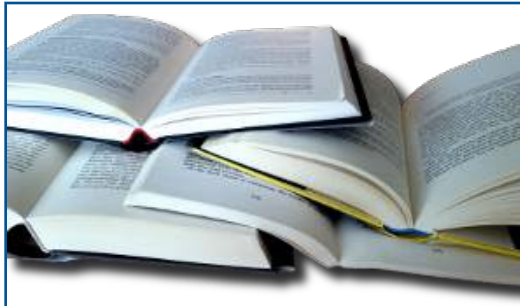


Quantitative data analysis

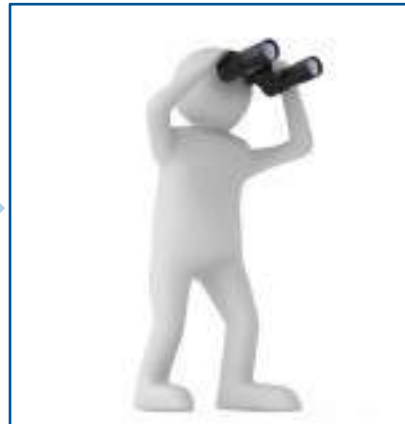
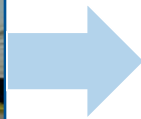
Qualitative data analysis



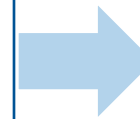
Research methodology



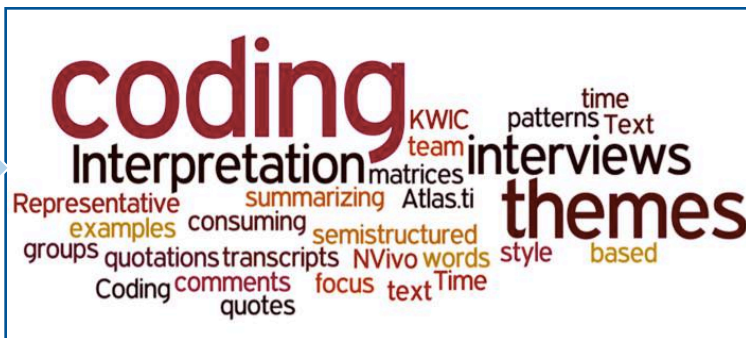
*Critical review of the
literature*



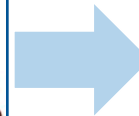
Observations



Interviews



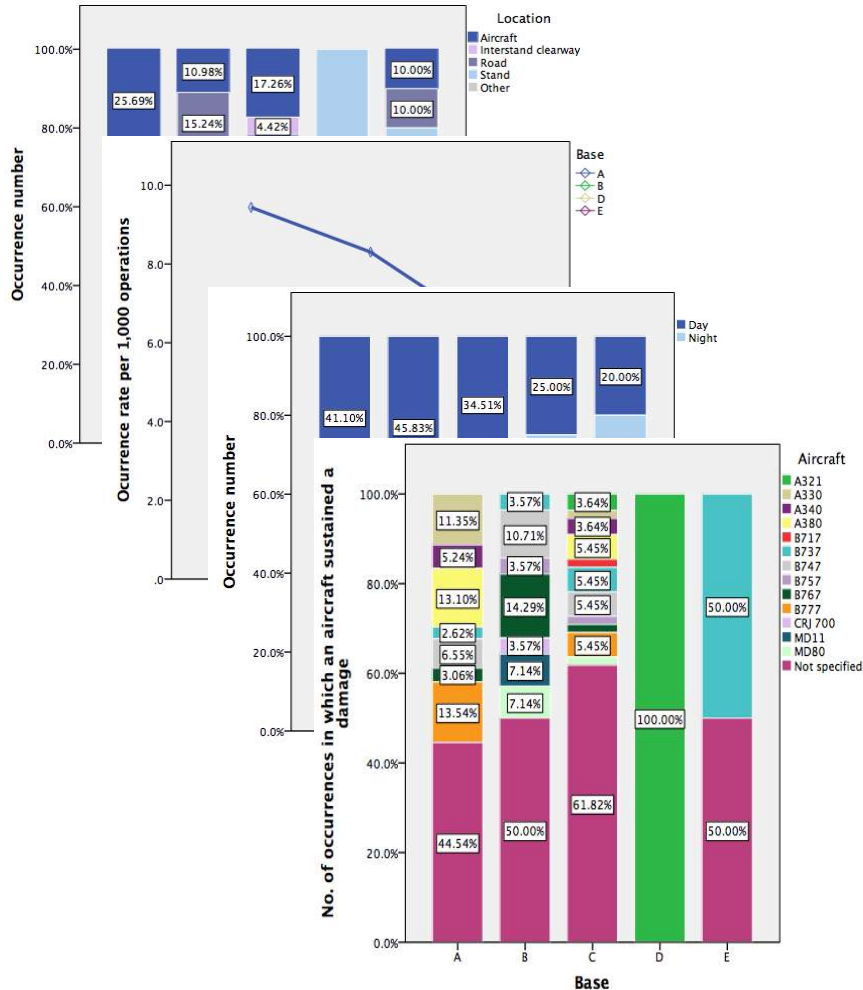
Qualitative data analysis



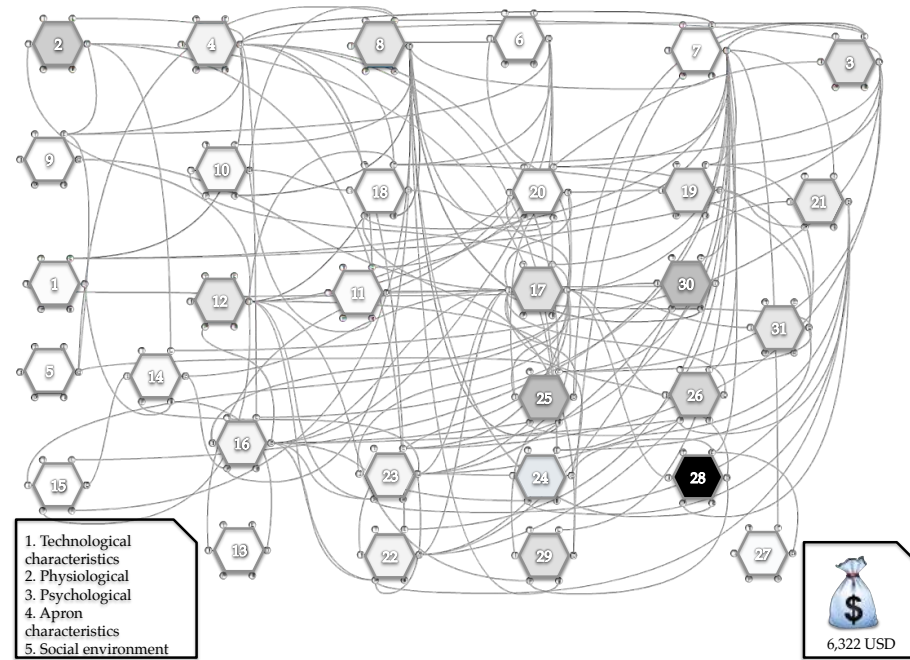
Quantitative data analysis

Quantitative data analysis

Descriptive statistics

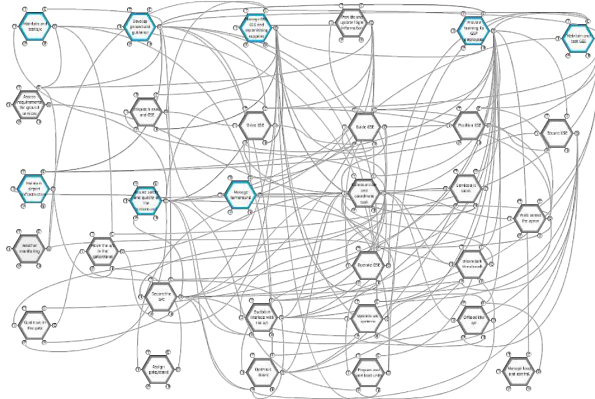


Pattern discovery



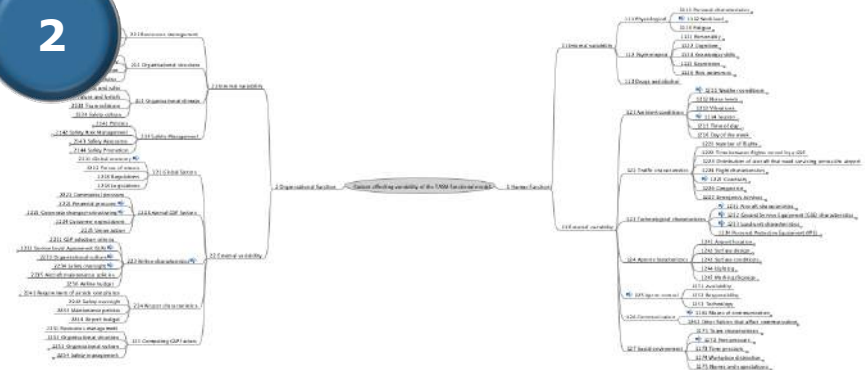
The outputs of the TASM framework

1



Functional Model
(31 functions)

2



Taxonomy of Variability
(≈440 factors at the lowest level)

3



Storyline description of variability of
apron operations

4



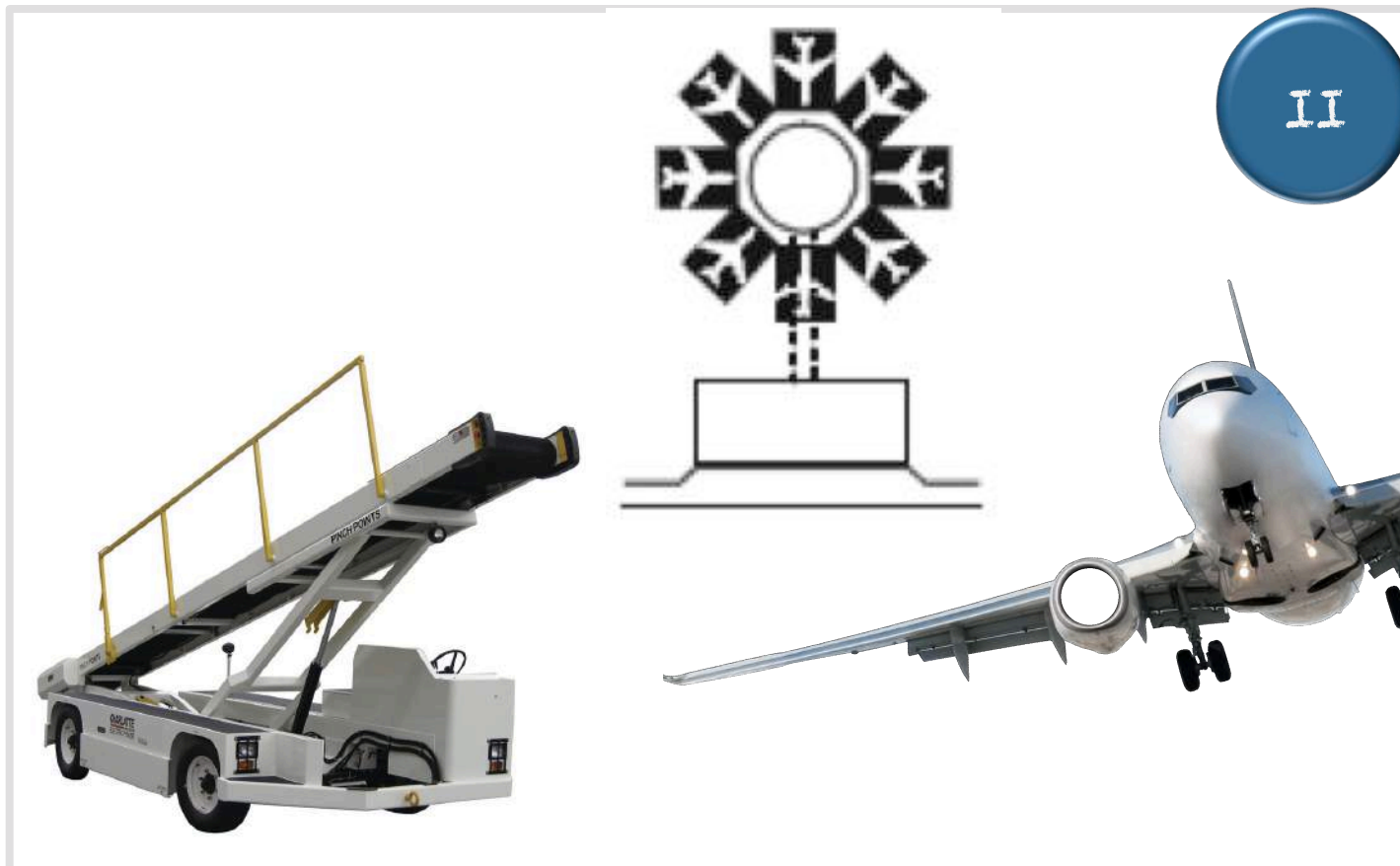
Development of the
recommendations

Finding and recommendations [1/4]



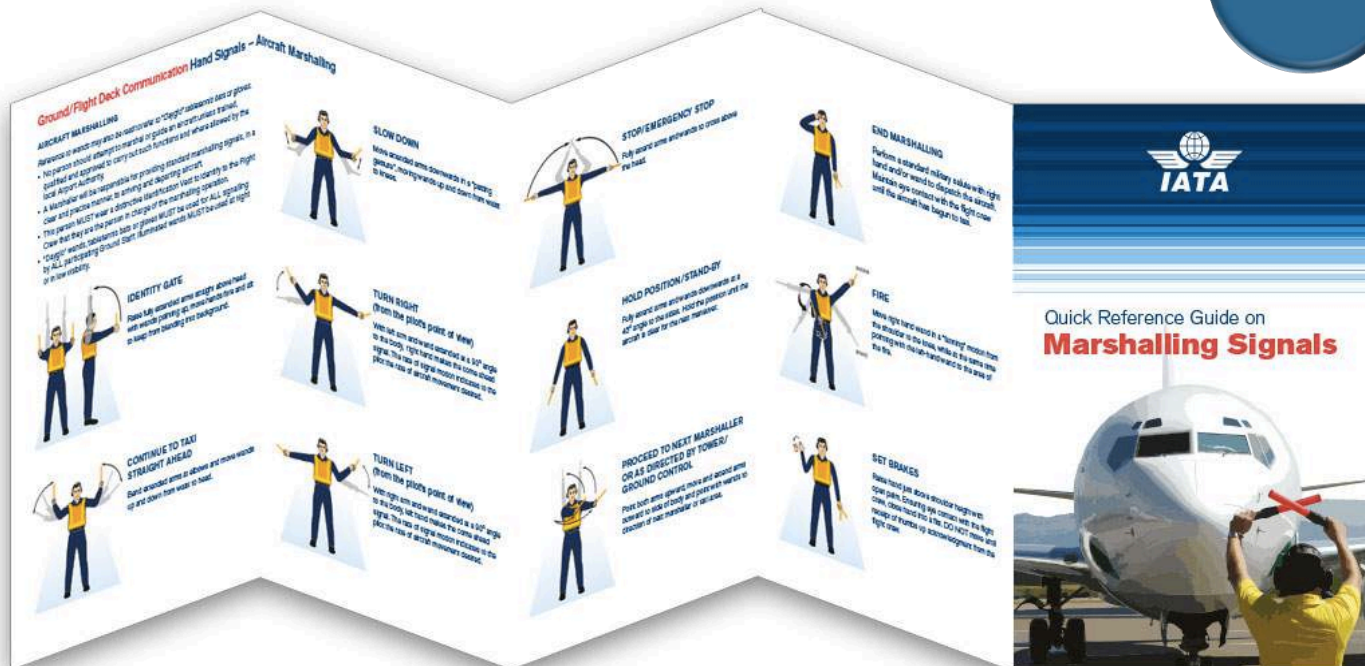
Develop national and international safety regulatory frameworks for Ground Handling Services (GHS).

Finding and recommendations [2/4]



Improve the design of Ground Service Equipment (GSE), aircraft and aprons.

Finding and recommendations [3/4]



Improve communication practices on the apron at all levels.

Finding and recommendations [4/4]



Improve working conditions for Ground Service Agents (GSAs).

Industry applications



→ *use the definitions, taxonomy and the severity classification scheme to develop safety regulatory requirements*



→ *implement the protocol for systemic hazard identification at MUAC*



→ *consider extending the Annex 19 applicability to ground handling*



→ *implement the framework for systemic safety modeling of everyday operations*



→ *implement the framework as a systemic planning tool*

Publications – Conferences – Workshops

- 5 papers in conference proceedings
- 1 ICAO information paper
- 2 workshop presentations
- 2 workshop tutorial
- 1 journal paper in review
- 2 journal papers in preparations





THANK
YOU

Contact:

m.studic11@imperial.ac.uk