



ASSESSING THE EDUCATIONAL GAPS IN AERONAUTICS AND AIR TRANSPORT

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DELIVERABLE WP6:

**ASSESSMENT OF COMPETENCE GAP BETWEEN COMPANIES' NEEDS AND EMPLOYEES'
ACTUAL COMPETENCES**

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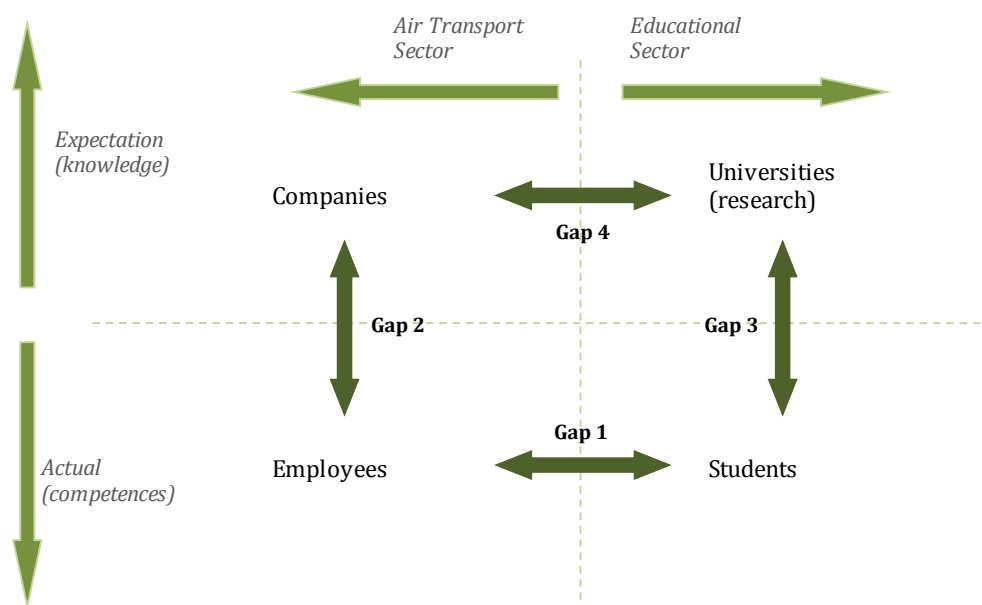
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Executive Summary

EDUCAIR project aims to improve the match between needs in human resources, and the educational and training offer of engineers and researchers within the Europe Union for the horizon of 2020 in the domains of Air Transport and Aeronautics. EDUCAIR project's rationale is built on the concept of competence gap. Decomposing the concept accordingly with the fundamental agents – that are: Companies, Employees, Universities and Student – we can identify the four fundamental competence gaps (see next figure), as follows:



A potential gap is identifiable between every pair of agents, leading to the identification of 4 potential gaps, being:

- **Gap 1** - Competence Gap - Gap between the competences that the employees need and the actual competences of the students (i.e. to what extent are the student's competences actually useful in their working daily activities?);
- **Gap 2** - Gap between the knowledge that the companies need and the actual competences of the employees (i.e. to what extent do the employees' competences actually fit in their companies' competences requirements?);
- **Gap 3** - Gap between the knowledge the universities generate and the actual competences of the students (i.e. is the knowledge generated in the research transferred in the courses?);
- **Gap 4** - Gap between the knowledge the companies need and the knowledge the universities have (i.e. is the universities' research and teaching activities of relevance for the companies?);

The analysis focussed on four key domains of activity, being: Airports, Airlines, Air Navigation Service Providers (ANSP) and Manufacturers.

The present Delivery presents the works developed in Work Package 6 (WP6) of EDUCAIR Project aimed to i) identify the competences required by employees (both industry and research centres) and employers, and ii) the assessment of the Competences Gap 2 – Gap between the knowledge that the companies need and the actual competences of the employees.

A set of five surveys was launched aimed to gather the necessary information to assess the attractiveness levels and of the competence gaps. One survey was tailored for every agent, in a total of four, as follows: Companies, Employees, Universities, Students and Graduates of universities and colleges with engineering programs involving air transport/ aeronautics who are not working in the AT&A sector. This WP has made use of two surveys targeting Companies (Employers) and Employees.

A 4-step methodological approach was used to assess the competence gap between Companies and their Employees, as follows:

- **Step 1** - Identification of the competences in AT&A;
- **Step 2** - Industry survey (quantitative and qualitative demand of competence);
- **Step 3** – Course Survey (supply of competence);
- **Step 4** – Gap Assessment.

In Step 1, a total of 88 core competences along the four domains of activities were identified and listed. This work was based on the works undertaken in WP3 (Struyf & Kupfer, 2012). These competences were clustered around 18 aggregated-competences, as follows:

- **Airport-related competences:**
 - *Infrastructure Design*
 - *Building & Construction*
 - *Infrastructure planning*
 - *Operations Handling*
 - *Maintenance*
 - *Environmental control*
 - *Security*
- **Airline-related competences:**
 - *Cockpit Crew*
 - *Technics & Engineering*
 - *Planning, Control & ICT*
- **ANSP-related competences:**
 - *Area Control*

- *Approach Control*
- *Tower Control*
- *Other ATC operations*
- *ATM*
- **Manufacturer-related competences:**
 - *Research & Technology*
 - *Operations*
 - *Engineering*

In addition to the competences, a set of General Skills were identified. The Skills complement the competences, often in domains not directly related with the job tasks, to make the employee more fit to the job. The following Skills have been considered;

- Problem solving;
- Analytical background;
- Theoretical background;
- Oral and written communications;
- Leadership;
- Ability to work in multidisciplinary teams.

A total of 87 companies, from 18 EU member states, have answered the call. Representatives from all four domains of activities were obtained, with a strong participation from the manufacturers. A total of 153 employees, from 19 EU member states, have responded to the survey. Again all domains of activity are present in the responses.

The assessment to the Competence (and General Skills) Gap was done through a cross comparison between the results of the two surveys. However, due to the relatively low rate of answers, the assessment of the gap at a competence level was not possible. As such, the gap was assessed to the level of the (18) aggregated-competences.

The results of the General Skills show a fair alignment between employers and employees. Indeed, both groups have ranked the Skills in a similar way. In addition, the valuation of the top 4 Skills is very similar. There are some minor misalignments in the remaining 3, with employees consistently valuating above the employers. We may thus conclude for a similar perspective on the relevancy of the most important skills and, thus for the non-existence of a gap in what concerns the general skills.

Looking now into the competences, the results evidence the existence of two main types of misalignments or gaps. The first type happens when there is a difference in the evaluation of the competences, by either an overvaluation (employees evaluated above than the employers) or

undervaluation (employees evaluated below than the employers). Although both situations have occurred, the former was far more common than the latter. The second type of misalignment occurred in case of different ranking or assortment of the competences. It was not uncommon a group ranked a given competence in the top three whereas the other in the bottom three. The assessment of the competence gaps was done for each of the four domains of activity (that is, airport, airlines, ANSP and manufacturers). In summary, the main conclusions for each domain of activity were as follows:

1. **Airports:** Gap or misalignment, presence of both types of misalignment: i) in six competences (out of eight) employees undervalued the relevancy of the competence and ii) substantial differences in the ranking of the competences.
2. **Airlines:** Gap or misalignment, presence of both types of misalignment: i) deviation both under- and overvaluation in the competences' relevancy and ii) substantial differences in the ranking of the competences.
3. **ANSP:** Gap or misalignment, presence of both types of misalignment i) deviation both under- and overvaluation in the competences' relevancy and ii) substantial differences in the ranking of the competences.
4. **Manufacturers:** the disaggregated analysis revealed mixed results. In all three clusters competences gaps were detected, as follows:
 - a. **Research & Technology:** nine gaps, of which five were significant, out of twelve;
 - b. **Operations:** six gaps, of which four were significant, out of seven;
 - c. **Engineering:** ten gaps, of which eight are significant, out of sixteen.

In all three cluster gaps were identified in the large majority of the competences evidencing the likely presence of a gap at aggregated level.

In all four domains of activities competence gaps are visible. Actions must now be prepared and brought forward. The actual level of problems brought the existence of the gaps, depend on several factors, including the actual nature of the gap, type of activity, labour and cultural context, etc. In any case, overall discussion can be made. As already discussed, two types of misalignments were identified. One type occurs when there is a disparity in the evaluation of the competence. The most frequent situation was an undervaluation by the employee. This may be denote that employers may still expect, and therefore demanding, a higher proficiency on some competences, whereas employees may not see the need to improve their competences and therefore lacking the necessary motivation. Cases of an overvaluation by the employee were not so common, but still existent. In this case we may predict a potential lack of acknowledgment by

the employer and, consequently, an employee's lower working satisfaction. The employers will not perceive that competence as important as the employee.

The other type of misalignment is related with the ranking of the competences, in which both groups rank higher or lower different competences. Such situations denote a divergence in the perspective and expectations of where to deploy efforts for improving proficiency. In the absence of an adequate communication, employees may not understand the need to invest in improving some competences, as they do not perceive it as relevant. Indeed, this type is ultimately the result of a discrepancy in the valuation of the competences.

In summary, the results of EDUCAIR project evidence the likely existence of a competence gaps between employers (companies) and employees in the four domains of EU AT&A sector.

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1 Introduction

Deliverable 3.3 of Work Package 3 (WP3) (Struyf and Kupfer, 2012) - *Setting the assessment framework for education and training*, explores the roots of the eventual divergence between the demand of and the supply of competences and set the scene for the works undertaken in WP4, WP5 and WP6. Deliverable 3.3 also identified the core competences in air transport and aeronautics. These competences are the focal points along which the gaps may emerge. Finally, it proposed a first draft version of the surveys to collect the required information from the sector. The surveys are the primary source of information for assessing the competence gaps.

The assessment of the competences was done in three separate Work Packages, namely: WP4, WP5 and WP6. They were developed in parallel. Each one studied different relevant stakeholders and perspectives, as follows:

- **WP4** – Universities (1st and 2nd Level of Bologna) and Graduating Students;
- **WP5** – Universities and Research Centres (3rd Level of Bologna) and Graduated Students and Post-Doctoral Researchers
- **WP6** – Companies and Employees.

Together they offer a complete view of the air transport and aeronautics sectors.

The present Deliverable reports the works and achievement of EDUCAIR WP6 - *Competences required by Industry and Research Centres in the Air Transport and Aeronautics*. The objectives of WP 6 include i) the identification of the competences required by employees (both industry and research centres) and ii) the assessment of the Competences Gap 2 – Gap between the knowledge that the companies need and the actual competences of the employees.

WP6 was divided into four tasks, as follows:

- *Task 6.1: Identification of key functional activities in air transport and aeronautics*
 - Identification of the current and future needs (demand) of competences in the key functional activities and the respective competences, i.e. job tasks.
 - Owing to budgetary and time constraints, a full scanning of demands in all the air transport and aeronautic sectors were not feasible. Instead, EDUCAIR concentrated its resources on the analysis of key functional activities.
 - This task used the scenarios developed in WP3 to identify the future functional activities.

Task 6.1 was led by IST with contribution from AUEB-RC/TRANSLOG, ULPGC, UA, TUDelft and NLR.

- *Task 6.2: Survey and Inquiry to the industry companies and research centres*

- Development of a List of companies to be surveyed.
- Finalization of (Online) Survey Instruments.
- Identification of Contact sources / Details for the survey.
- Implementation / Running of the survey.

Task 6.2 is led by IST with contribution from AUEB-RC/TRANSLOG, ULPGC and UA on the implementation of Task 6.2 survey.

- *Task 6.3: Survey and Inquiry to the industry employees*

- Development of a List of companies (employees) to be surveyed.
- Finalization of (Online) Survey Instruments.
- Identification of Contact Sources / Details for the survey.
- Implementation / Running of the Survey.

Task 6.3 is led by IST with contribution from AUEB-RC/TRANSLOG and UA on the implementation of Task 6.3 survey.

- *Task 6.4: Gap Assessment*

- Data Analysis & Gap Assessment.
- Documentation of WP6 Review and Survey Results / Submission of D6.10 Deliverable.

Task 6.4 is led by IST with contribution from AUEB-RC/TRANSLOG, ULPGC and UA on the preparation of D6.10 Deliverable.

This report is structured in 7 sections, each one dedicated to a specific topic and task of EDUCAIR in general and WP6 in particular, as follows:

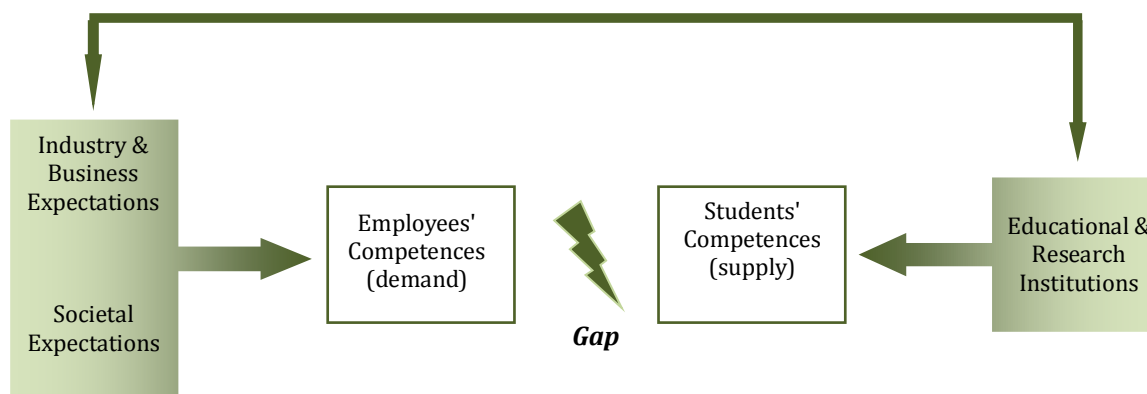
- **Section 1**, the present one, introduces the reader to the contents of the report and provides a description about the WP6 including: objectives, scope, tasks and rationale.
- **Section 2** provides an overview about the objectives, scope and rationale of EDUCAIR project, frames WP6 within EDUCAIR project (that is, clarifies the relationships with the remaining WPs);
- **Section 3** describes the methodological approach to assess the competence gaps
- **Section 4** describes the key functional activities in air transport and aeronautics;
- **Section 5** describes the structure of the surveys conducted in EDUCAIR, in general, and in WP, in particular, and presents the results.
- **Section 6** is dedicated to the assessment of the competence gap.
- **Section 7**, the final section, concludes the report.

2 EDUCAIR Project

2.1 Objectives

The recent dynamics and evolutions have indisputably brought changes in the demand of professional competences for working in air transport- and aeronautics-related professions. Arguably, the very nature of the professional competences has evolved in parallel with the progressive modification in economies, societies and, ultimately, in the air transport systems. As such, we are led to conclude that prospective employees have to master the current (and ideally future) competences if they aspire becoming competent professionals. Since prospective employees are firstly students, then this entails that universities and other education institutions have to permanently update the courses and the curricula.

In face of the constant changes, there is a real risk of mismatch between the prospective employees' competences and the market's actual requirements. And if such mismatch is not addressed, there is the danger of creating a significant competence gap that will inevitably affect the competitiveness and efficiency of the European air transport and aeronautics sectors (Figure 2.1).



Source: Struyf and Kupfer, 2012

Figure 2.1 - Potential competence gap

EDUCAIR project aims to improve the match between needs in human resources and the educational and training offer of skills across the Europe Union. EDUCAIR will identify the air transport and aeronautics needs in terms of staff training and education in the horizon of 2020, in order to recommend improvement in the current educational offers.

On the other hand, the expectable growth in traffic will lead to an increasing demand for labour in AT&A. The industry thus needs to remain attractive in order to attract and keep the most skilled human resources. However, the globalisation and other dynamics are leading to a fierce

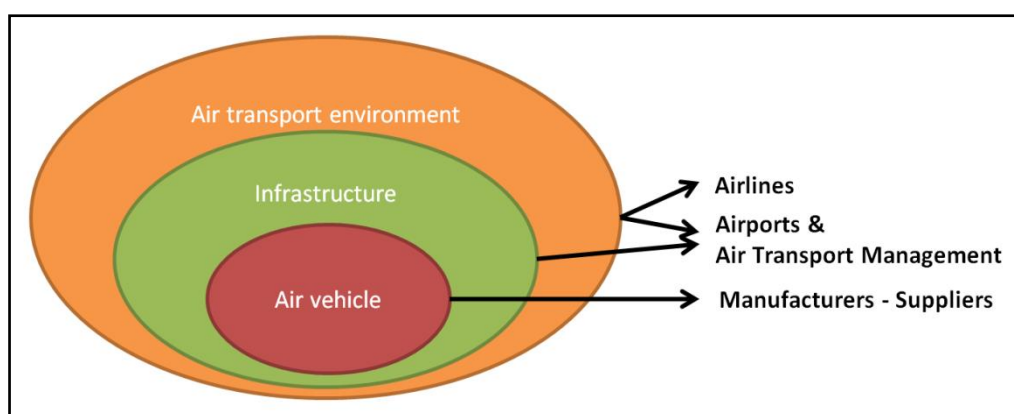
competition among companies located in different regions and continents, often operating under different labour and educational regimes. This is leading the industry to a great pressure for reducing costs, which necessarily reflects in the wages and other working benefits. There is thus the real danger of either graduated students (and researchers) or employees start looking to other industries for better working conditions. If this happens, it may threaten the longstanding competitive hedge of the European Union AT&A industry. Assessing the current attractiveness of the industry is consequently important so that, if necessary, corrective measures could be implemented.

2.2 Scope

2.2.1 Demand Side

The demand side refers to the labour market that recruits the graduated students in air transport and aeronautics. Owing to time and budget restrictions, EDUCAIR's scope was limited to the key sectors of the marker. These sectors correspond to the large majority of the demand basic demand and the derived demand for educated staff. Foremost, EDUCAIR will only focus on the civil aviation labour market, and restrict the geographical coverage to EU27.

EDUCAIR's demand side scope is illustrated in Figure 2.2. EDUCAIR focuses on four sectors, being: manufacturers and suppliers of air vehicles, airports, airlines and companies that deal with air transport management. It is also important to add that air vehicles comprise solely aircrafts.



Source: EDUCAIR (2012)

Figure 2.2 - Demand side of the aviation market which will be studied by the EDUCAIR project

At the lowest level, there is the air vehicle. Design and construction of the air vehicle on the one hand and the maintenance of the air vehicle on the other hand can be distinguished. A large fraction of airline costs and activities are related to Maintenance, Repair and Overhaul (MRO).

Some airlines do MRO themselves, other use MRO suppliers or rely on the OEM (Original Equipment Manufacturers). Often, there is a combination of all three.

However, as the aeronautics and air transport sector is more than only the aircraft, we have to broaden the view and, in first instance, also look at the necessary infrastructure and infrastructure management, as well as infostructure, that is needed by the sector, such as airport landside and airside infrastructure management and air traffic control navigation and communication air infrastructure. General air transport management cannot be ignored in this analysis. Air transport management influences the aviation environment, the aircraft specific domains and the infrastructure and makes sure that the different domains and layers work well together.

The third layer comprises the air transport environment. This environment contains aircraft operations and training, the airport operations, air traffic management and the air transport companies (airlines). It is important to add here, that, next to the air traffic management, there is also the management of the aircraft design, development, testing, certification, production and new versions along the entire life cycle. Managing an aircraft development and production programme is far more complex than managing an airline or airport and should not be omitted or ignored. For example, is it generally known that developing a new airliner costs around ten billion euros; the production of a thousand is worth 100-250 billion euros and life-cycle costs are much higher (Airliner, 2012, several articles). Development takes five to six years, production may span ten to twenty years in different versions and lifetime can be over 40 years. The process involves hundreds of suppliers at four or five levels. Therefore, the technical managers are often senior engineers after some years of experience and aircraft and equipment producers also employ economists, personnel managers etc.

2.2.2 Supply Side

The supply side refers to the higher-education and long life learning institutions that provide training in air transport and aeronautics. In EDUCAIR the universe of European Union institutions was narrowed down to the universities offering engineering education programmes on the 1st and 2nd level of Bologna. For the education on the 3rd level of Bologna (i.e. PhD programs) and the post doc research, also other educational areas are analysed, for example management/business economics, law, economics/public policy. In addition, lifelong learning programmes (mainly professional or corporate training) aiming to complement knowledge gained through previous education will be also examined. Table 2.1 summarizes the various supply entities that will be covered by the EDUCAIR project.

Table 2.1: Overview of levels and types of education concerning Air Transport and Aeronautics

	Level of education	Type of education
Academic: University	1 st and 2 nd cycle of Bologna	Engineering
	3 rd cycle of Bologna	<ul style="list-style-type: none"> • Engineering • Management/ Business Economics • Law • Economics/ Public Policy
	Research (post-doc)	<ul style="list-style-type: none"> • Engineering • Management/ Business Economics • Law • Economics/ Public Policy
Non-academic: Lifelong learning	Professional/corporate programmes	Engineering

Source: Struyf and Kupfer (2012)

2.3 Rationale

To explore the sources and extend of the competence gap, the assessment framework presented in Figure 2.3 will be used. The framework is based on two core concepts, being: *competence and knowledge*. Competence may be understood as the ability to retrieve the *right* skill from our mental *warehouse* of skills to solve some problem. The more adequate our skill is to solving the problem, the higher our competence will be. Knowledge, on the other hand, may be understood as the information, understanding and skills of someone on some domain. A person's competence depends on the ability to pin-point in her body of knowledge the adequate skill to do something. Naturally, if there is no knowledge or the skill is not correctly identified, then the person's competence is affected.

Looking again to Figure 2.1 and using this assessment framework, we may identify the four gaps and better understand the positioning and origin of the Competence Gap (Gap). Figure 2.4 identifies the four gaps. Using the concepts of competence and knowledge, and analysing from two perspectives – industry (demand) and educational institutions (supply) – the assessment framework presented in Figure 2.3 identifies four gaps, being:

- **Gap 1** - Competence Gap - Gap between the competences that the employees need and the actual competences of the students (i.e. to what extend are the student's competences actually useful in their working daily activities?);

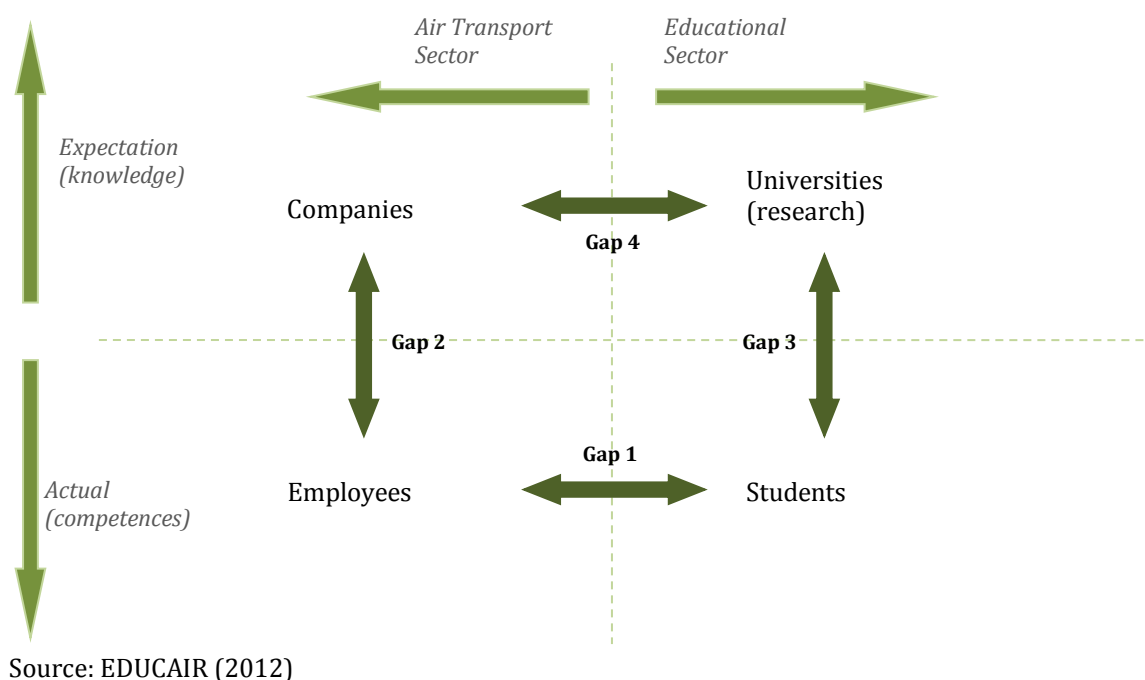


Figure 2.3 - The four gaps framework

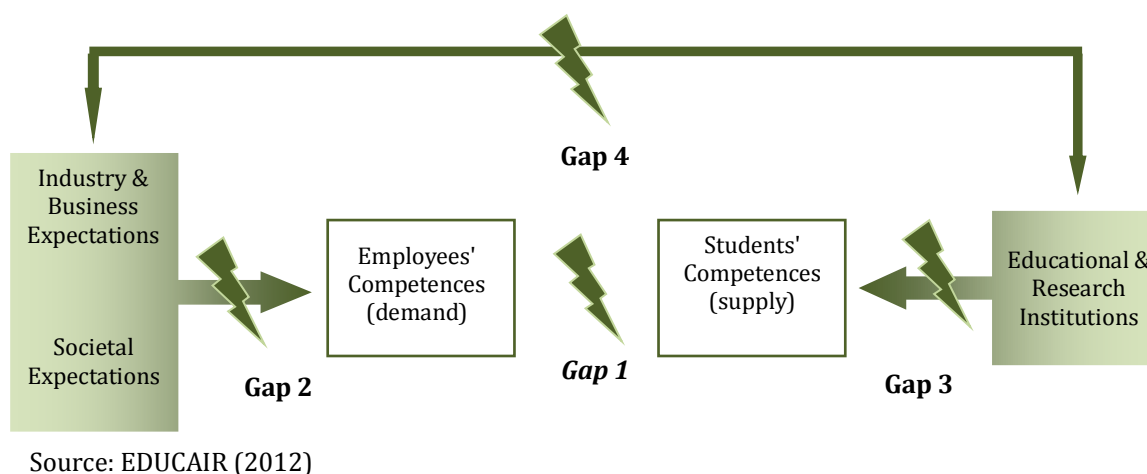


Figure 2.4 - Competence Gaps

- **Gap 2** - Gap between the knowledge that the companies need and the actual competences of the employees (i.e. to what extent do the employees' competences actually fit in their companies' competences requirements?)
- **Gap 3** - Gap between the knowledge the universities generate and the actual competences of the students (i.e. is the knowledge generated in the research transferred in the courses?)
- **Gap 4** - Gap between the knowledge the companies need and the knowledge the universities have (i.e. is the universities' research and teaching activities of relevance for the companies?)

A detailed description on the various competence gaps can be found in Deliverable 3 of EDUCAIR project (Struyf and Kupfer, 2012)

Figure 2.5 presents EDUCAIR's overall methodological approach to assess the four competence gaps. The methodological approach is divided into three stages, being:

1. **Conceptual development** of the competence gap framework and **Identification of the key competence** – already done in WP3;
2. **Collection of information** (relevant stakeholder's views and perspective) on the current state of those competences - done in WP4 , WP5 and WP6
3. **Competence Gap assessment** - cross comparison between the *demand* side and the *supply* side for those competences – done in WP6 and WP7, and to be done in WP8.

The first stage corresponded to the identification of the key competences in the various relevant stakeholders (that is, companies, employees, universities and students) that led to the conceptual development of the Four Gaps Framework. This part was developed and completed in WP3 (See Deliverable 3, Struyf and Kupfer, 2012). The design of the survey included the elaboration of four questionnaires that were structured to allow assessing the competences gap (more information about the survey can be found bellow in Section 5 and in the Deliverables 4 and 5). To complement and validate the surveys a set of interviews, meetings and other desktop research was conducted. Upon completion of this second stage, the surveys were disseminated and the interviews and meetings were conducted. Finally, the information from the surveys and other sources were compiled and compared. The assessment of the competence gaps was done through the analysis and cross comparison between the *demand* and the *supply* side on each gap.

The present deliverable describes the results of the tasks conducted under WP6 that led to the assessment of the Gap 2 between the needs of the companies and the actual competences of the employees. The scope of the deliverable (and WP6) corresponds to the green shadow in Figure 2.5.

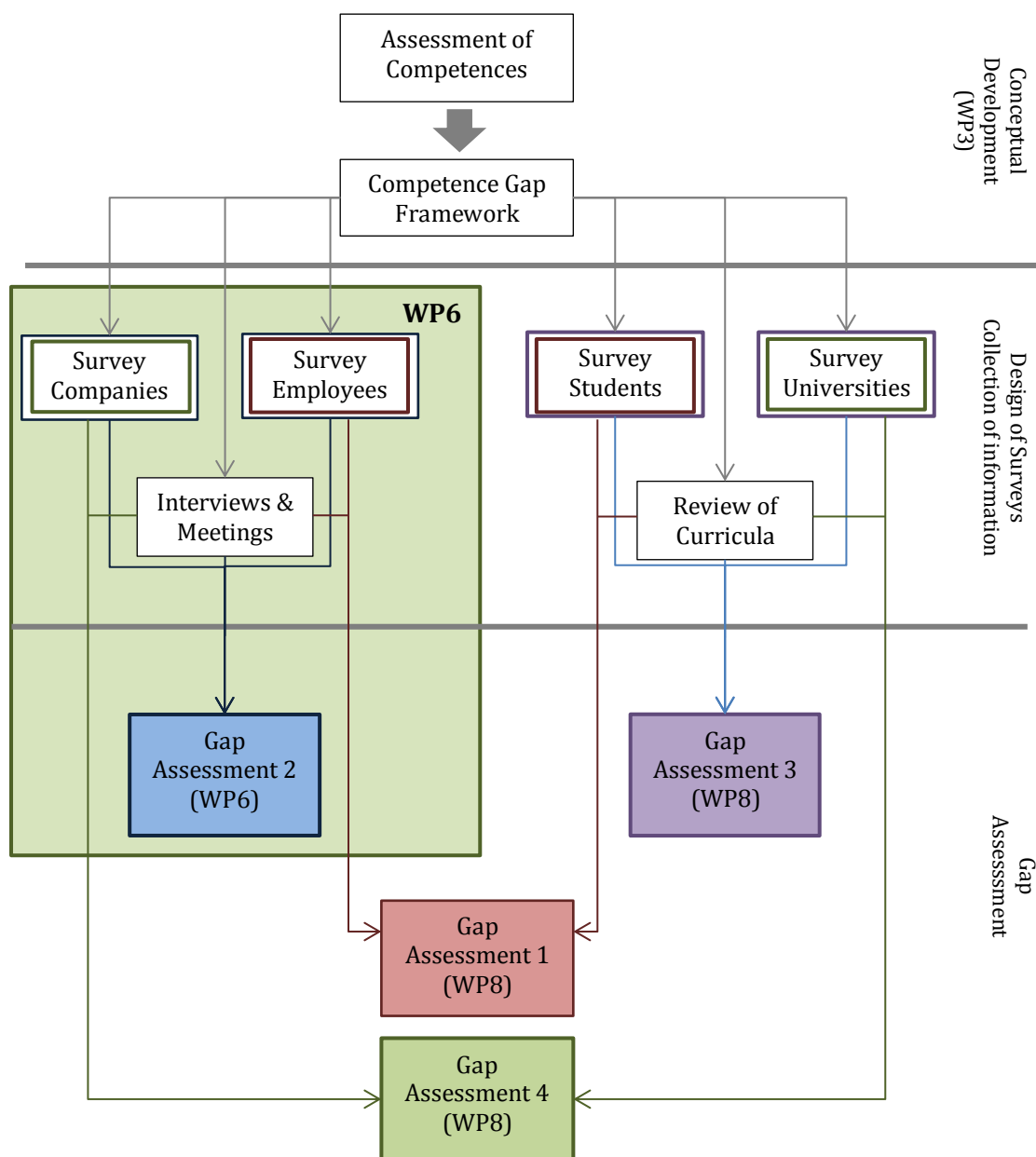


Figure 2.5 – EDUCAIR rationale for assessing the competence gaps

3 Methodological approach to assess the Competence Gap

3.1 Basic Definitions

In this chapter we briefly recall the key concepts underlying the assessment of the competence gaps (a more comprehensive presentation is available in Deliverable 3):

- Knowledge,
- Skill,
- Competence,

3.1.1 Knowledge

Knowledge can be defined as the "inferred capability which makes possible the successful performance of a *class of tasks* that could not be performed before [a] learning [process] was undertaken" (Gagné, 1962, pp 355). In turn, learning process can be understood as capacity of an individual of, in face of a set of stimulus, to acquire the capability to solve a given class of tasks. As such, knowledge is the outcome of the interaction between an individual's capacity to learn (intelligence) and his opportunity to learn (Winterton et al, 2005). Knowledge thus depends on the social context where the individual is embedded.

Knowledge can be segmented accordingly its purpose and nature. General knowledge refers to knowledge that is necessary for a person's daily activity and interaction with others in the Society. This type of knowledge is irrespective of any occupational context. Conversely, specific knowledge refers to knowledge gained in a specific context and it is necessary for meeting specific requirements or conducting specific tasks. In addition, knowledge is cumulative since firstly, an individual gains an explicit and factual knowledge on a given task (declarative knowledge), which will support the capability of utilising the knowledge in new tasks and different context (procedural knowledge) (Winterton et al, 2005).

Knowledge is cumulative and built over time based on previous acquired knowledge. The individual's mental and cognitive abilities determine his capacity of building knowledge.

3.1.2 Skill

Skill can be defined as "goal-directed, well-organised behaviour that is acquired through practice and performed with economy of effort" (Proctor and Dutta, 1995, 18). In other words, skill refers to how good an individual is able of executing a given task.

The definition of skill requires further explanations. First, a skill is a goal-oriented behaviour denoting that it is manifested in response of an external demand. Second, a skill is a well-

organised behaviour meaning that it exhibits structure and a coherent set of patterns. Third, a skill is acquired and improved over time through repetition and fourth, the efforts and cognitive demands reduce as the skill improves (Winterton et al, 2005).

Different types of skills have been identified, depending on the nature of the external demand, namely:

- *Perceptual skill* is related with an individual's ability to make distinctions and judgements;
- *Response skill* is related with an individual's ability to promptly react to a specific demand. This type of skill can be improved and, eventually, become automatised, if practiced over time.
- *Motor skill* is related with an individual's ability to perform some motor-related behaviour, such as speed and accuracy of physical movements, or dexterity. Indeed, this type of skill was one of the firsts to be identified (Swift, 1904, 1910, Bryan and Harter, 1897 and 1899).
- *Problem-solving skill* is related with an individual's ability to solve new (or unknown) tasks. This skill is dependent upon intellectual and mental models.

3.1.3 Competence

The literature is populated with definitions on the concept of competence and, the related term, competency (Winterton et al, 2005, Hoffman, 1999, Elleström, 1997, Robotham and Jubb, 1996), yet, thus far no consensus has been reached. The reasons are discussed elsewhere in detail (Jeris and Johnson, 2004, Cseh, 2003, Pate et al., 2003, or Boon and van der Klink, 2002), but may be ascribed to different epistemological assumptions, cultural differences or, even, differences in the context of the study (or nature of object of analysis). Indeed, the Mansfield (2004) identified three different contexts where the notion can be applied, being:

- Competence is a characteristic that describes how an individual performs (and fulfils) his job's demands. The better he meets (and fulfils) his job's demands, the higher his competence will be. This notion is focussed on the outcome of an individual's job's activity.
- Competence refers to an individual's attributes and traits to meet the job's demands. This notion is focussed on the individual's intrinsic properties.
- Competence refers to the tasks that an individual do. The tasks are defined by the type of demands of the job. This notion is related with the individual's job's tasks.

For the purpose of this study, we adopted Woodruffe's (1991) definition on competence and competency. The author defines *competence as a (job's) task that an individual can perform*, and *competency as an individual's capability (or characteristic) of doing well a given (job's) task*. This definition was supported by other authors, such as Le Deist and Winterton (2005), Hartle (1995)

or Tate (1995)¹. The definition of competence has a functional nature, being related with the properties (and functions) of a task or job; while competency has a behavioural nature being related with an individual's can achieve.

The individual's competence is built over time, and several factors influence its development, namely: ability, knowledge, understanding, skill, action, experience or motivation (Weinert, 2001). Among these, skills is a fundamental prerequisite.

3.1.4 Interaction between Knowledge, Skill and Competence

Although knowledge, skill and competence refer to different psychological components of human development, they influence each other and their development is determined by the others. Yet, it should be noted that as with any psychological component, many other factors influence their development. For the purposes of this research, it is relevant to highlight the cascade of influence between these three components. Figure 3.1 shows the cascade of influence between the three components. An individual's intellectual capabilities are required for the development of knowledge. In turn, the practical utilization and "operationalization" of knowledge is condition for developing skills. Finally, all these components are necessary prerequisites for the development of competences.

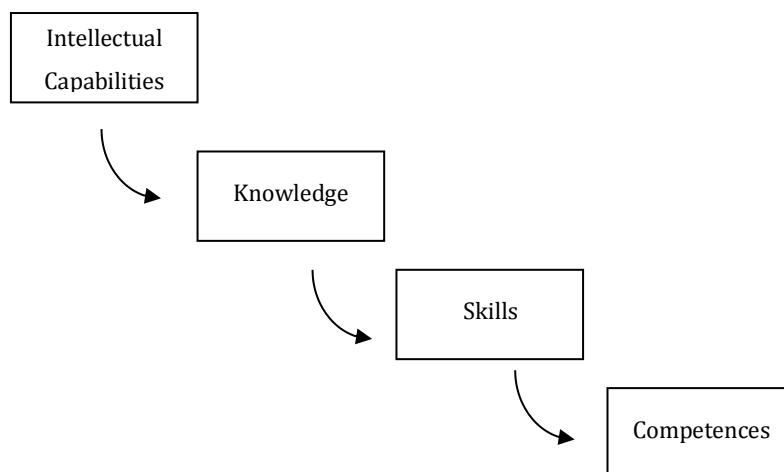


Figure 3.1 - Influence between knowledge, skills and competences

3.2 Methodological approach to assess the competence gap

We deployed a 4-step methodology to assess the Competence Gap (Figure 3.2).

¹ It should be noted that other authors consider precisely the opposite, or with other meanings. For example, Mangham (1986) related competence with a personal models; McClelland (1976) related competency with superior performance; or Dale and Iles (1992) use both terms interchangeably.

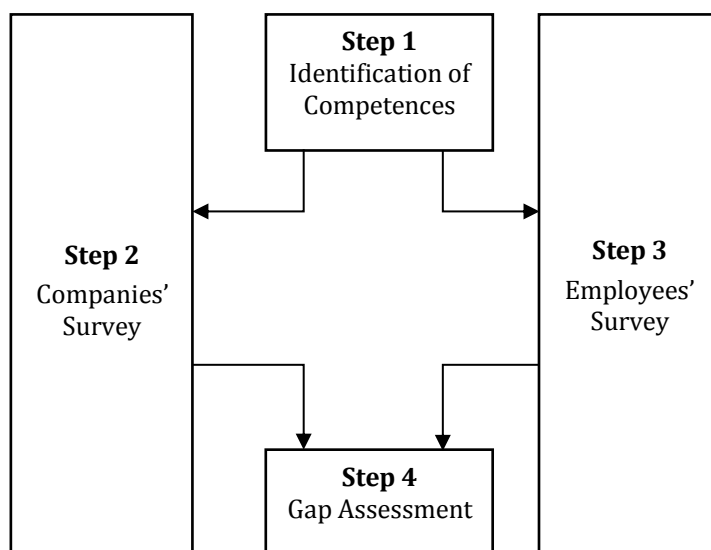


Figure 3.2 – Gap Assessment Methodology

The steps were:

- **Step 1** - Identification of the competences in AT&A;
- **Step 2** - Industry survey (quantitative and qualitative demand of competence);
- **Step 3** – Course Survey (supply of competence);
- **Step 4** – Gap Assessment.

Each step is fully described in the following chapters, as follows: Step 1 in Chapter 4, Step 2 and Step 3 in Chapter 5 and Step 4 in Chapter 6.

4 Identification of the Competencies and General Skills – Step 1

Due to the diversity and complexity of the sector, we have narrowed our analysis to four key domains of activity, being: airlines, airports, air navigation service providers and manufacturers. Deliverable 3 (WP3) presents an in depth discussion about the current forces driving the development of the AT&A sector and, ultimately, determining the competences and general skills. In this deliverable, we present the competences that were actually included in EDUCAIR surveys (Table 4.1). The different key functions/competences are grouped into different categories per company.

Table 4.1: Key functions / tasks of demand side elements

Airlines	Cockpit Crew	<ul style="list-style-type: none"> - planning of the flight - on board instrument control - general and radio navigation & communication - air law & operational procedures - management of technical aspects (e.g. engine performance, cabin pressurization)
	Technics & Engineering	<ul style="list-style-type: none"> - maintenance and repair of airframe - maintenance and repair of power plant - maintenance and repair of on board instruments - maintenance and repair of navigation and radio communications equipment - maintenance and repair of auxiliary systems (undercarriage, hydraulics, air conditioning, etc.)
	Planning, Control & ICT	<ul style="list-style-type: none"> - coordination of maintenance - planning and coordination of operations - safety management - flight dispatching - determination and provision of meteorological circumstances - ramp planning
Airports	Infrastructure	<ul style="list-style-type: none"> - airside infrastructure (runways, taxiways, aprons and holding bays design)

	Design	<ul style="list-style-type: none"> - building and terminal (passenger and cargo terminals, ancillary services buildings) - landside access
	Building & Construction	<ul style="list-style-type: none"> - airside infrastructure - building and terminal - landside access
	Infrastructure planning	<ul style="list-style-type: none"> - master planning - land use
	Operations Handling	<ul style="list-style-type: none"> - handling of passengers (e.g. luggage handling) - handling of freight (e.g. loading and unloading) - handling of air vehicles (e.g. fueling, de-icing)
	Maintenance	<ul style="list-style-type: none"> - airside (runways and other surfaces) - terminal
	Environmental control	<ul style="list-style-type: none"> - noise control - emission control - waste management - wildlife control
	Security	<ul style="list-style-type: none"> - security concerning passengers - security concerning cargo - security concerning employees - prevention of intrusion/unauthorized access
Air Traffic Control and Management	Area Control	<ul style="list-style-type: none"> - supervision of Area Control Centre operations - en route aircraft control - planning & coordination en route air traffic
	Approach Control	<ul style="list-style-type: none"> - supervision & planning approach operations - provision of terminal radar approach control
	Tower Control	<ul style="list-style-type: none"> - supervision of tower operations - on the ground aircraft movements control - aircraft landing & taking-off control

	Other ATC operations	<ul style="list-style-type: none"> - provision of flight information to VFR (Visual Flight Rules) traffic - planning and coordination of network capacity
	ATM	<ul style="list-style-type: none"> - design, development and evaluation of ATC procedures - design, development and sustainment of ATC systems, product and tools - management of safety of ATC operations - management of air traffic capacity and efficiency - management of interaction of operational controllers with operational environment
Manufacturers - Suppliers	Research & Technology	<ul style="list-style-type: none"> - failure assessment and recognition - avionics, electronic and electrical systems & EMC (Electromagnetic Compatibility) - customer service - fluid mechanics and acoustics - propulsion and powerplant - RAMS (Reliability, Availability, Maintainability and Safety), human factors & operability - software design & IT (Information Technology) - structural design - test engineering - services solutions - quality engineering - production rigs
	Operations	<ul style="list-style-type: none"> - airline operations appreciation - components and aircraft architecture - manufacturing engineering - maintenance - RAMS (Reliability, Availability, Maintainability and Safety), human factors & operability - governance - risk management - composites manufacturing and assembly

	Engineering	<ul style="list-style-type: none"> - aircraft operability and design maturity integration - design - failure assessment and recognition - stress and structures analysis - materials and processes - systems engineering and architecture - airworthiness and certification - architecture, integration and in-service support - systems & electronics engineering - structural & general engineering - flight physics - configuration management - composites design and stress - supply management - lean experts & supply chain quality field engineering - electrical design/integration
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Competences are the so-called “hard skills” that employees must have to adequately do their job tasks. However, more and more, other competences not related with the actual job functions are increasingly valued. These competences, also called “soft skills”, are required in today’s globalised world. They enable employees to effectively work in multidisciplinary teams (not only in terms of competences but also in terms of geographical origin of the team members). We grouped these competences under the overall label of “General Skills”. The following General Skills were included in the surveys:

- Problem solving;
- Ability to work in multidisciplinary teams;
- Oral and written communications;
- Analytical background;
- Technical background;Leadership;
- Theoretical background.

5 Surveys to the Companies (Step 2) and Employees (Step 3)

5.1 Introduction

The surveys (Step 2 of EDUCAIR's methodological approach, see Figure 2.5 in Section **Error! Reference source not found.**) provided the bulk of the information for the assessment of the competence gaps. The interviews, meeting and other, although relevant, served mainly for calibration purposes.

The adaptation of the Four Gaps Framework (Figure 2.3) to the scope of the EDUCAIR project led to the identification of the *relevant stakeholders* as the key sources of information for analysis the various competence gaps – that is, the target of the surveys. Table 5.1 gives an overview of the relevant stakeholders (the upper panel shows the scope, while the lower level shows the stakeholders). Four types of relevant stakeholders were identified, being:

1. companies (human resources),
2. employees,
3. universities (professors and lecturers),
4. graduating and graduated students.

Table 5.1: Overview of target group of survey

INDUSTRY (demand side)	EDUCATION (supply side)
<ul style="list-style-type: none"> • Airlines • Airports • Companies involved in air traffic management (such as air traffic control organisations) • Aircraft manufacturers and suppliers 	<ul style="list-style-type: none"> • Universities and colleges with engineering programmes involving air transport/aeronautics • Universities and colleges with research and PhD programmes in air transport/aeronautics • Vocational and Professional training institutes
Relevant Stakeholders:	Relevant Stakeholders:
<ol style="list-style-type: none"> 1. Managers of new employees and people recruiting new employees (human resources) 2. New employees (max. 5 years' experience) 3. The employees/professionals (with more than 5 years' experience) 	<ol style="list-style-type: none"> 1. Heads of departments, professors or lecturers related to air transport/aeronautics 2. Graduating students only 3. Graduated students (pursuing a doctorate) 4. Graduated students that are not working in air transport or aeronautics 5. Researchers (post-doctoral fellows)

Source: EDUCAIR(2012)

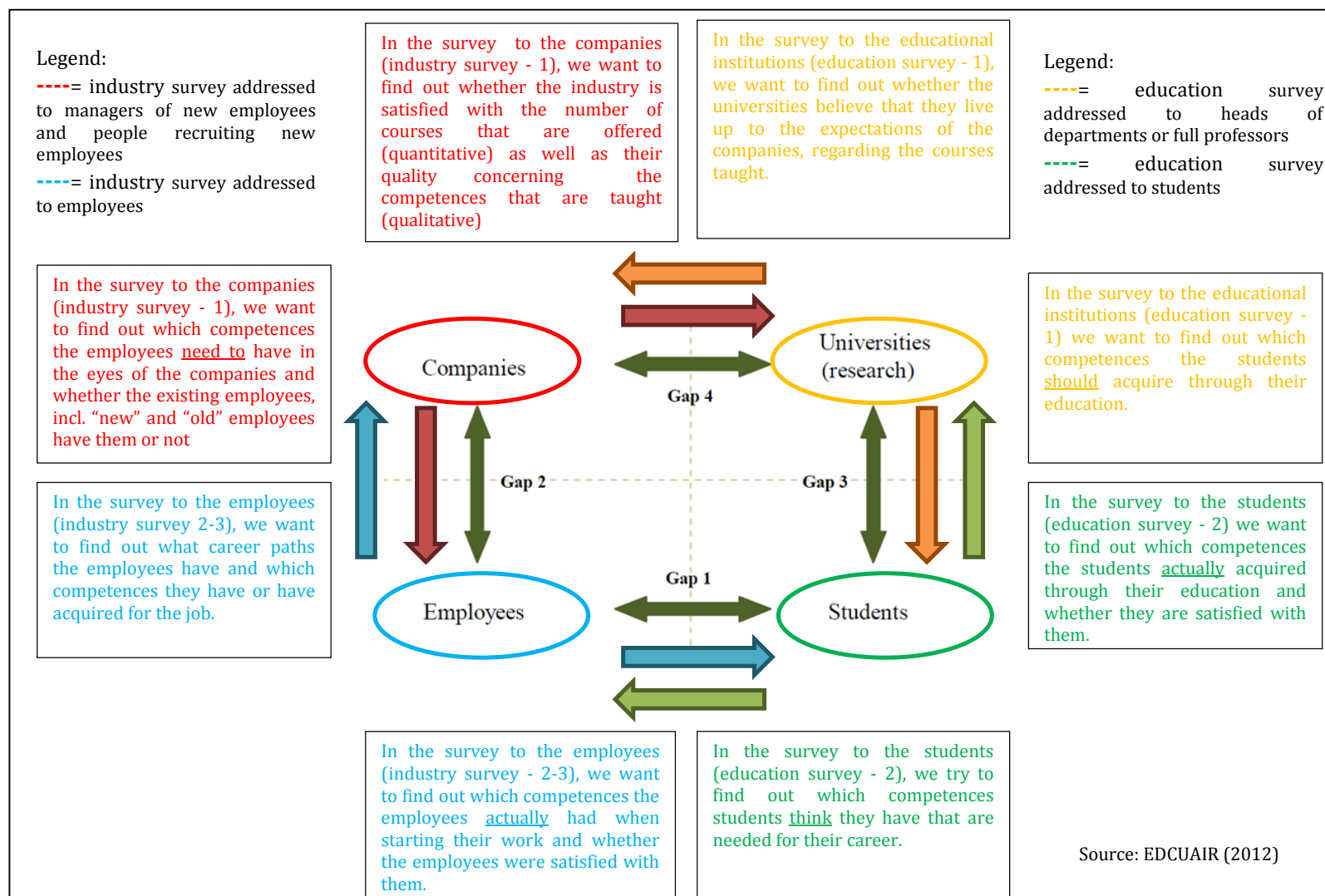


Figure 5.1 - Overview of different surveys in line with the educational gaps

A tailored survey was designed and launched for each stakeholder, in a total of four surveys. Figure 5.1 shows what was gauged in the survey and how this was linked to the specific relevant stakeholders. This is aligned with the assessment framework (Figure 2.3). The link between Table 5.1 and Figure 5.1 is shown by use of colors.

For practical matters, each stakeholder received one survey. Looking to Figure 5.1, we may conclude that each stakeholder is the focal point for two gaps; therefore, each survey contained questions from two gaps. Bearing in mind that the competences and the gaps were assessed in different Work Packages (WP4, WP5, WP6 and WP8)(Figure 2.5), then the design of the surveys entailed a strong articulation and coordinating among WPs.

The following diagram (Figure 5.2) presents the rationale underlying the design of the surveys. Within bracket, we present the number of the question. All surveys contain questions aimed to assess the respective gaps of each stakeholder. With the exception of the survey targeting universities, a split of the questions between each gap was possible. In what concerns the universities, the questions were used to assess both gaps. All surveys started and ended, in a similar fashion, with the basic characterisation of the respondent and a request about their interest in receiving further news and updates. It is important to note that the surveys also provided information for the assessment of the attraction and repulsion factors of air transport and aeronautics, in the WP7.

5.2 Dissemination Efforts and Description of the Collected Surveys

All the information about the five on-line surveys, including the description of the different target groups and the hiperlinks to the surveys (in Survey Monkey) are at the project website (www.educair.eu). This helped the 'cross-dissemination' of the surveys through the different target groups, since the website visitors from one target group may acknowledge the other surveys and forward them to their acquaintances.

In parallel with the website, a profile in two well-known business-oriented and social-oriented networking websites Facebook and LinkedIn were created (<http://www.facebook.com/Educair>; pt.linkedin.com/pub/educair-project/5b/a71/651/). We also disseminated the surveys in several groups related to air transport and aeronautics in LinkedIn and Facebook. We also have sent target messages to EDUCAIR's first degree connections through LinkedIn. EDUCAIR's LinkedIn profile has reached 380 first degree connections.

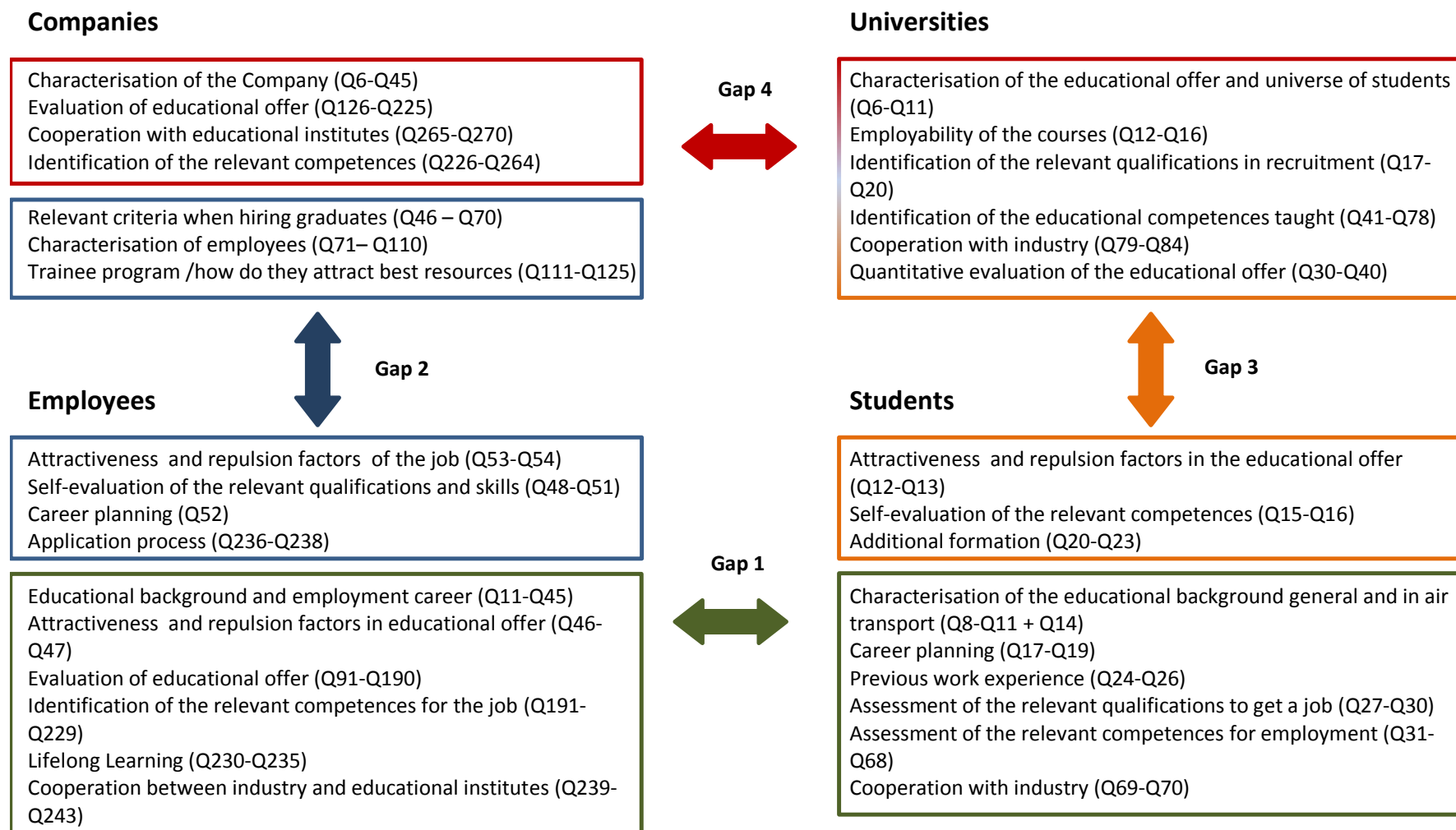


Figure 5.2 - Structure of the surveys and list of questions to assess the competence gaps

We have sent target messages to contacts in specific groups related to the air transport and aeronautics sectors from our mailing list (See Annex II).

In addition, we have also contacted the Airlines and Airport managers from our mailing list. We also contacted the associated airports' operators and World Business Partners of the Airports Council International - ACI to disseminate the surveys.

The Air Transport Action Group – ATAG had also disseminated the EDUCAIR's surveys among its members as requested by IST while participants of AIRDEV conference have received a message to be aware of EDUCAIR surveys. The employees' survey was disseminated in the European Aeronautics Science Network (EASN) in the Latest News section (<http://www.easn.net/>).

The two main surveys that support the assessment of Gap 2 were the survey to companies and employees.

Since we have received much more responses from Manufacturers & Suppliers and Other (Consultants/Government/Associations/Authorities bodies) in the first wave of dissemination, a second effort was made in order to achieve more answers from Airports, Airlines and ASNP. All partners have contributed to this task. A detailed list of contacts can be found in the ANNEX II.

Moreover, personalized messages to the surveys' respondents of the first wave of dissemination were sent, asking them to disseminate EDUCAIR's surveys among their professional contacts and at the same time making them aware of how important was their contribution to the Project by answering the survey.

Summarizing, a strong effort was made to disseminate the surveys among different target groups. We mobilized partners, associations and privileged contacts to help us in this task. We used the most important and well-known business-oriented and social-oriented networking websites Facebook and LinkedIn.

5.3 Detailed Description of the Surveys

The surveys were thought to provide an intuitive and simple experience to the respondents. Aware that the targets (companies, employees, students, etc.) are constantly approached to provide information, the surveys were kept short and the amount of information was reduced to the minimum necessary. The following rules guided its structure:

- Minimise and simplify the required information – the maximum duration of the surveys was kept below 20 min;

- Tailoring the surveys – as explained in Section 2.2.1, we have identified a set of core functions within the AT&A sectors, these were our targets. Yet, even so, they exhibit major differences in terms of needed competences or educational background. Likewise, we may expect changes the attractiveness level within the sectors. Therefore, the surveys were tailored to the function of the respondent;
- Minimisation of the open questions – this reduces the duration of the survey, focus the respondent on the purpose and minimise the number of empty questions. In any case, owing the variety and diversity of reasons (some of them entirely subjective) leading to abandon a carrier in AT&A, some of the question concerning the attractiveness level were open questions.
- Relaxation of the boundaries – we are aware that the precise answer of many information would require considerable efforts, whereas, other information is hardly known or recorded. On the other hand, precise information is not fundamental to assessing the attractiveness level or the competence gaps; we need to have confidence about their existence and a clear idea about their dimension.

As already described in the previous sections, we have developed 5 Surveys in EDUCAIR project, with the following targets:

1. Students and Researchers in AT&A
2. Universities in AT&A
3. Graduated Students in AT&A but working in other fields.
4. Employees in AT&A
5. Companies in AT&A

The first three surveys are described in detail in other deliverables, namely: D4.8, D5.9 and D7.11. Herein, we will describe the surveys number 4 and 5 that are listed in Annex I.

The employees survey is structured around 7 parts, as follows:

1. General information about the respondent (Q1 – Q10)
 - Personnel data,
 - Geographical location,
 - Position in the company and area of activity.
2. Educational Background & Career Path (Q11 – Q47)
 - Graduation domain,
 - Educational level in the domain of AT&T,
 - Attraction and repulsion factors in the educational background in AT&T,

3. Qualifications & Skills and career (Q48-Q54)
 - Self- evaluation of the qualifications needed for the job
 - Self- evaluation of the skills needed for the job
 - Career Planning
 - Attraction and repulsion factors of the current job in AT&T,
4. Evaluation of the educational offer and competences (Q91-Q229)
 - Quantitative and qualitative satisfaction of the current courses/programs in AT&T available,
 - Competences that are relevant for the activities in the company,
 - Self-competences,
5. Lifelong learning (Q230-Q235)
 - Incentives to additional courses/programs,
6. Cooperation between industry and educational institutions (Q236-Q243)
 - Process of get the current job
 - Influence of the cooperation Industry & Universities in self-career
 - Opinion about the cooperation Industry & Universities
7. Other Comments (Q244 – Q246)
 - Open field for inserting any question
 - Request authorisation for sending further information or for direct contact.

The survey was uploaded in the platform SurveyMonkey (www.surveymonkey.com) and it is available at: <https://pt.surveymonkey.com/s/surveyemployees>

The companies survey is also structured around 7 parts, as follows:

1. General information about the respondent (Q1 – Q5)
 - Personnel data,
 - Geographical location,
 - Position in the company and area of activity.
2. Characterisation of the company (Q6 – Q45)
 - Market addressed by the company,
 - Number of employees and which backgrounds,
 - Expectations to hire in the next 5 and 15 years,
3. Relevant criteria when hiring graduates and characterisation of employees (Q46– Q110)
 - Relevant qualifications needed for the jobs in the company,
 - Relevant skills needed for the job in the company,

- What qualifications and skills the employees have,
- 4. Trainee program /how do they attract best resources (Q111-Q125)
 - Trainee programs in the company,
 - Benefits to attract their employees,
- 5. Evaluation of educational offer and identification of the relevant competences (Q126-Q264)
 - Quantitative and qualitative satisfaction of the current courses/programs in AT&T available,
 - Competences that are relevant for the activities in the company,
- 6. Cooperation with educational institutions (Q265-Q270)
 - Type of cooperation with educational institutes
 - Financial sponsorship
 - Opinion about the cooperation Industry & Universities
- 7. Other Comments (Q270 – Q272)
 - Open field for inserting any question
 - Request authorisation for sending further information or for direct contact.

The survey was uploaded in the platform SurveyMonkey (www.surveymonkey.com) and it is available <https://www.surveymonkey.com/s/industrysurveycompanies>

5.4 Results of Survey to Companies (Step 2)

This section presents and discusses the results obtained from the survey targeting AT&A companies.

5.4.1 Characterisation of the respondents

A total amount of 87 companies have answered to our call. The distribution per country is presented in in Figure 5.3. The country indicates the geographical location of the person that actually responded to the survey, and not the headquarters or market. A total of 18 EU member states are represented, which is a reasonably good coverage of the EU. The countries with more responses are: Greece (20%), Portugal (12%), Netherlands (12%) and Spain (8%). This likely reflects a bias towards the national countries of EDUCAIR partners. Understandably, each EDUCAIR partner has more contact in its country.

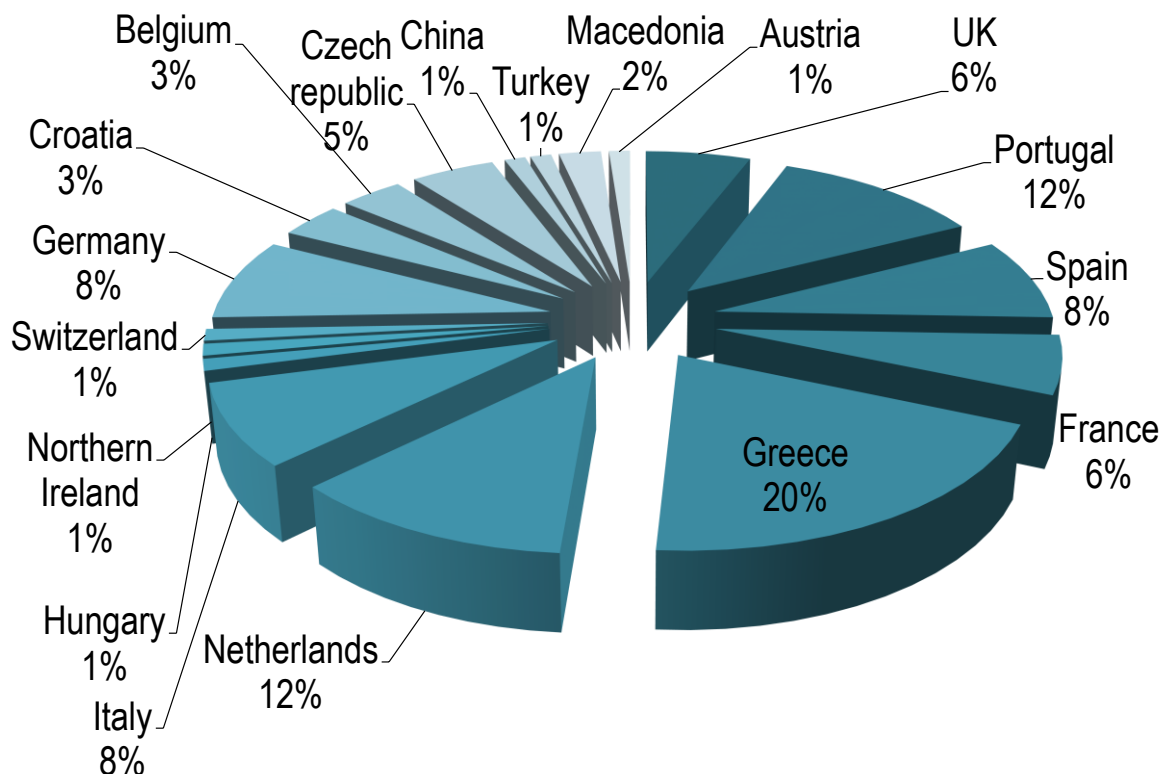


Figure 5.3 – Country distribution of the respondents

As expected the vast majority of the companies play at worldwide level (Figure 5.4). This simply reflects the Global nature of the Aviation Industry. In any case, a non-irrelevant amount of companies still compete a national level.

As already explained, we have concentrated our analysis in four domains, namely: airlines, airports, air navigation service providers and manufacturers. The following picture (Figure 5.5) distributes the respondents per category. Interestingly, the largest amount of respondents share does not belong to any of the four categories. Follows, the manufactures with a total amount of 22 of respondents. Airlines were the group with lower amount of responses corresponding to 4 of total. In any case, the amount of answers was found sufficient to conduct the analysis.

Table 5.2 – Companies, Institutions and Associations participating in the companies' survey

Companies/Institutions/Associations			
Rolls-Royce plc	ISDEFE	Embraer Portugal SGPS, SA	Active Space Technologies S.A.
Novabase	Airport Research Center GmbH	ISA Software	GMV Skysoft
Nortávia, Transportes Aéreos S.A.	Munich Airport	Brussels Airlines	InfraTec GmbH Infrarotsensorik und Messtechnik
CRIDA A.I.E.	German Dutch Windtunnels DNW	Evektor, spol s r.o.	University of Applied Sciences - Upper Austria
SAFRAN Group	German Aerospace Center, DLR	Prague Airport	ERGON RESEARCH SRL
OGMA, Indústria Aeronáutica de Portugal, S.A.	Osijek Airport Ltd.	QinetiQ	Oxsensis Ltd.
Athens International Airport S.A (AIA)	Deep Blue	Ecorys	SEGULA TECHNOLOGIES
EUROCONTROL	Airbus ProSky	Nanjing University of Aeronautics and Astronautics	INASCO
Hellenic Civil Aviation Authority	Kelly Services HR Company	HAVELSAN INC	LA composite, s. r. o.
GOLDAIR HANDLING S.A.	CROATIA CONTROL LTD	NTU/BMTIM	UNIS, a.s.
SICTA	Nommon Solutions and Technologies S.L.	Lufthansa Technik AG	MILTECH HELLAS SA
Slot Consulting Ltd.	NATS	SAGA	Reggio Emilia Innovazione
Bombardier Aerospace	KLM Engineering & Maintenance	CIMNE	INGENIA AIE
International Air Transport Association	SEA Società Esercizi Aeroportuali Spa	GFIC	Anotec Consulting
CEAS, Council of European Aerospace Societies	DNW	Heidrick & Struggles	Lufthansa Consulting GmbH
von Karman Institute for Fluid Dynamics	PT. Wing Umar Sadewa	G4S	

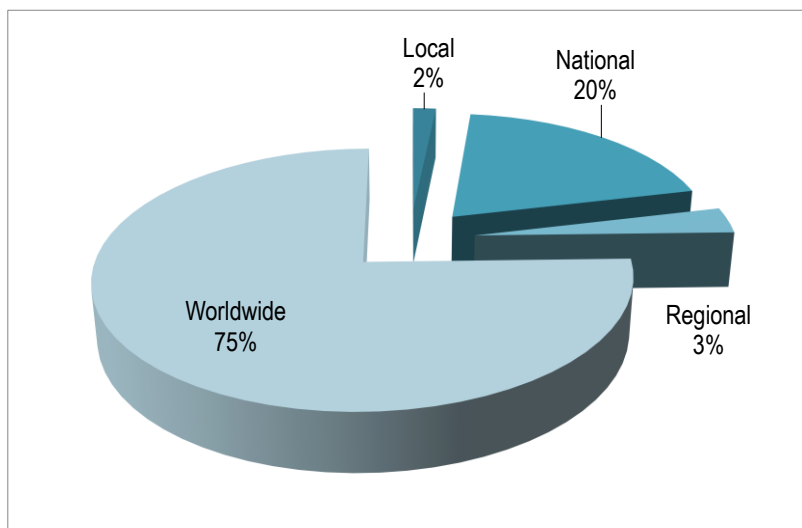


Figure 5.4 – Companies' market

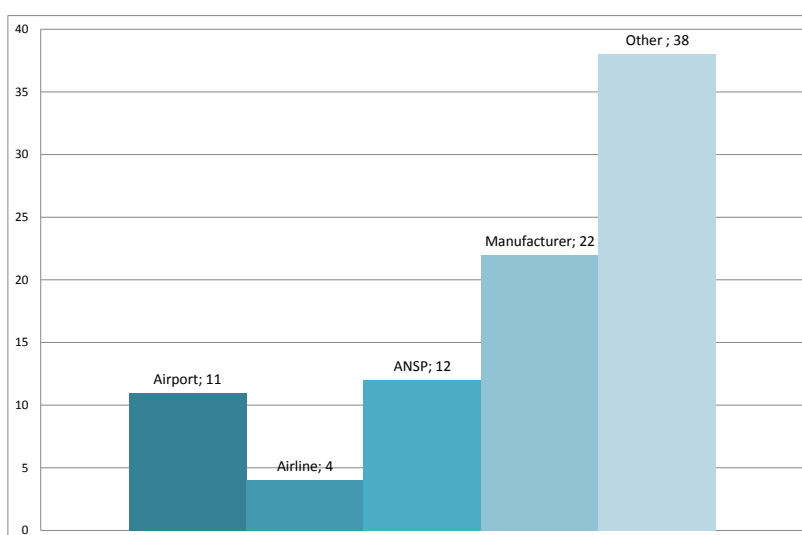


Figure 5.5 –Commercial activity of the companies

5.4.2 Companies' educational and formation component

About 58% of industries replied not having any sort of formation plan for entry level employees (Figure 5.6). Looking now into the companies' perception on the current educational offer, the results show a clear positive perception (Figure 5.7). Indeed, in all educational domains, companies have a perception of an adequate amount of available courses or programs. Of also interest is the high level of unknown towards the actual educational supply (ranging from 25 to 55%).

The engineering (1st and 2nd level of Bologna) are the educational levels with lower level of unknown. This is understandable in the sense that most companies operate in an engineering-related market. Even so, around of 26% of companies reported not knowing if there is enough educational offers. However, when we look to 3rd level of engineering education this value rises up to 29% and when looking to non-engineering related educational offer this level ranges between 45 and 55%. This denotes that companies are focused on the 1st and 2nd levels of bologna.

Does your company have any trainee program in air transport / aeronautics topics for entry-level employees?

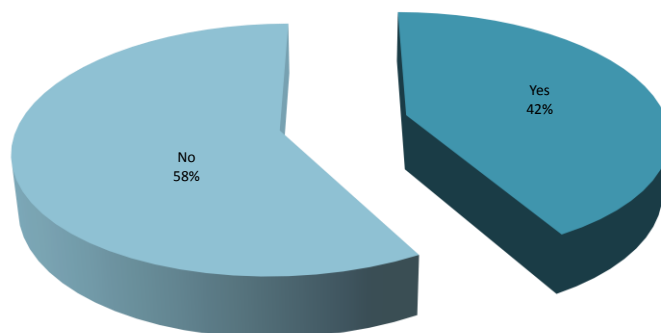


Figure 5.6 – Formation for entry level employees

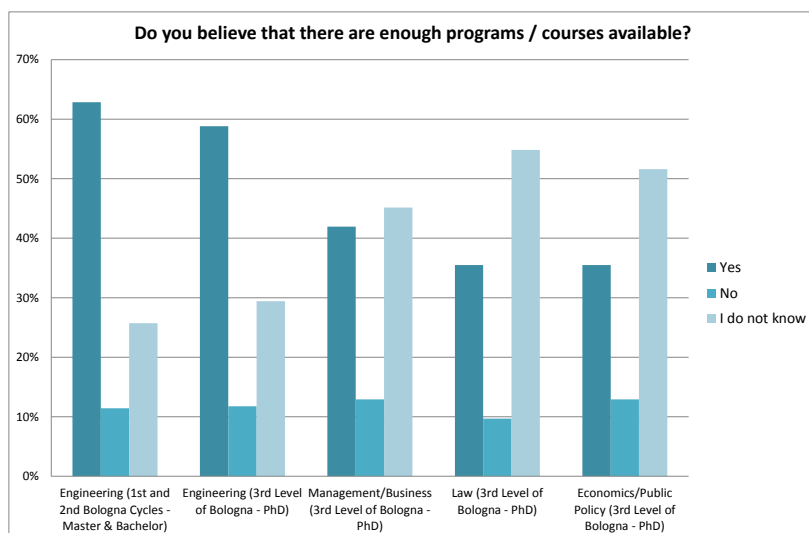


Figure 5.7 – Companies' perception about educational offer

Looking now to the level of satisfaction, the picture is again clearly positive (Figure 5.8). More than 50% of the companies reported being satisfied with the engineering-related education. This evidences the good shape of EU educational system. When looking to the other educational domains the amount of positive answers is lower, because there is again a strong unknown about it. Indeed, around 35% respondents declared not knowing about the quality of engineering-related education, and between 57% and 68% about the other educational domains. This is likely to result from the fact of most companies being engineering-related companies.

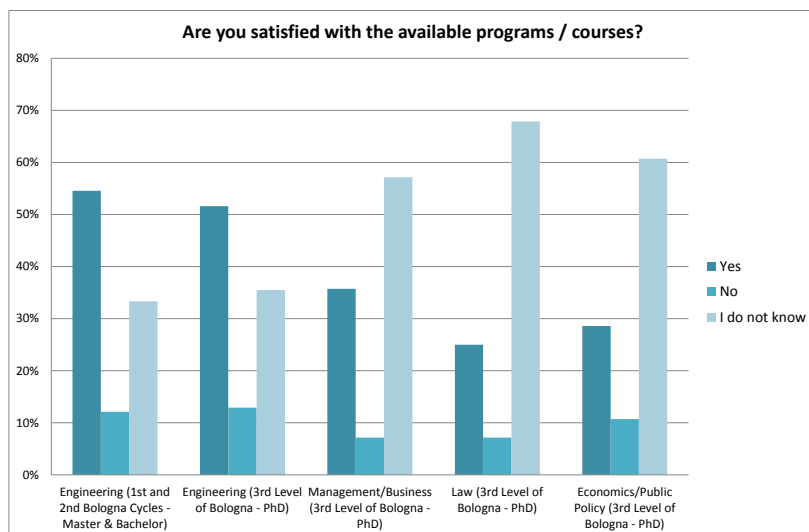


Figure 5.8 – Companies' perception about educational offer's quality

Despite the relatively high levels of unknown about the educational offers, the vast majority of the companies reported having some sort of relationship with universities (around 74% - Figure 5.9). This denotes a good and strong level of interactions. Looking now into the nature of the relationship (Figure 5.10) most of interactions denote involve exchange of information about the educational offer, as follows: 59% as internships, 41% as guest lectures and 29% by proving material. The other type of interaction is related with research (around 62%), either financing support or involvement in research projects.

Finally, in Table 5.3, we present the relevancy of applicants' educational and professional background in the hiring process. Companies value the most the fact of employees having a higher-educational degree. Internships are ranked in last, denoting that companies do not highly value this kind of experience. Perhaps, they are more relevant for students' intellectual development.

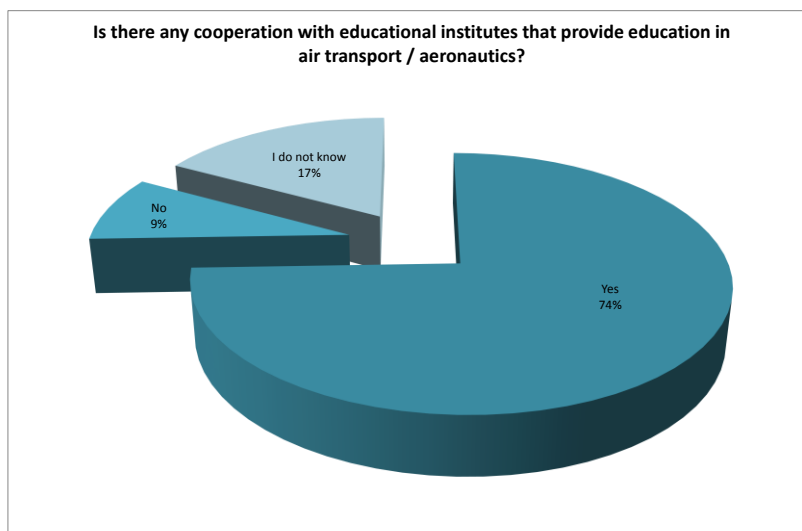


Figure 5.9 – Industry-Universities cooperation

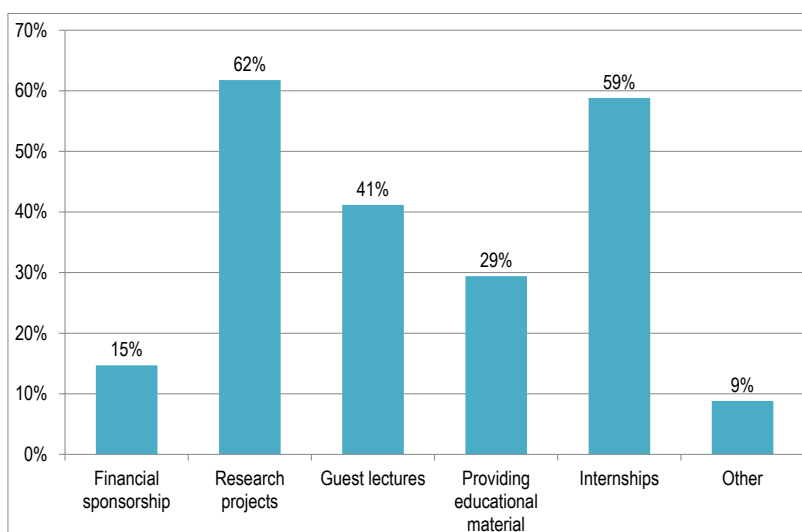


Figure 5.10 – Nature of the Industry-Universities cooperation

Table 5.3 – Educational and Professional Experience background relevancy in hiring process

Level of Education and Professional Experience	Average
University degree	3.48
University degree in air transport/ aeronautics	2.85
Previous working experience	2.83
Previous working experience related to air transport/ aeronautics	2.82

Note: 1. Not relevant | 2. Minor relevancy | 3. Relevant | 4. Highly relevant

5.4.3 Demand for General Skills and Competences

The following graph (Figure 5.11) presents the results to the relevancy of the general skills. As already explained respondents were invited to rate each skill from 1 (not relevant) to 4 (high relevancy). The other category includes: Mission, Vision, Value structure; Soft Skills in order to frame the environment and culture of the organization.

In overall, all skills were considered relevant, as they have a rate above 2.5 (the average). This indicates that students must master a wide range of general skills. *Problem solving* was the skill most valuable with a rate of 3.63. This skill entails students to have a specific mindset and focus on practical aspects. Closely behind, we have two skills: *ability to work in multidisciplinary teams* and *oral and written communication*. These skills are clearly related with the current global nature of many companies, not only in terms of market but also in terms of workers. In current working environment, employees have to working in diverse teams and ever-changing working conditions, these requires mastering other skills besides the technical ones. Interestingly, the *analytical, technical and theoretical background* and *leadership* skills are considered less relevant. This may be surprising since AT&A sector is highly technological and analytical oriented.

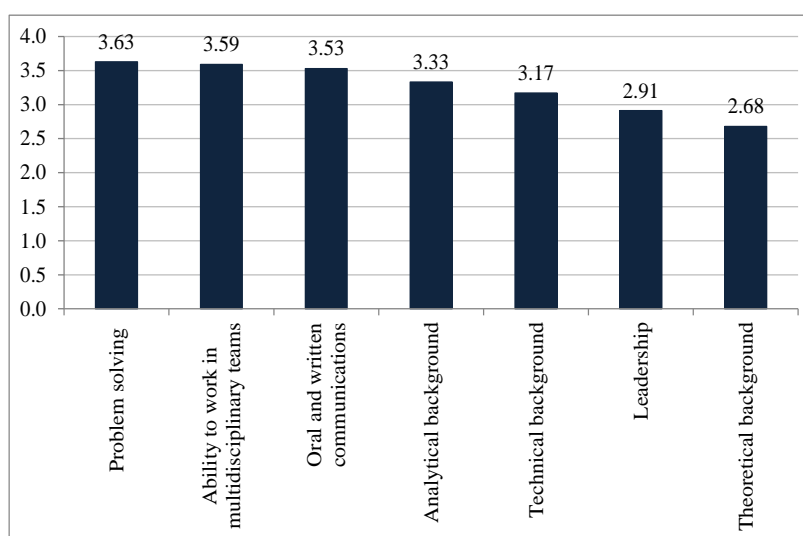


Figure 5.11 – Relevancy of General Skills

Unfortunately, the reduced amount of answered rendered non-valid to conduct an analysis by competence. Instead, we had to do the analysis based on the aggregated competences, the only exception being the Manufacturer-related competences. Starting with the airport-related competences (Figure 5.12), we conclude that the most valued competences are related with

security, maintenance and emergency planning. This reflects the current threat hanging over the aviation sector. As it is well known after the event of the 11th September 2001 in the United States and new paradigm of security was introduced. Since then many other hazards have emerged. It is therefore natural that airport highly valued this aggregated competence. Follows the competence *environment control*. Sustainable development lies at the core of EU development and the air transport sector a main target of environmental measures. Airports have to comply with increasingly strict environmental rules, therefore, the relevancy of these competences is rather natural.

The less relevant competence related with the *Design* of airports. The airport network of the EU is rather consolidated, projects for new airports are almost non-existence, it is therefore understandable that this competence is less relevant.

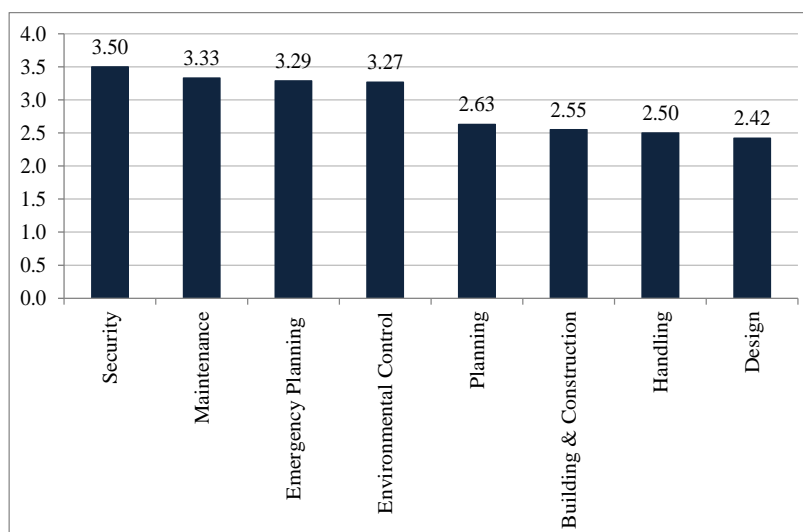


Figure 5.12 – Airport-related aggregated competences

Looking now into airline-related competences (Figure 5.13), by far, companies consider relevant the competences related with *technicians & engineering*. The other two competences are visible less relevant.

The following group is the Air Navigation Service Providers (ANSP)-related competences (Figure 5.14). There is a competence that was consensually considered being of utmost relevancy, with a final rate of 4. This is the *area control* competence. Clearly in second, we got the competence *approach control* with a rate of 3.17. These results denote the current main concerns and focus of attention of ANSP. The *ATM* competence was considered of lower relevancy with a rate below the 2.00.

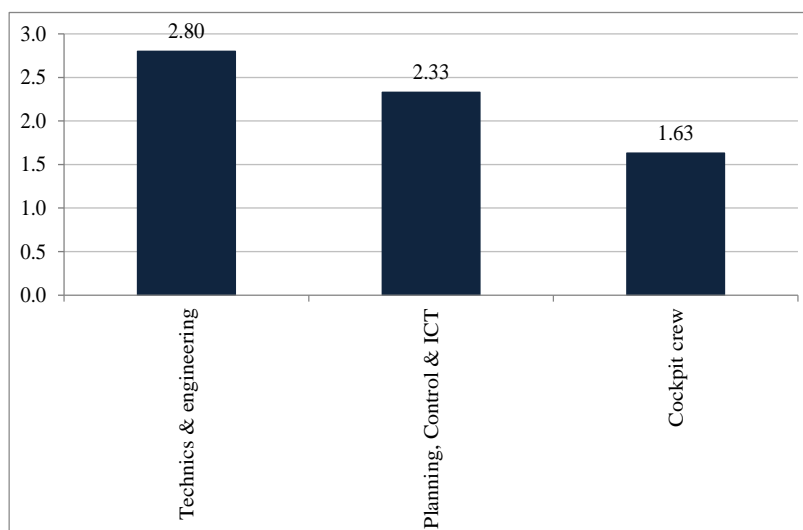


Figure 5.13 – Airline-related aggregated competences

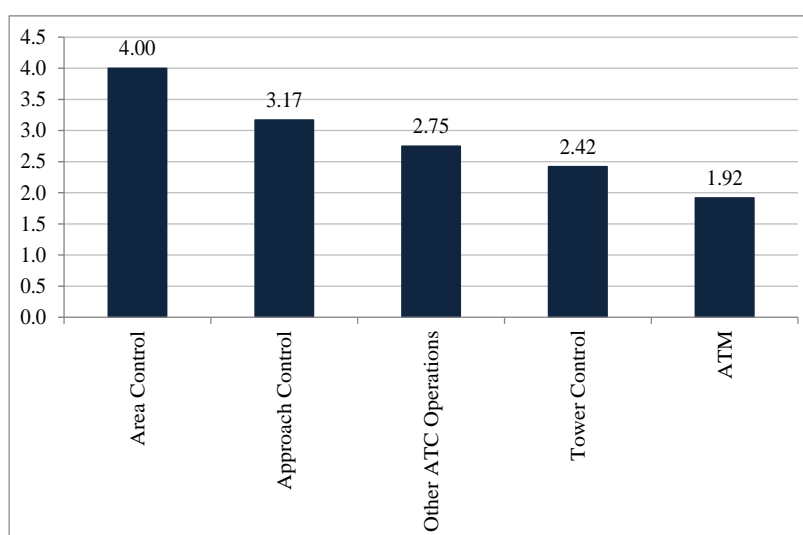


Figure 5.14 – Air Navigation Service Providers-related aggregated competences

The amount of answers received from Manufacturers renders possible the disaggregated analysis by competence. Starting with the Research & Technology cluster, the competence *Software design & IT* was consensually considered being of utmost relevancy, with a final rate of 3.63 (Figure 5.16). The less important one was *Propulsion and powerplant*, nonetheless with a rate of 2.11 which is considered to be relevant by companies. The majority of the competences related to Research and Technology are above 2.50 (the average) which denotes the relative importance of all of them.

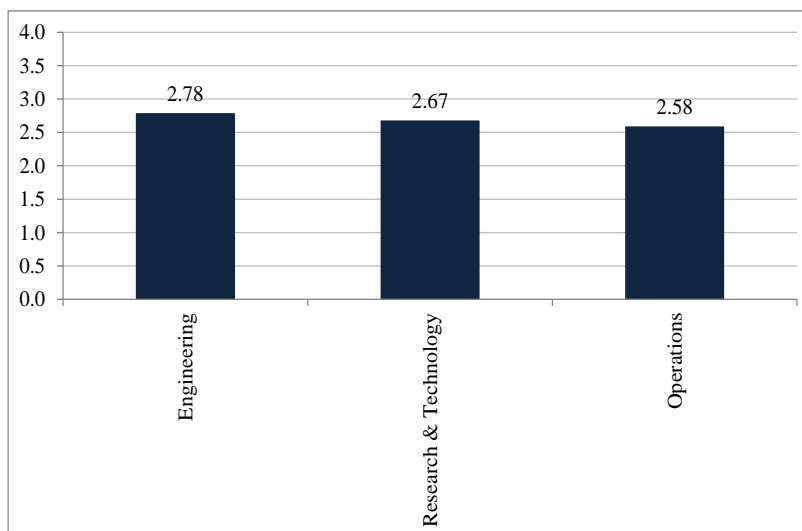


Figure 5.15 – Manufacturers-related aggregated competences

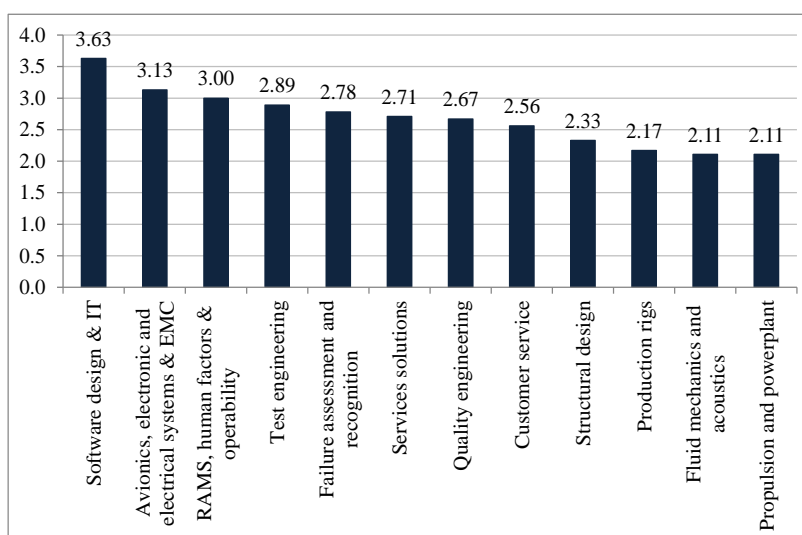


Figure 5.16 - Manufacturers-related competences: Research and Technology

Regarding the competences related to Operations, the competence *Components and aircraft architecture* was considered being relevant, with a final rate of 3.17.

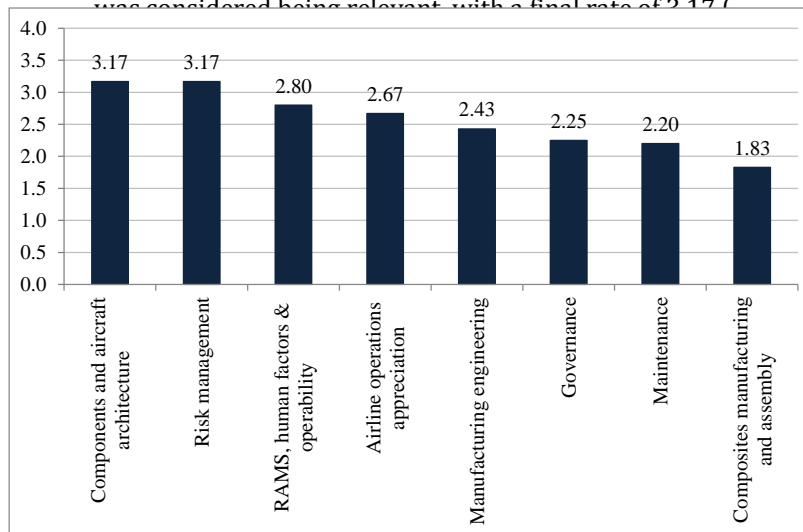


Figure 5.17). The less important one was *Composites manufacturing and assembly* with a rate of 1.83 which denotes the relatively low importance of this competence to companies.

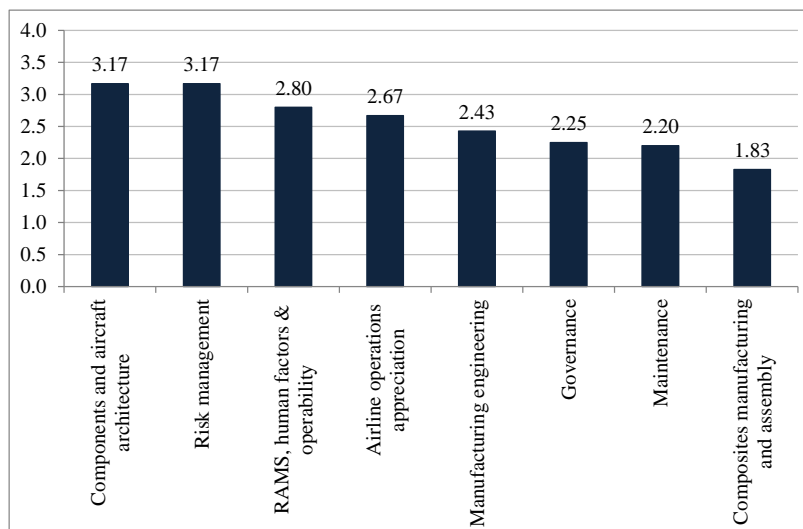


Figure 5.17- Manufacturers-related competences: Operations

Regarding the competences related to Engineering, the competence *Systems & electronics engineering* was considered being highly relevant, with a final rate of 3.50 (18). The less important one was *Composites design and stress* with a rate of 2.14, even though this competence is considered to be relevant. The majority of the competences related to Engineering are above 2.50 (the average) which denotes the relatively importance of all of them.

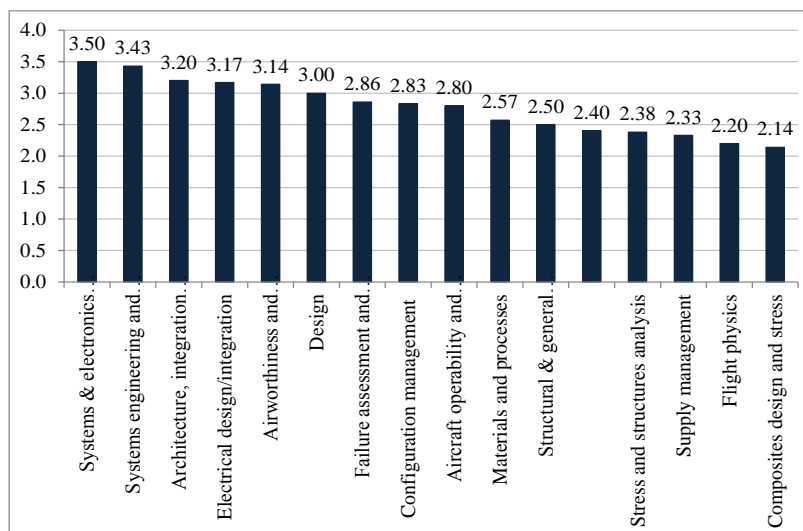


Figure 5.18 - Manufacturers-related competences: Engineering

Companies not fitting into any of the previous group were gathered altogether in the Other domain. Since they included many types of companies, such as: Consultants, Government, Associations or Authorities, we could not develop a list of competences. Instead, we asked the respondent to write down the key competences. This was an open question. The following table (Table 5.4) provides their own responses. It is interesting to notice that for most of them Communication skills, different languages (English as essential), pro-activity, multi-disciplinary skills and social skills like working in international teams are very important for their companies' activities.

Table 5.4- Consultants/Government/Associations/Authorities bodies related Competences

Relevant competences considered by Consultants/Government/Associations/Authorities bodies
Technology focused forward thinking Initiative Perform multiple tasks
Basic and Detailed knowledge of Air Traffic Management from the different stakeholders point of view
Technical and operational experience within Air Traffic Management or Flight Operations (Pilot or Engineer). Degree in Politics or Economics specialising in economic regulation.
Focus on achievement of results & customer satisfaction. Communication skills

More information on current international/European programmes in terms of ATM content - More inter-disciplinary working
Technical Skills: Highly Relevant; 80% of the new employees possess it Soft Skills and behaviour Skills: Core; Fundamental; 50% of new employees possess it
1) Analytical and problem solving skills 2) Strong mathematical background 3) Communication skills 4) Fluent English 5) Knowledge of air transport sector The first three are the most important, and usually the hardest to find
Domain knowledge Analytical skills Communications skills Multi-disciplinary skills Working in (international) teams
Economic / welfare theory Ability to carry out quantified analyses Finance skills
MBA Aviation, Aviation law, experts in PEL, Airworthiness, OPS PHD Economic Transport economist
Accreditation for Screening. Visual, Acoustic and Mental Ability.
Team work (70%) Customer Care (70%) Problem Solving(60%) excellent use of english (70%) Perception of industry (50%)
Competences / degree: 1) Degree in economics or industrial engineering / 80% 2) First aviation job experience / 20% 3) Ability to analyze complex business situations and develop solutions / 40% 4) High level of independance / 30% 5) Good social and cooperative conduct, ability to work in multicutral and dynamic teams / 50% 6) Assertive, convincing and service oriented manner with clients / 40% 7) Ability to present complex issues accurately in written and spoken communication / 50% 8) Excellent computer skills / 80% 9) Very good spoken / written knowledge in English and knowledge in another language / 60%

5.5 Results of Surveys to Employees (Step 3)

This section presents and discusses the results obtained from the survey targeting AT&A employees.

5.5.1 Characterisation of the respondents

A total amount of 153 employees have answered the survey. The distribution per country is presented in Figure 5.19. The country indicates the geographical location of the person and not his/her nationality. A total of 19 EU member states are represented, which is a reasonably good coverage of the EU. The countries with more responses are: Portugal (22%), Germany (16%),

Spain (14%), France and Belgium (7%), Greece and Italy (6%). This likely reflects a bias towards the national countries of EDUCAIR partners. Understandably, each EDUCAIR partner has more contact in its country and in neighboring countries.

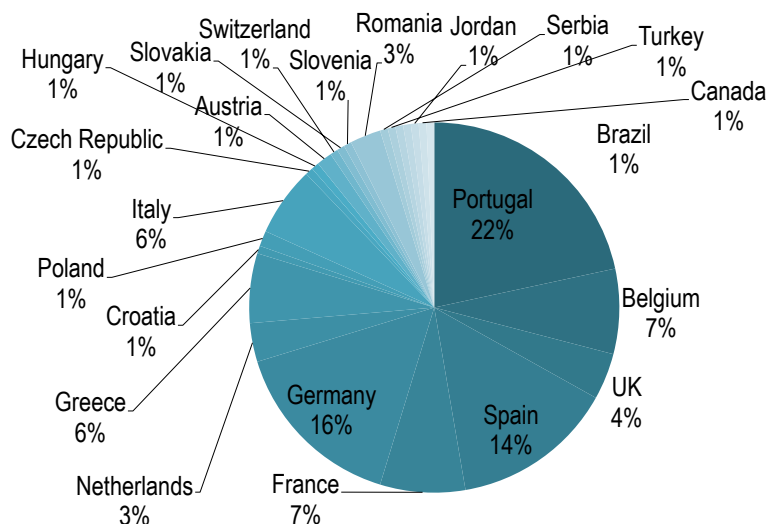


Figure 5.19 - Country distribution of the respondents

The respondents are from 102 different companies which are listed below in the Table 5.4

Table 5.5 - Companies, Institutions and Associations participating in the employees' survey

Companies/Institutions/Associations			
NAV Portugal	KU Leuven	Omnidea, Lda	LogisticNetwork Consultants GmbH
Association of European Airlines	CEIIA	CRIDA A.I.E	National Institute of Aerospace Research - INCAS Bucharest
ANA Aeroportos de Portugal SA	Emirates	Estonian Air Navigation Services	National Aerospace Laboratory NLR
Rolls-Royce plc	Antwerp Airport	Vaisala	Institute of Fundamental Technological Research Polish Academy of Sciences
GesNaer Consulting	Yapsystems	GMV	Jeppesen
Accenture	Aena (Spanish Airports and Air Navegation Provider)	ONERA	EY Consulting
Tap Portugal	MTorres Diseños Industriales	W AERONAUTICA	Hellenic Civil Aviation Authority - HCAA Rhodes "Diagoras" Airport ATC

Companies/Institutions/Associations			
			section
Gael Ltd	Iberia Express	RWTH Aachen University	INTESPACE
Indra Sistemas	Virtual Aviation College	Eurocontrol	Aéroports de Paris
TU LF Kosice	IATA	Innaxis	PBS Velka Bites, a.s.
Fraport AG	DLR - German Aerospace Center	Arup	Zodiac Aerospace
Network Airline Services	IFRSKEYES	Athens International Airport S.A.	INASCO
ALG Europraxis Consulting	IN+/IST	Harmonic Drive AG	MTA SZTAKI
SATA Air Azores	German Aerospace Center (DLR)	APRE	National Research and Development Institute for Gas Turbines COMOTI
INTA, National Institute for Aerospace Research	Airport Ljubljana	Aeroporti di Roma S.p.A.	LimitedSkies
Orbest, SA	Alten Italia	Institute for Theoretical and Experimental Analysis of Aeronautical Structures - S.C. STRAERO S.A.	Cenaero
Bauhaus Luftfahrt e.V.	Isdefe	JPM consultancy	sener
Altran	Aircraft Technologies and services	SEA Società Esercizi Aeroportuali S.p.A	TEKEVER
Airbus SAS	BCD Business Consultancy & Development Ltd	S.A.G.A. sPa Società Abruzzese Gestione Aeroporto	Emirates Airline
Siemens SA	IBERIA Airlines of Spain	KITE solutions srl	USE2ACES b.v.
Pernod Ricard Travel Retail - Europe	Apcoa Parking GmbH / Parking operator / Private company	InfraTec GmbH, Dresden	EADS (Innovation Works)
NetJets Transportes Aereos	SMCPFA	Meridiana Maintenance S.p.A.	SMATSA
DFS	FFG	VKI	Eurocopter Germany

Companies/Institutions/Associations			
BAE Systems	Airberlin technik	Vancouver Airport Authority	Reno-Tahoe Airport Authority
CAA / Eurocontrol/ BM TIM	Minerva Consulting and Communication	CIMPA	ICCS
INSTITUTE OF URBAN TRANSPORT, PMU, MINISTRY OF URBAN DEVELOPMENT, INDIA	Groundforce		

The following picture (Figure 5.20) distributes the respondents per category. Once again, the largest amount of respondents (66 respondents) does not belong to any of the four categories (Airport, Airlines, Air Traffic Control and Management and Manufacturers/Suppliers). Follow the Manufactures with a total amount of 28 respondents and Airports with 25 respondents. Airlines and Air Traffic Control and Management were the two groups with lower amount of responses with 17 respondents each. In any case, the amount of answers was found sufficient to conduct the analysis.

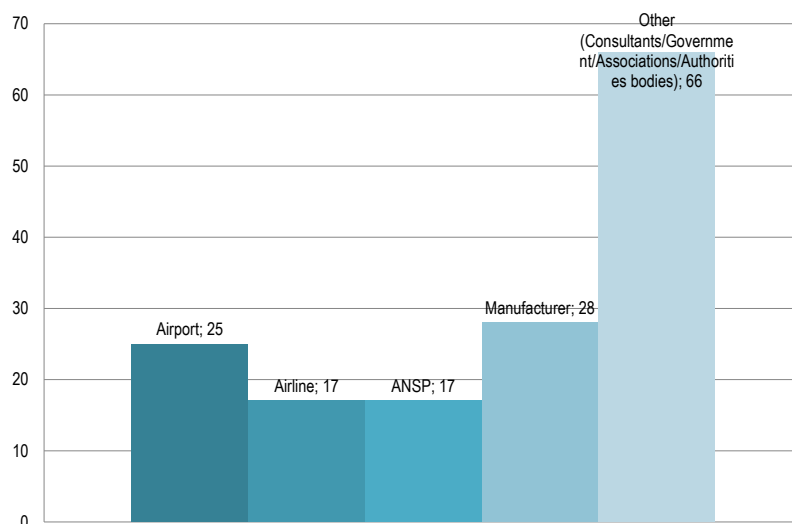


Figure 5.20 - Commercial activity of the companies

The most respondents are young people between twenties and forties (58%) and only 21% are older than forty-nine years old (Figure 5.21). Only 26% are female, which reinforce the idea that aviation industry traditionally attracts a majority of male employees (Figure 5.22).

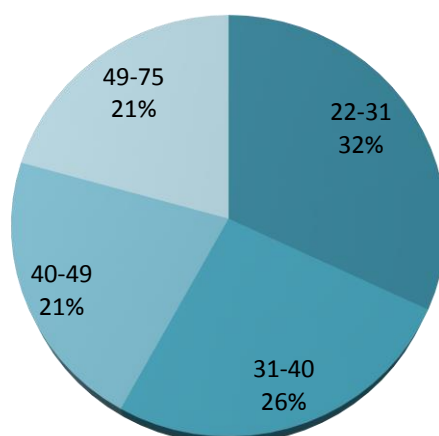


Figure 5.21 – Age of the respondents

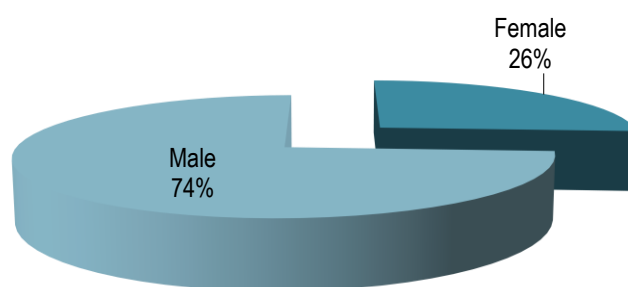


Figure 5.22 – Gender

More than half (53%) of respondents are in the same job position for less than 5 years and only 9% are in the same position for more than 15 years (Figure 5.23)..

For how many years have you been working on the same function?

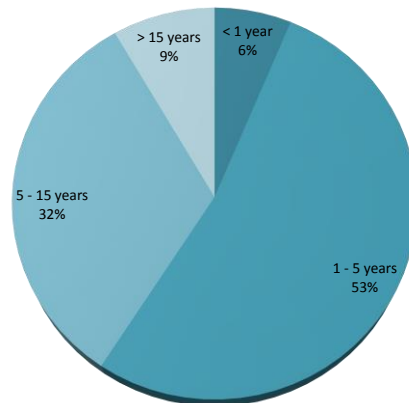


Figure 5.23 – Number of years in the same job position

A majority of respondents (69%) has a master degree (Figure 5.24) and as expected most of them has their graduation major in aerospace engineering (45%). Follows Mechanical and Civil engineers and Management with 12%, 7% and 5% respectively (Figure 5.25).

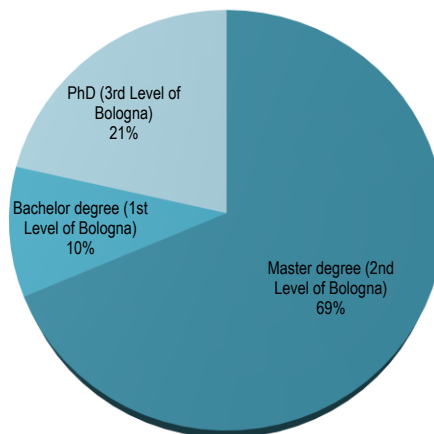


Figure 5.24 – Educational background of respondents

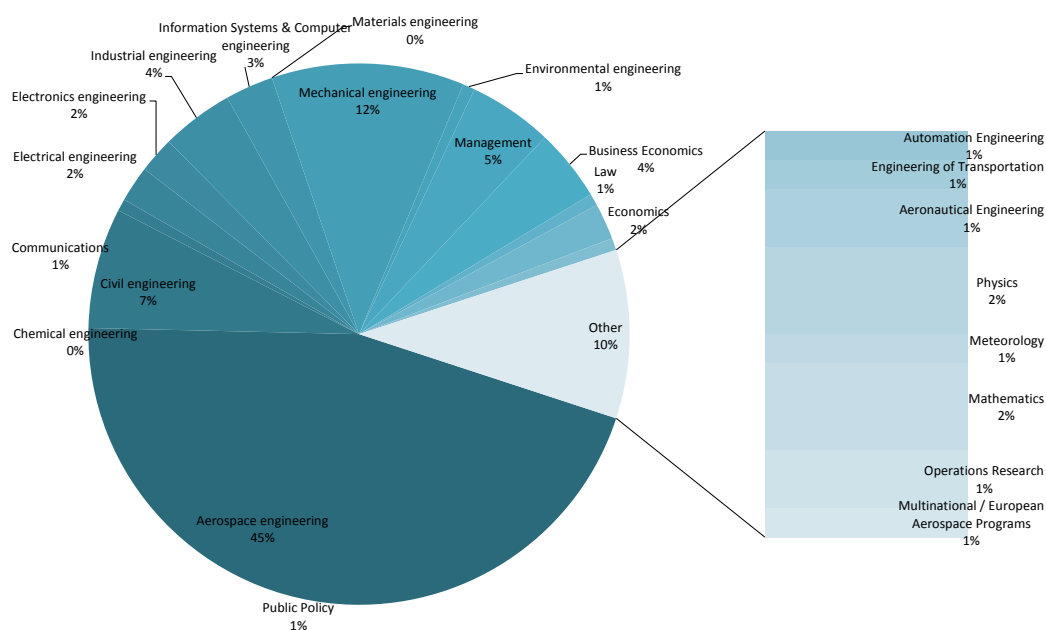


Figure 5.25 – Graduation major of the respondents

5.5.2 Employees' educational and formation component

About 61% of employees replied having received incentives from their company to develop their competences through internal or external courses (Figure 5.6). About 71% of employees had attended additional programs or courses to gain competences needed for their job (Figure 5.27). This situation denotes that employees are encouraged to keep up to date via courses (Life Long Learning).

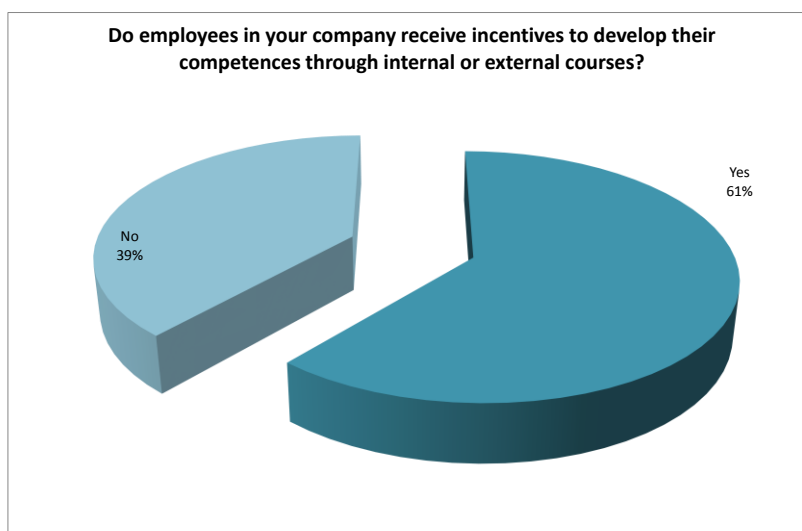


Figure 5.26 – Incentives to internal and external courses

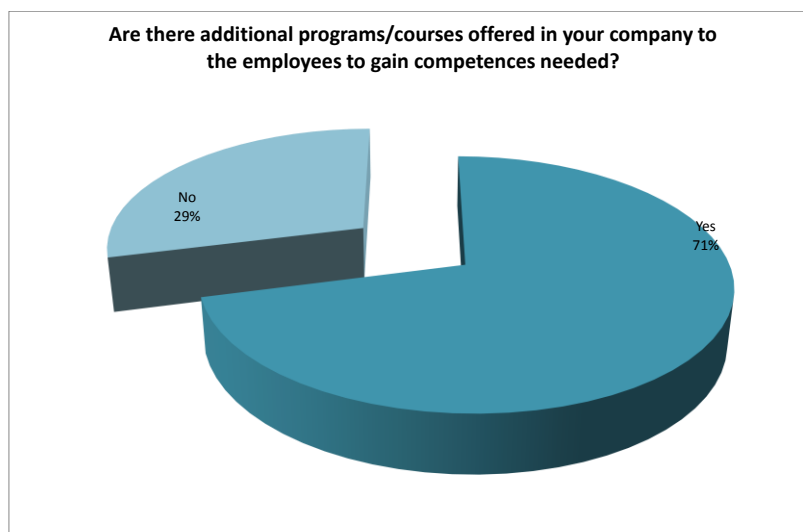


Figure 5.27 – Extra programs/courses in the companies

Looking now into the employees' perception on the current educational offer, the results show a clear positive perception (Figure 5.29). Indeed, in all educational domains, employees have a perception of an adequate amount of available courses or programs. It should be noted that there is a high level of unknown towards the actual educational supply (ranging from 19% to 63%). The engineering (1st and 2nd level of Bologna) are the educational levels with lower level of unknown. This is understandable in the sense that most employees work in an engineering-related market. Even so, around of 19% of employees reported not knowing if there is enough educational offers. However, when we look to 3rd level of engineering education this value rises up to 34% and when looking to non-engineering related educational offer this level ranges between 48 and 63%.

Looking now to the level of satisfaction, the picture is again clearly positive (Figure 5.29). More than 45% of the employees reported being satisfied with the engineering-related education. When looking to the other educational domains the amount of positive answers is lower, because there is again a strong unknown about it. Indeed, between 21% and 38% respondents declared not knowing about the quality of engineering-related education, and between 56% and 68% about the other educational domains. This is likely to result from the fact of most employees work in engineering-related companies.

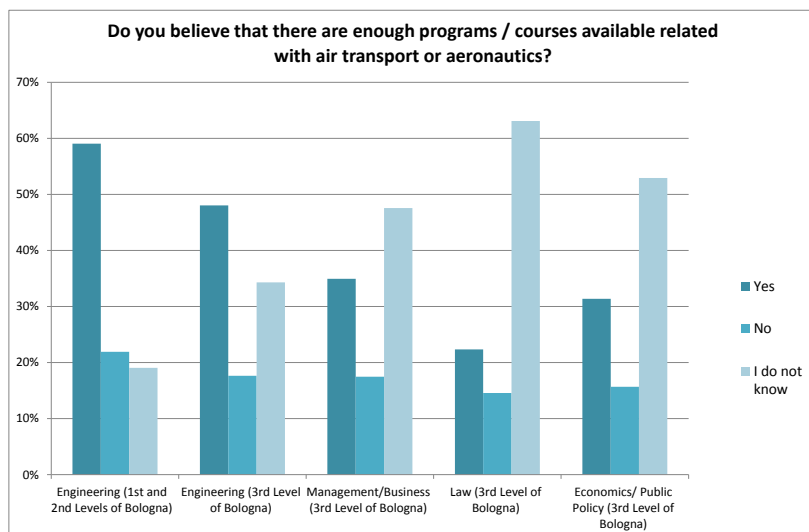


Figure 5.28 - Employees' perception about educational offer

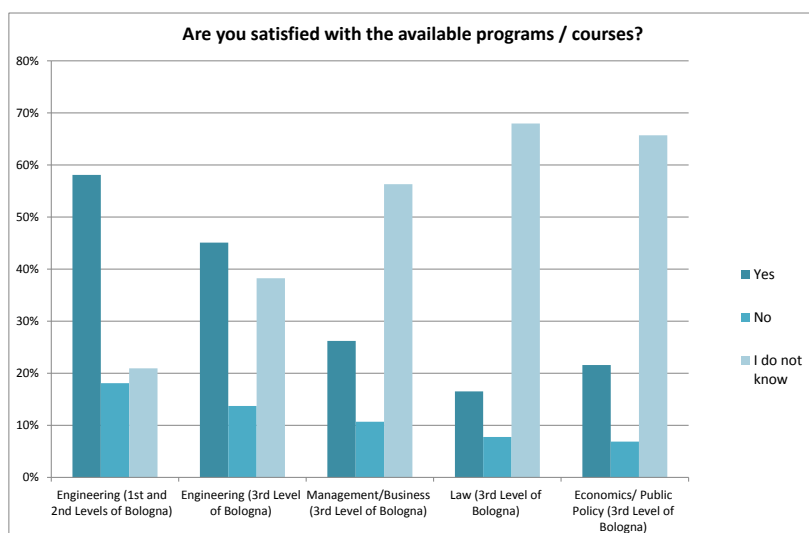


Figure 5.29 - Employees' perception about educational offer's quality

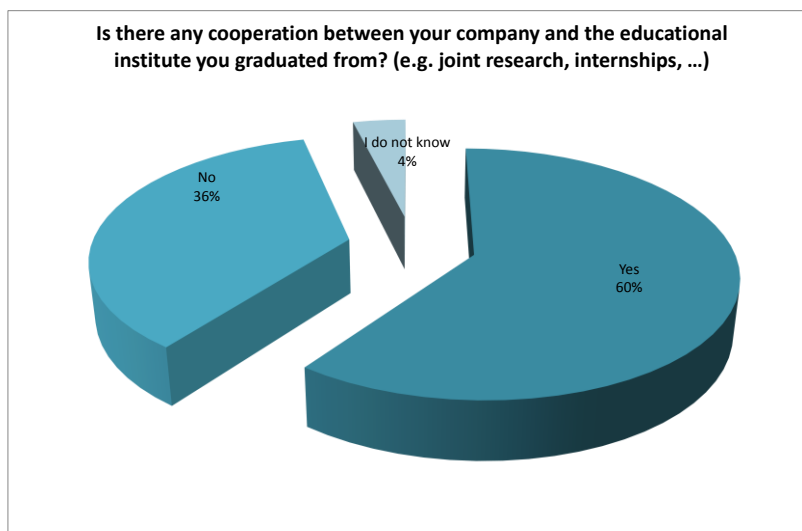


Figure 5.30 - Industry-Universities cooperation

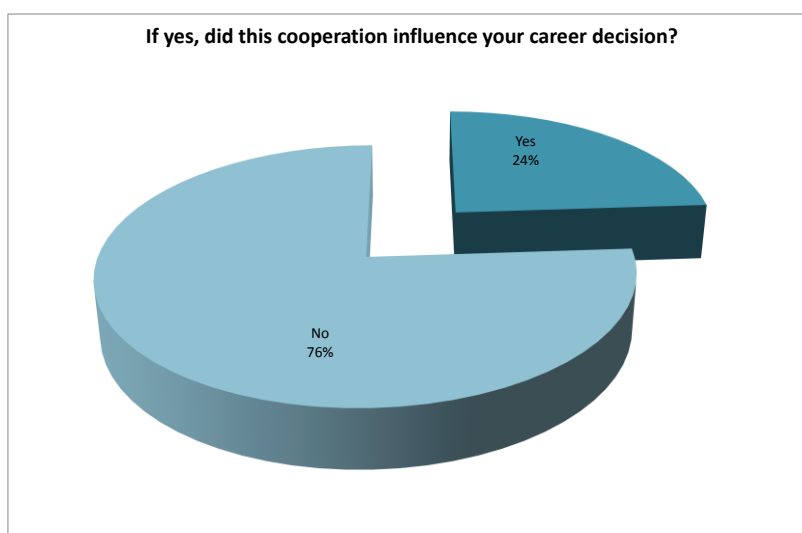


Figure 5.31 – Influence of Industry-Universities cooperation

Despite the relatively high levels of unknown about the educational offers, the vast majority of the employees reported having some sort of cooperation with universities (around 60%). However, 76% of the respondents replied that this cooperation had not influenced their career decision.

Finally, we present the relevancy of applicants' educational and professional background in the hiring process. The results are counterintuitive. Clearly companies value the most the fact of employees having an higher-educational degree, either in AT&A or any other sector. This is an interesting results given the fact the most companies incentives their employees to gain

competences needed in the jobs' activities. Then previous professional background is ranked lower than university-level education. Such situation may denote that companies prefer younger applicants with higher mental flexibility to adapt to companies' culture. (Table 5.6).

Table 5.6 – Educational and Professional Experience background relevancy in hiring process

Level of Education and Professional Experience	Average
University degree	3.53
University degree in air transport/ aeronautics	3.05
Previous working experience	2.83
Previous working experience related to air transport/ aeronautics	3.00

Note: 1. Not relevant | 2. Minor relevancy | 3. Relevant | 4. Highly relevant

5.5.3 Demand for General Skills and Competences

The following graph (Figure 5.32) presents the results to the relevancy of the general skills. As already explained respondents were invited to rate each skill from 1 (not relevant) to 4 (high relevancy).

In overall, all skills were considered relevant, as they have a rate above the average. This indicates that students must master a wide range of general skills. *Problem solving* was the skill most valuable with a rate of 3.76. Closely behind, we have two skills: *ability to work in multidisciplinary teams* and *analytical background*. These skills are clearly related with the current global nature of many companies, not only in terms of market but also in terms of workers. In current working environment, employees have to working in diverse teams and ever-changing working conditions, these requires mastering other skills besides the technical ones.

As expected, the *technical and theoretical background* and *leadership* skills are considered relevant with high average (around 3). This is understandable since AT&A sector is highly technological oriented.

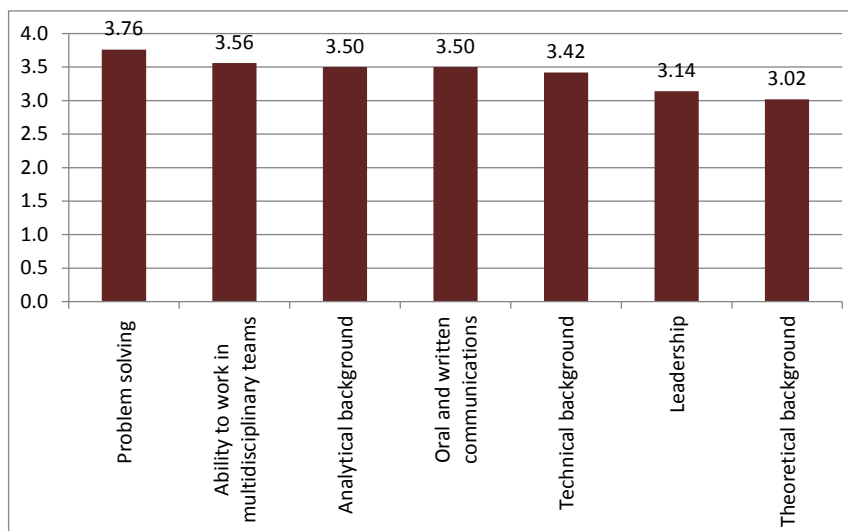


Figure 5.32 - Relevancy of General Skills

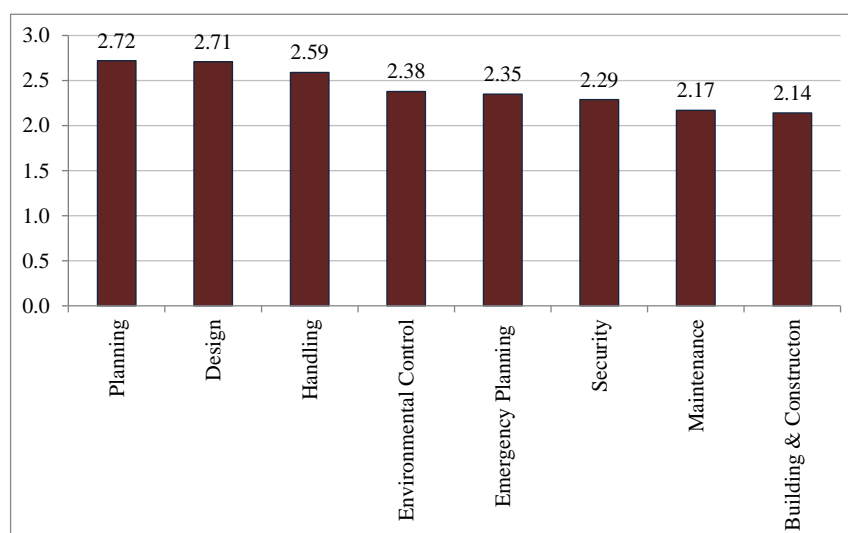


Figure 5.33 - Airport-related aggregated competences

Unfortunately, the reduced amount of answered rendered non-valid to conduct an analysis by competence. Instead, we had to do the analysis based on the aggregated competences. Again the exception is the Manufacturer domain, in which the amount of answers were enough to conduct a disaggregated analysis. Starting with the airport-related competences (Figure 5.33), we conclude that the most valued competence is related with *planning*. Follow the competences *design* and *handling*.

The less relevant competences are related with the *security*, *maintenance* and *building & construction* of airports. The airport network of the EU is rather consolidated, projects for new airports are almost non-existence, it is therefore understandable that *building & construction* is

less relevant. However, *security* and *maintenance* was the most valued competences for companies and the less important ones for employees. Here we observed a misalignment between employers and employees.

Looking now into airline-related competences (Figure 5.34), employees consider relevant the competences related with *planning, control & ITC*. The other two competences are slightly less relevant. Here again, for employers the most relevant competence is *Technics & engineering* and for employees is considered the less important one.

The following group is the Air Navigation Service Providers (ANSP)-related competences (Figure 5.35). The most relevant competence is *ATM* with a rate of 2.51. In second, we got the competence *tower control* with a rate of 2.32. The *approach control* competence presents a rate of 2.30 and the remaining two competences were considered of lower relevancy with rates below 2.5 which are *area control* and other *ATC operations*. Once again, the most relevant competence for employers, which is *Area Control*, is one of the less important for employees.

The last group is related with competences in the manufacturing of air-vessels. Here we have analysed by disaggregate competence since more answers were achieved in this employees' category. The competence *Test engineering* related to Research Technology was considered the most relevant with a final rate of 2.79 (Figure 5.37). The less important one was *Production rigs* with a rate of 1.79. The majority of the competences related to Research and Technology are bellow 2.50 (the average) which denotes the relatively minor importance of all of them considered by employees contrasting with the companies opinion.

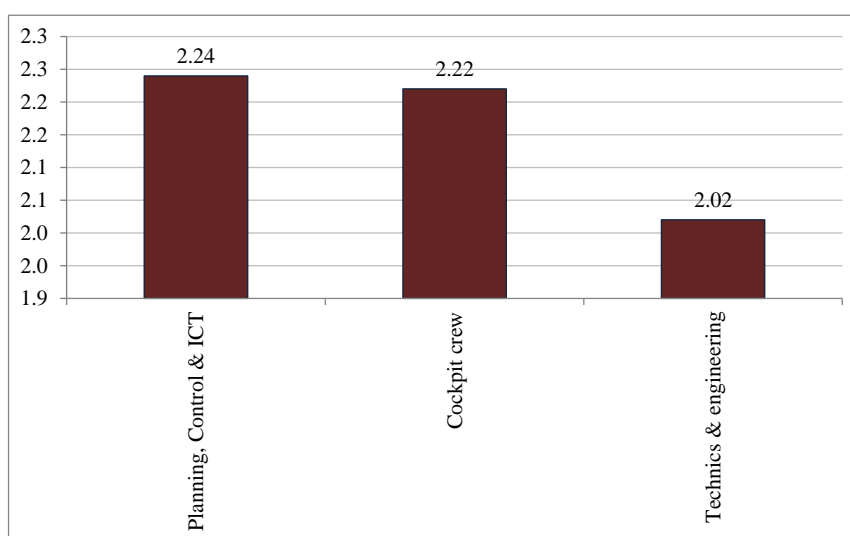


Figure 5.34 - Airline-related aggregated competences

Regarding the competences related to Operations, the competence *Components and aircraft architecture* was considered being relevant, with a final rate of 2.80 (Figure 5.38). The less important one was *Governance* with a rate of 1.67 being of minor relevancy to employees.

Regarding the competences related to Engineering, the competence *Systems engineering and architecture* was considered being relevant, with a final rate of 2.70 (Figure 5.39). The less important one was *Lean experts & supply chain quality field engineering* with a rate of 1.67. The majority of the competences related to Engineering are above 2.50 (the average) which denotes the relatively importance of all of them to employees.

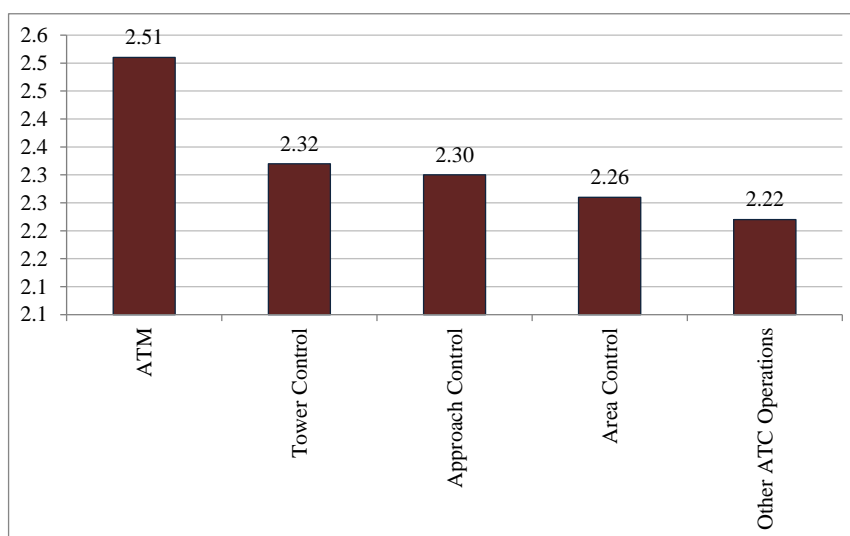


Figure 5.35 - Air Navigation Service Providers-related aggregated competences

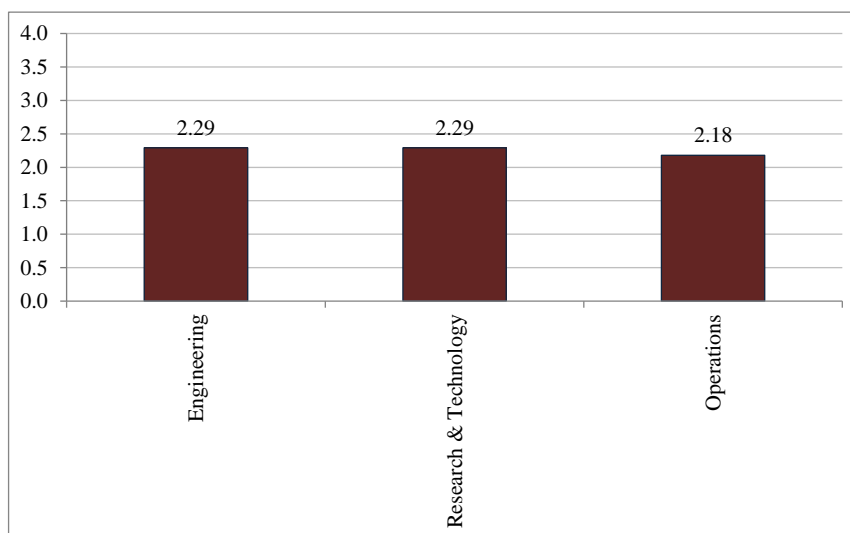


Figure 5.36 - Manufacturers-related aggregated competences

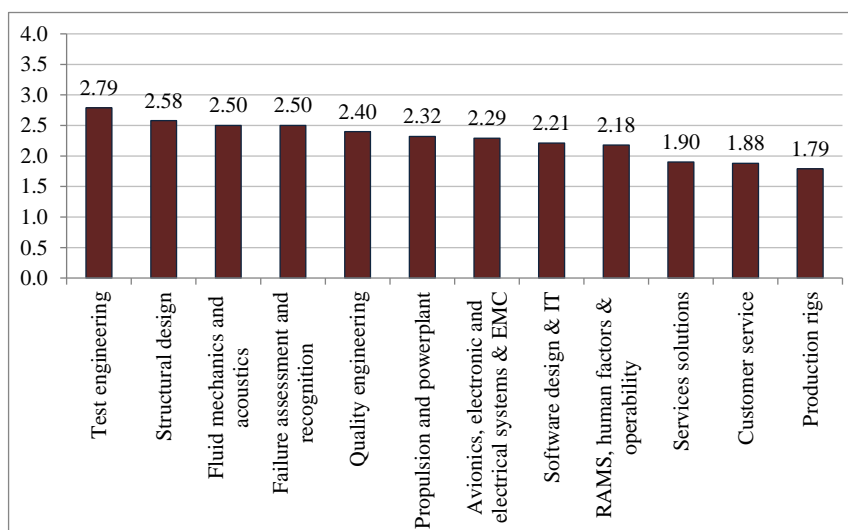


Figure 5.37- Manufacturers-related competences: Research and Technology

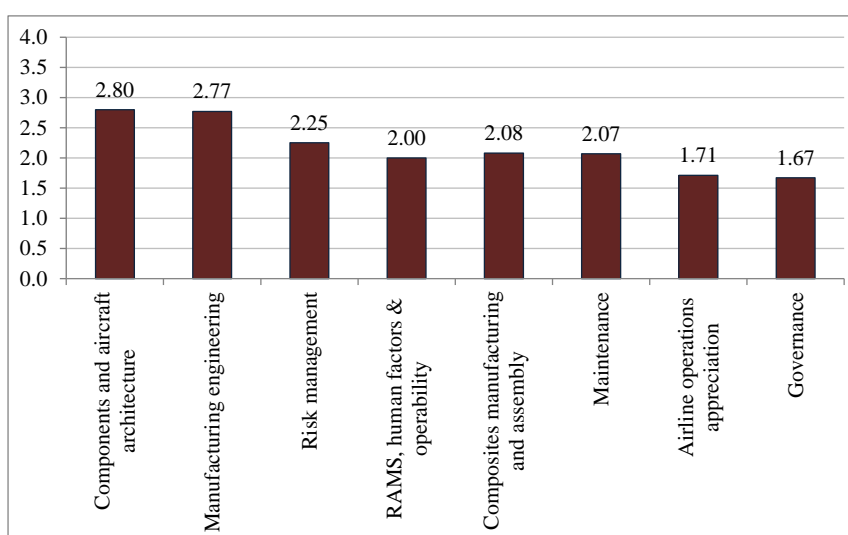


Figure 5.38 - Manufacturers-related competences: Operations

Regarding the competences that employees of Consultants, Government, Associations or Authorities bodies considered to be relevant for their activities on job, the following table (Table 5.7) provides their own responses since it was an open question. It is interesting to notice that for most of them Communication skills, different languages (English as essential) and social skills like working in groups are very important for their jobs. Since AT&A courses are more theoretical and technical rather than practical, it seems that communication skills are being neglected and companies and employees missing those competences in their daily activities.

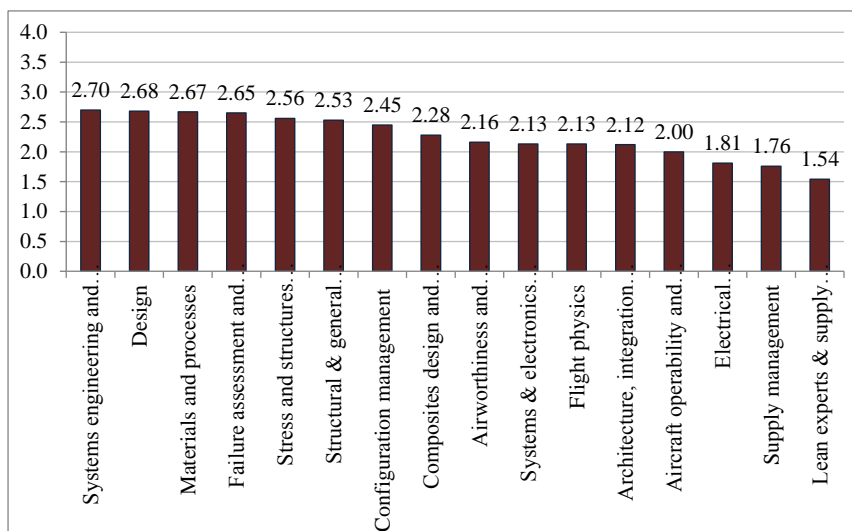


Figure 5.39 - Manufacturers-related competences: Engineering

Table 5.7 - Consultants/Government/Associations/Authorities bodies related Competences

Relevant competences considered by Consultants/Government/Associations/Authorities bodies employees and if they possessed those competences when graduated.
Airport and air navigation knowledge
Advanced spreadsheet (Excel) - had some competences, but I believe I should have been provided even more. Airport planning; using ICAO/IATA/FAA manuals and publications - I never even knew these existed until I started working
Public Policies Development Implementation Wide Technical Background in Aeronautics/Yes Wide knowledge of the Aeronautics sector in Europe and outside Europe/No State of Art of the main technologies in Aeronautics/No Research and Development Management and Strategic Planning/No English Language/No
Engineering competencies (math, understanding of relevant disciplines such as aero- and thermodynamics, structures, ...): yes Specific aeronautical knowledge (aircraft design, certification rules, etc): yes Use of specific tools (CATIA, Matlab, ...): partly Management skills (project acquisition, project organisation, communication strategies, etc) : no

Relevant competences considered by Consultants/Government/Associations/Authorities bodies employees and if they possessed those competences when graduated.
<p>The list of competencies is as follows:</p> <ul style="list-style-type: none"> - Communication/social skills are the prime competence - Fluent oral and written english is a basic requirement - Consultants must be able to keep their clients satisfied even when conflicts arise - Negotiation skills - Clients always want to get more for the same time/money. Consultants must be able to hold their ground and defend their interests - Valid engineering background (particularly aerospace) is a valuable asset - Being specialized in a particular area can be added value - Flexibility - Consultants are useful for the knowledge they bring. If they are not willing to learn/evolve they are not as valuable.
Required competence include research capability and educational capability; after completing Ph.D. my research capability somewhat developed, my capability as a teacher was not
<p>Good communication skills - yes</p> <p>Leadership skills - yes</p> <p>Structured approaches - yes</p> <p>Open horizon and wide range of skills - partially self-acting - yes</p> <p>Eager and accurate - yes .</p>
Problem solving adaptability fast learning general knowledge most of them are learnt in the real life, not during a University course University gave me "Forma Mentis", as well as Lyceum (actually the latter did the best work), but the rest was up to the single student
Review of documents 8168, 9643 and annexes of ICAO 2, 4, 14, 15, 16 as well as the evaluation of the follow-up to its recommendations I didn't possess those competences when I graduated
Research,development, training, marketing and management, some of them yes
Airline management ,airline economics, leasing law, airport management, arbitration. I did not have any of these competences except general economics and management
<p>Operational skills in optimizing procedures / self learned in job</p> <p>Contract negotiations / university and experience in job</p> <p>Leadership and motivation / sports as basis</p>
Air transport system knowledge (incl. technical background) - partially possessed Autonomy - not really possessed Curiosity - possessed Inventivity - possessed

Relevant competences considered by Consultants/Government/Associations/Authorities bodies employees and if they possessed those competences when graduated.
<p>The relevant competences that I already have when I graduated are: technical and theoretical knowledge Languages IT</p> <p>The ones I didn't have were: Management, economics and law project management lead teams</p>
<p>The competences that are relevant for my current work activities are the following (in summary):</p> <ol style="list-style-type: none"> 1. engineering background 2. experience with airport planning and air transport issues 3. related work experience is highly appreciated 4. focus on research 5. oral and communication skills (different languages) 6. management skills <p>I possessed 1, 2, 5, and 6 when graduating</p>
<p>I did not possess any of the following at graduation time: Information management Procedure design Air Traffic Control basics</p> <p>All that I have learned in these areas was through on the job trainings and post-graduation courses.</p>
<p>Airport operations experience - need to be acquired with working experience management experience - need to be acquired with working experience strategic thinking - can only be learned / taught to certain extent acquisition skills - can only be learned / taught to certain extent</p>
<p>Mixture between technical and management skills. At the moment of my graduation I was more focused on technical skills</p>
<p>Computational Engineering, esp. data analysis (YES) Simulation expertise (YES) Air Traffic Management (NO)</p>
<p>Technical and academic background Structural way of finishing tasks Self-management Time-management Communication skills and rhetoric (problem solving, planning and communicating ideas) Foreign languages</p>
<p>The main competence I need is to analyse information and be able to understand it and think on ideas to test and evolve the concepts. Another competence is to put together ideas from different sources and relate them coherently. Thinking on what is relevant and what is accessory. The ability to communicate with others in a comprehensive way my ideas. Being able to work in group with people of different countries and with different background. My aeronautical studies provided me with the "language" that is used in my job and with the analytical, and summary skills. It did not provide the skills to work in group or communicate.</p>
<p>Ability to cooperate with Civil Aviation Authorities</p>
<p>Integrational and coordinational function</p>

Relevant competences considered by Consultants/Government/Associations/Authorities bodies employees and if they possessed those competences when graduated.
I had a theoretical base in the aeronautics field, not a practical one. I had a lack of communication and managerial competences
Project management EU funding FP7 Proposal writing Analysis International Project Management Transportation
Question not so relevant in my present position. Nevertheless, my project management and business development abilities were developed after my graduation and are vital to my daily activities.
Design methodologies and optimization. No, I do not have any of the above indicated by my studies.
Writing proposals is an important part which I was not learning in school. I have to work in an interdisciplinary team where aeronautics, control, electrical engineering are all key, but I did not have a broad overview on lot of the topics fresh out of school.
Scientific competence - YES Written and oral scientific presentation skills - YES Leadership - YES
Working in multidisciplinary teams Internationally oriented Analytical skills Communication skills
Air education is more and more theoretical. very low hands on labs and classes
Knowledge is available, but putting it into practise has to be learned "on-the-job".
My airline transport pilot licence was obtained 2 years after my master degree in Delft University of Technology. My test pilot education at the Centre d'Essais en Vol (EPNER) was completed 9 years after finishing my master degree in Delft.
INTELLIGENT TRANSPORT SYSTEMS APPLICATIONS
Strong theoretical background (available at graduation), Research mentality (not available at graduation), Industrial requirements processing (not available at graduation), Visionary thinking (not available at graduation).
Config mgt process, Service Bulletin Process, Post Delivery Process, Post Delivery Data Management (DMU, Visualization, Data Storage). I had a class in PDM and in Teamcenter which gave me a first idea of Config mgt and Data mgt. But as for the Post delivery Process I never really thought about the complexity and never really learned at university.

Relevant competences considered by Consultants/Government/Associations/Authorities bodies employees and if they possessed those competences when graduated.
Knowledge in air transport engineering. Had it after the bachelors (old 5-year program). Research, analytic and problem solving oriented mind. Got it after the Ph.D. program (in the US) Good oral and written communication in English. Got it after the Ph.D. program (in the US) Ability to work in multicultural teams. Got it after the Ph.D. program (in the US)
<p>As part of a graduate programme previous experience in aviation was not compulsory. What is needed was:</p> <ul style="list-style-type: none"> - have completed or be about to complete a Masters degree in a relevant field - air traffic management, aeronautics, engineering and science are ideal fields of study, but we are keen to receive applications from graduates from different disciplines. - have an excellent command of English or French, our two working languages <ul style="list-style-type: none"> - be a citizen of one of our 39 Member States - model our five corporate behaviours, displaying a readiness to change, strong teamwork skills, genuine customer focus, a result-driven approach, and the integrity expected of an international civil servant.
Management and Communication, Technical Knowledge,

6 Assessment of the Competence Gap (Step 4)

The analysis of both companies and employees surveys suggests the existence of a gap between the competences demanded by the companies and those perceived or actually owned by the employees, the same does not happens in what concerns the relevancy of the skills. The gap is apparent in all four domains of activity (that is, airports, airlines, air navigation service providers and manufacturers) and exhibits a distinctive and transversal feature: employees tend to rank the competences lower than their counterparts employers.

The analysis of the gaps will follow an identical order as presented in the previous chapters. As such, starting with the analysis to the General Skills, the following Table 6.1 and Figure 6.1 compares the results of each survey. The values were already discussed in the two previous sections. There are presented here for simplicity purposes. The first column lists the aggregated competences, the second and third columns list the results obtained in the companies and employees surveys respectively, the fourth column presents the difference between the two previous; the fifth and sixth columns indicate the rank of competences on each survey (companies and employees respectively). The same structure is applied in the subsequent analysis.

As already explained, the assessment of the gaps is mainly of qualitative nature. Yet, a quantitative valuation is provided for guiding purposes only. Differences up to 0.25 are not considered representing a Gap (to be represented by the colour green in Table6.1 to Table 6.7). Differences greater than 0.25 and up to 0.5 are considered representing a Gap (to be represented by the collar orange in Table6.1 to Table 6.7). Differences above 0.5 are considered representing a significant Gap (to be represented by the colour light red in Table6.1 to Table 6.7).

The results show a low divergence between the surveys. The skills are ranked in the same order. There is one exception in what concerns the 3rd and 4th positioning but the differences are too small for being representative. In addition, the first four skills received a fairly similar rate. In the last three there was a visible divergence with employees consistently rating above the companies.

The following conclusions can be drawn. Firstly, there is a concordance between employees and companies in what concerns the most relevant skills and the respective relevancy, which evidences an alignment between the two groups. Secondly, the divergence in the remaining skills evidences an overemphasising by the employees. A gap is visible in the following skill:

Theoretical Background. Yet, the difference is not necessarily relevant since this skill was ranked low by both groups: in seventh (and last) by the employees and sixth by the employees. So, both groups agreed in the relative inferior relevancy of this skill. We must recall that 3rd Level Students are mainly concerned with development of theoretical knowledge.

Table 6.1 – Comparing Employers and Employees' Relevancy of General Skills

	Employers	Employees	Dif.	Rank Comp.	Rank Emplo.
Problem solving	3,63	3,76	-0,13	1 st	1 st
Ability to work in multidisciplinary teams	3,59	3,56	0,03	2 nd	2 nd
Oral and written communications	3,53	3,50	0,03	3 rd	3 rd
Analytical background	3,33	3,50	-0,17	4 th	3 rd
Technical background	3,17	3,42	-0,25	5 th	4 th
Leadership	2,91	3,14	-0,23	6 th	5 th
Theoretical background	2,68	3,02	-0,34	7 th	6 th

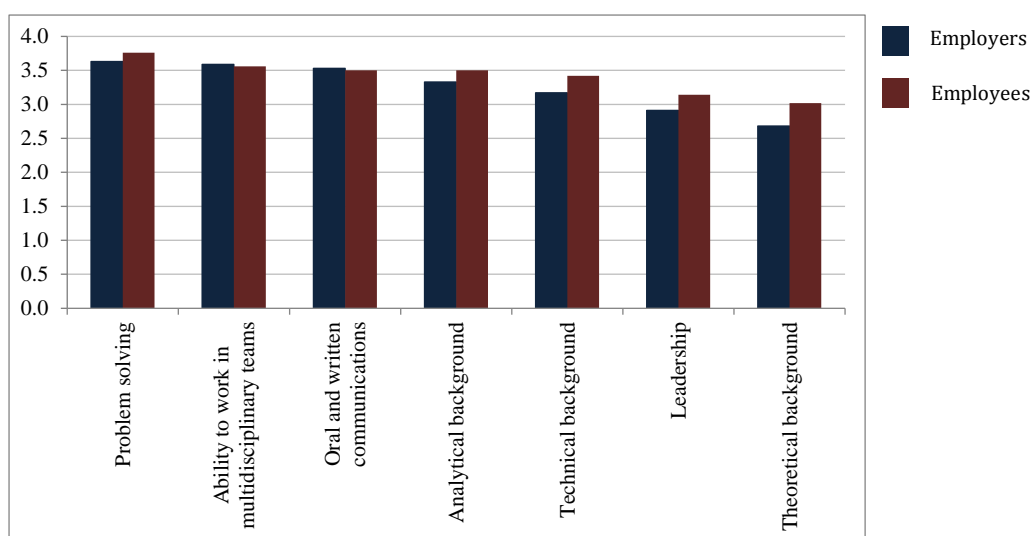


Figure 6.1 - Comparing Companies (blue) and Employees' (red) Relevancy of General Skills

Looking now into the airport-related competences, a significant gap is visible. Two relevant conclusions may be drawn. The first was already mentioned as transversal in some domains of activity and it is related with the employees' consistent lower rate of the competences than the companies. Besides evidencing a different perception between employees and employers (which is something expectable), more importantly the results may evidence an undervaluation by the employees of the competences. A second conclusion is that employees have a misaligned

perception – Gap – on the relevant competences, since the most relevant competences for the employers are among the lowest for the employees. Employers ranked in the three first place the competence *security*, *environmental control* and *emergency planning*; which was ranked in sixth, third and fourth, respectively, by the employees. On the other hand, the first three competences ranked by employees were: *design*, *handling* and *environmental control*, which was ranked in seventh, fourth and second by the employers.

Table 6.2 – Comparing Employers and Employees' Airport-related aggregated competences

	Employers	Employees	Dif.	Rank Comp	Rank Emplo.
Security	3,50	2,29	1,21	1 st	6 th
Maintenance	3,33	2,17	1.16	2 nd	7 th
Emergency Planning	2,29	2,35	0,94	3 rd	5 th
Environmental Control	3,27	2,38	0,89	4 th	4 th
Planning	2,63	2,72	-0,09	5 th	1 st
Building & Construction	2,55	2,14	0,41	6 th	8 th
Handling	2,50	2,59	-0,09	7 th	3 rd
Design	2,42	2,71	-0,29	8 th	2 nd

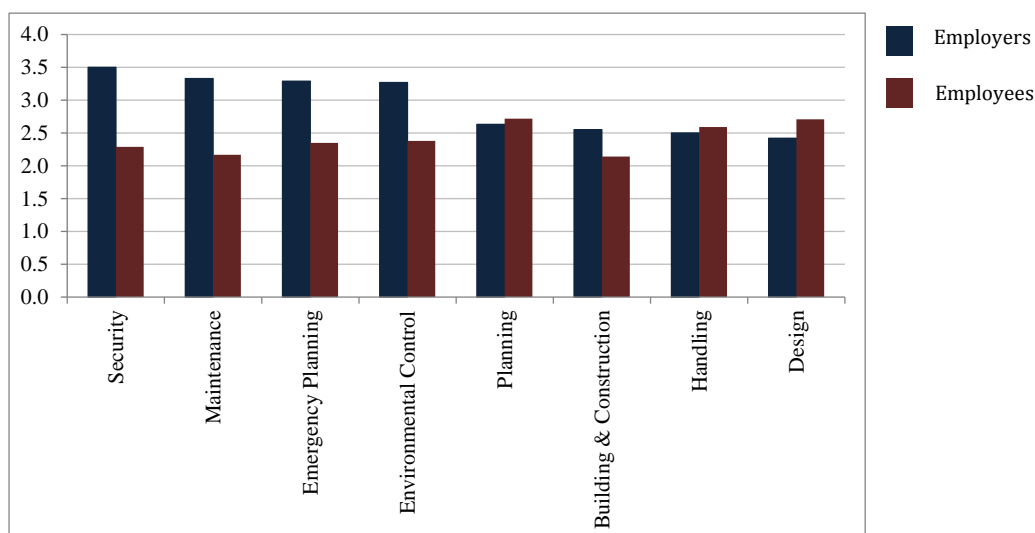


Figure 6.2 - Comparing Employees and Employers' Airport-related aggregated competences

We may then conclude for the existence of a visible Gap or misalignment between employees and employers, mainly because in four competences (out of eight) there is a significant gap and in two more there is a gap.

The following domain of activity is the airlines. We should at this moment emphasise that the results must be interpreted with some caution side few answers were obtained from the employers. This case resembles to the previous one, with an almost symmetrical perspective about the relevancy of the competences. The first conclusion is that employees and employers have a mismatched vision about the importance of the competences. Employers ranked the competences as follows: *technics & engineering*, *planning, control & ICT*, and *cockpit crew*; whereas employees ranked these in third, first and second respectively.

Table 6.3 – Comparing Employers and Employees' Airlines-related aggregated competences

	Employers	Employees	Dif.	Rank Comp	Rank Emplo.
Technics & engineering	3,80	2,02	0,78	1st	3rd
Planning, Control & ICT	2,33	2,24	0,09	2nd	1st
Cockpit crew	1,63	2,22	-0,59	3rd	2nd

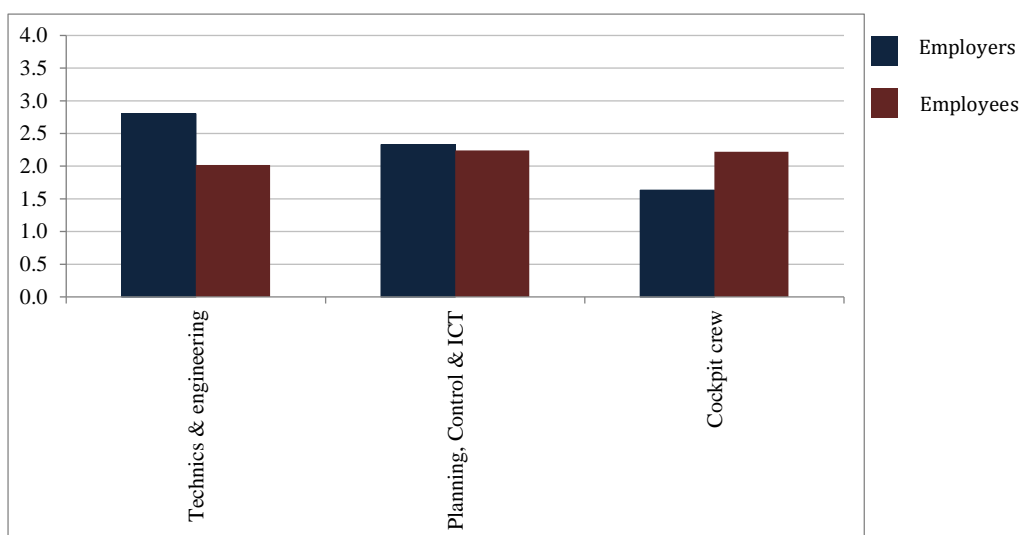


Figure 6.3 - Comparing Employers and Employees' Airlines-related aggregated competences

The second conclusion is for a clear discrepancy in the valuation of the competencies' relevancy. This misalignment is visible in the competence *technics & engineering*, ranked in first and in third by the employers and employees respectively, and in the competence *cockpit crew*. In what concerns the remaining competence, employees evaluated below the employers.

We may then conclude for the existence of a visible Gap or misalignment between employees and employers, mainly because of the discrepancy in the evaluation of the competences' relevancy.

The following domain of activity is the Air Navigation Service Providers (ANSP). Similar results to the two previous domains were again found. The evaluation of the competencies' relevancy exhibits a notable symmetry. The employers' top three competences were: *area control*, *approach control* and *tower control*; these were ranked in fourth, third and fifth respectively by the employees. On the other hand, the employees' top three competences were: *ATM*, *tower control* and *approach control*, which were ranked in fifth, third and second by the employers.

A misalignment in the relevancy is visible in four (out of five) competences. We may then conclude for the existence of a visible Gap or misalignment between employees and employers, as in all competences there is a substantially deviation between the results.

Table 6.4 – Comparing Employers and Employees' Air Navigation Service Providers-related aggregated competences

	Employers	Employees	Dif.	Rank Comp	Rank Empl.
Area Control	4,00	2,26	1,74	1 st	4 th
Approach Control	3,17	2,30	0,87	2 nd	3 rd
Other ATC Operations	2,75	2,22	0,53	3 rd	5 th
Tower Control	2,42	2,32	0,10	4 th	2 nd
ATM	1,92	2,51	-0,59	5 th	1 st

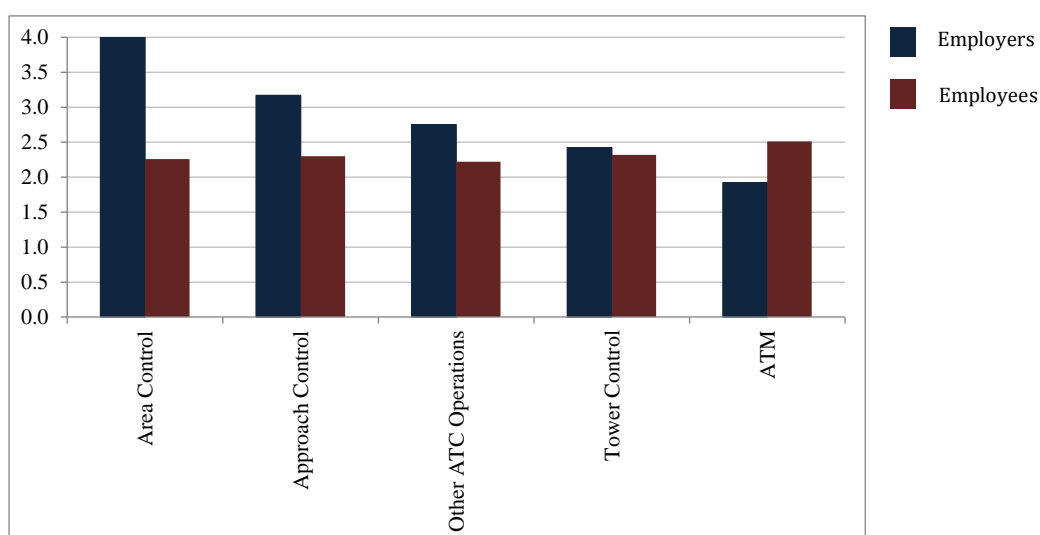


Figure 6.4 - Comparing Employers and Employees' Air Navigation Service Providers-related aggregated competences

The last domain of activity is the manufacturers. Owing to the amount of answers, a disaggregated-level analysis was possible. The results are presented by aggregated competence: *Research and Technology, Operations and Engineering*.

Starting with the Research and Technology aggregate competence (Table 6.5 or Figure 6.5), gaps or misalignments were identified in nine competences, in five of which the gap was significant. In only three competences no visible gap was identified. The top 3 competences, valued by the employers, exhibit a significant competence, with employees ranking them in seventh, sixth and eighth. On the other hand, the competences ranking in the top 3 positions by the employees, exhibit lower differences (in one there is no gap and in the other two there is a minor gap).

Table 6.5 – Comparing Employers and Employees' Manufacturers-related competences: Research Technology

	Employers	Employees	Dif.	Rank Comp	Rank Empl.
Software design & IT	3.63	2.21	1.42	1 st	7 th
Avionics, electronic and electrical systems & EMC	3.13	2.29	0.84	2 nd	6 th
RAMS, human factors & operability	3.00	2.18	0.82	3 rd	8 th
Test engineering	2.89	2.79	0.1	4 th	1 st
Failure assessment and recognition	2.78	2.5	0.28	5 th	3 rd
Services solutions	2.71	1.9	0.81	6 th	9 th
Quality engineering	2.67	2.4	0.27	7 th	4 th
Customer service	2.56	1.88	0.68	8 th	10 th
Structural design	2.33	2.58	-0.25	9 th	2 nd
Production rigs	2.17	1.79	0.38	10 th	11 th
Fluid mechanics and acoustics	2.11	2.5	-0.39	11 th	3 rd
Propulsion and powerplant	2.11	2.32	-0.21	12 th	5 th

Looking now into the competences belonging to the aggregated competence Operations (Table 6.6 and Figure 6.6), Gaps have again being identified in six (out of eight) competences. The employees have valued consistently below the employers. Both groups agree that the competence *components and aircraft architecture* is the most relevant (comparing with the others). No gaps were detected in the competences *maintenance* and *composites manufacturing and assembly*. These two competences were ranked in last by the employers.

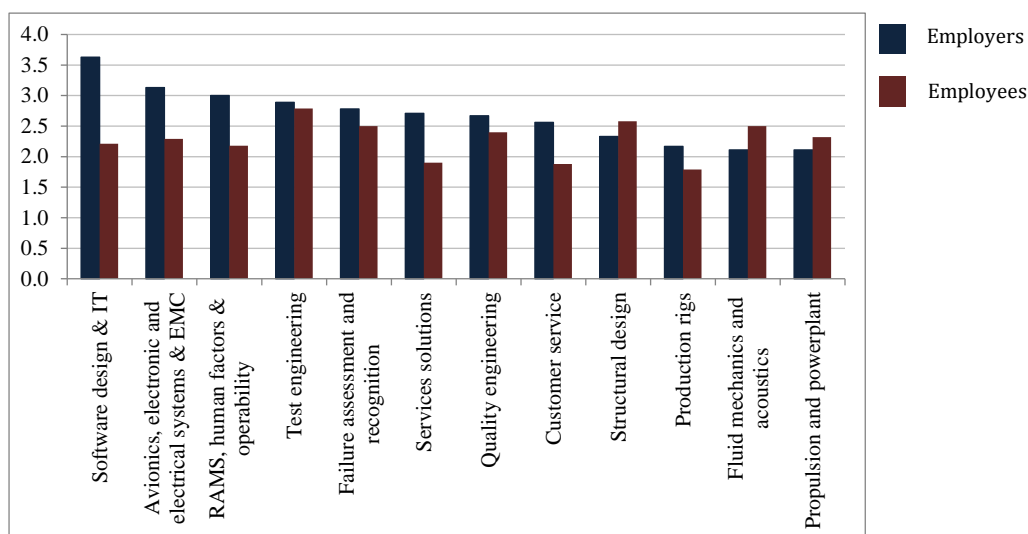


Figure 6.5 - Comparing Employers and Employees' Manufacturers-related competences: Research Technology

Table 6.6 - Comparing Employers and Employees' Manufacturers-related competences: Operations

	Employers	Employees	Dif.	Rank Comp	Rank Emplo.
Components and aircraft architecture	3.17	2.8	0.37	1 st	1 st
Risk management	3.17	2.25	0.92	1 st	3 rd
RAMS, human factors & operability	2.8	2	0.8	2 nd	6 th
Airline operations appreciation	2.67	1.71	0.96	3 rd	7 th
Manufacturing engineering	2.43	2.77	-0.34	4 th	2 nd
Governance	2.25	1.67	0.58	5 th	8 th
Maintenance	2.2	2.07	0.13	6 th	5 th
Composites manufacturing and assembly	1.83	2.08	-0.25	7 th	4 th

The last cluster refers to the Engineering-related competences. This cluster reveals lower level of Gaps, since almost in six (out of sixteen) no Gap is visible. In the remaining ten competences, eight exhibit significant gaps, including the top 5 by the employers, and two a gap, being: *design* and *configuration management*. The competences with lower differences, reduced or no Gap, are

ranked lower by the employers, including the last two: *flight physics* and *composites design and stress*.

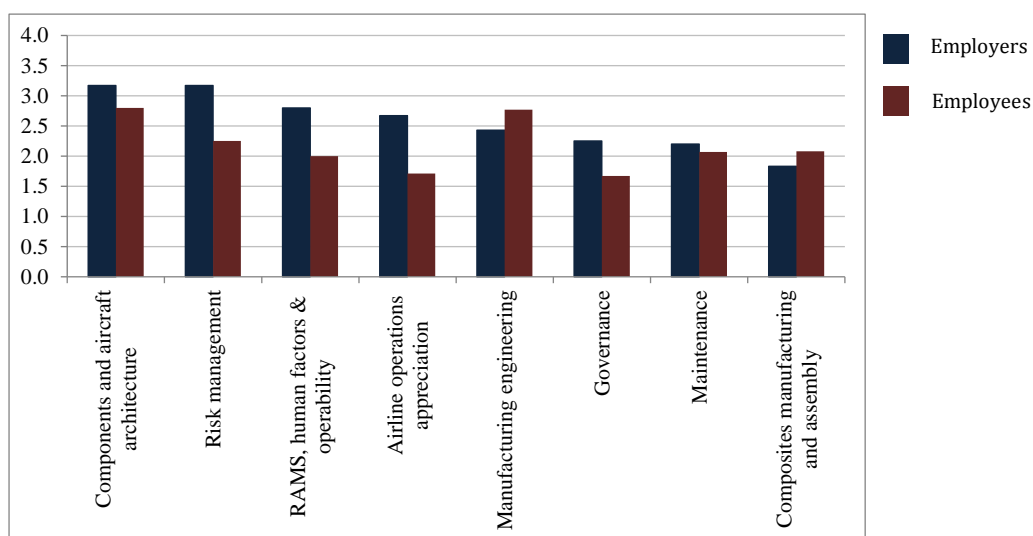


Figure 6.6 - Comparing Employers and Employees' Manufacturers-related competences: Operations

Table 6.7- Comparing Employers and Employees' Manufacturers-related competences: Engineering

	Employers	Employees	Dif.	Rank Comp	Rank Empl.
Systems & electronics engineering	3.50	2.13	1.37	1 st	10 th
Systems engineering and architecture	3.43	2.70	0.73	2 nd	1 st
Architecture, integration and in-service support	3.20	2.12	1.08	3 rd	11 th
Electrical design/integration	3.17	1.81	1.36	4 th	13 th
Airworthiness and certification	3.14	2.16	0.98	5 th	9 th
Design	3.00	2.68	0.32	6 th	2 nd
Failure assessment and recognition	2.86	2.65	0.21	7 th	4 th
Configuration management	2.83	2.45	0.38	8 th	7 th
Aircraft operability and design maturity integration	2.80	2.00	0.8	9 th	12 th
Materials and processes	2.57	2.67	-0.1	10 th	3 rd
Structural & general engineering	2.50	2.53	-0.03	11 th	6 th
Lean experts & supply chain quality field engineering	2.40	1.54	0.86	12 th	15 th
Stress and structures analysis	2.38	2.56	-0.18	13 th	5 th
Supply management	2.33	1.76	0.57	14 th	14 th
Flight physics	2.20	2.13	0.07	15 th	10 th
Composites design and stress	2.14	2.28	-0.14	16 th	8 th

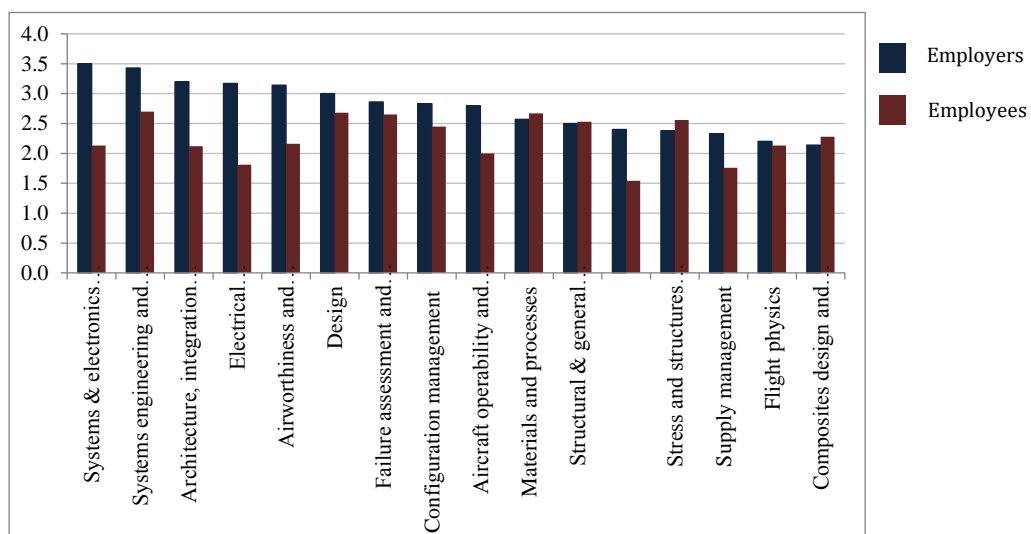


Figure 6.7- Comparing Employers and Employees' Manufacturers-related competences: Engineering

7 Conclusions

This Deliverable reports the works and findings of *WP6 – Competences required by industry and research centres in the air transport and aeronautics*. The objectives of WP 6 include i) the identification of the competences required by employees (both industry and research centres) and ii) the assessment of the Competences Gap 2 – Gap between the knowledge that the companies need and the actual competences of the employees.

The presentation of the objectives, rationale and scope of EDUCAIR project is done in Chapter 2. EDUCAIR project aims to improve the match between needs in human resources and the educational and training offer of skills across the Europe Union. The rationale is that a gap may emerge between each pair of key agents in the AT&A sector. A total of four key agents were identified, being: from the demand side: companies (employers) and employees, and from the supply side: the universities and the students. Due to the size of the AT&A sector, we have defined the scope of EDUCAIR project to four main domains of activity, being: airports, airlines, air navigation service providers and manufacturers.

Chapter 3 presents the 4-step methodological approach deployed to assess the competence Gaps, as follows:

- **Step 1** - Identification of the competences in AT&A (Chapter 4);
- **Step 2** - Industry survey (quantitative and qualitative demand of competence) (Chapter 5);
- **Step 3** – Course Survey (supply of competence) (Chapter 5);
- **Step 4** – Gap Assessment (Chapter 7).

Each step corresponds to a designated chapter. The list of competences, listed in Chapter 4, was identified based on the earlier works undertaken in WP3 (Deliverable 3). A total of 88 competences were considered. These competences were clustered around 18 aggregated-competences, along the four domains of activities. The assessment of the competences gap was based on two stated preference surveys to the employers and to the employees (both described in Chapter 5). The surveys were made available on-line, and a wide and intensive pan-European dissemination was undertaken. A total of 87 and 153 answers were obtained for the survey to the employers and to the employees, respectively. Notwithstanding the substantial amount of answers, a detailed competence-level analysis was only viable in the Manufacturer-related competences. In the remaining the analysis was based on the aggregated-competences. In

addition to the competences, an evaluation of the so-called General Skills was also undertaken. A total of 7 general skills were considered.

In the last step – Step 4 (Chapter 6) – the results of both surveys were confronted and the misalignment were finally identified. A misalignment denotes the existence of a gap.

The results of the General Skills show a fair alignment between employers and employees. Indeed, both groups have ranked the Skills in a similar way. In addition, the valuation of the top 4 Skills is very similar. There are some minor misalignments in the remaining 3, with employees consistently valuating above the employers. We may thus conclude for a similar perspective on the relevancy of the most important skills and, thus for the non-existence of a gap of skills.

Looking now into the competences, the results evidence the existence of two main types of misalignments. The first type happens when there is a difference in the evaluation of the competences, by either an overvaluation (employees evaluated above than the employers) or undervaluation (employees evaluated below than the employers). Although both situations have occurred, the former was far more common than the latter. The second type of misalignment occurred in case of different ranking or assortment of the competences. It was not uncommon a group ranked a given competence in the top three whereas the other in the bottom three. The assessment of the competence gaps was done for each of the four domains of activity (that is, airport, airlines, ANSP and manufacturers). In summary, the main conclusions for each domain of activity were as follows:

5. **Airports:** Gap or misalignment, presence of both types of misalignment: i) in six competences (out of eight) employees undervalued the relevancy of the competence and ii) substantial differences in the ranking of the competences.
6. **Airlines:** Gap or misalignment, presence of both types of misalignment: i) deviation both under- and overvaluation in the competences' relevancy and ii) substantial differences in the ranking of the competences.
7. **ANSP:** Gap or misalignment, presence of both types of misalignment i) deviation both under- and overvaluation in the competences' relevancy and ii) substantial differences in the ranking of the competences.
8. **Manufacturers:** the disaggregated analysis revealed mixed results. In all three clusters competences gaps were detected, as follows:
 - a. **Research & Technology:** nine gaps, of which five were significant, out of twelve;

b. Operations: six gaps, of which four were significant, out of seven;

c. Engineering: ten gaps, of which eight are significant, out of sixteen.

In all three cluster gaps were identified in the large majority of the competences evidencing the likely presence of a gap at aggregated level.

In all four domains of activities competence gaps are visible. Actions must now be prepared and brought forward. The actual level of problems brought the existence of the gaps, depend on several factors, including the actual nature of the gap, type of activity, labour and cultural context, etc. In any case, overall discussion can be made. As already discussed, two types of misalignments were identified. One type occurs when there is a disparity in the evaluation of the competence. The most frequent situation was an undervaluation by the employee. This may be denote that employers may still expect, and therefore demanding, a higher proficiency on some competences, whereas employees may not see the need to improve their competences and therefore lacking the necessary motivation. Cases of an overvaluation by the employee were not so common, but still existent. In this case we may predict a potential lack of acknowledgment by the employer and, consequently, an employee's lower working satisfaction. The employers will not perceive that competence as important as the employee.

The other type of misalignment is related with the ranking of the competences, in which both groups rank higher or lower different competences. Such situations denote a divergence in the perspective and expectations of where to deploy efforts for improving proficiency. In the absence of an adequate communication, employees may not understand the need to invest in improving some competences, as they do not perceive it as relevant. Indeed, this type is ultimately the result of a discrepancy in the valuation of the competences.

In summary, the results of EDUCAIR project evidence the likely existence of a competence gaps between employers (companies) and employees in the four domains of EU AT&A sector.

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9 Annex I: Surveys

1. Companies Survey - Professionals involved in the management and recruitment of new employees
2. Employees Survey - Graduated employees working in the air transport and aeronautics companies. Graduation must be in Engineering (all levels of Bologna) or Management/ Business Economics/ Law/ Economics/ Public policy (3rd level of Bologna - holder of Phd)

10 Annex II: Detailed Contacts Lists

This annex includes the list of contact established within the works of WP6.

10.1 Companies in General

Company	Contact Person	Email
KLM E&M	Dick Dam	Dam@td.klm.com
Cranfield	Keith Mason	K.Mason@cranfield.ac.uk
TNT	Johan Vanneste	johan.vanneste@tnt.com
Arkefly	Zoraime Croes	zoraima.croes@arkefly.nl
Honeywell	Joeri deruytter	joeri.deruytter@honeywell.com
Honeywell	Michal Orlita	michal.orlda@honeywell.com
Schiphol	Lonneke	
Lufthansa Consulting	Peter Belinskiy	peterbelinskiy@yahoo.de
KLM	Ignaas Caryn	
Brussels Airport	Tom Hendrickx	t.hendrickx@skynet.be
Fokker	Michel van Tooren	Michel.vanTooren@fokker.com
Fokker	Corine Zegers	Corine.Zegers@fokker.com
Transavia	Mevr. Schenkel	recruitment@transavia.com
Transavia	Jean-Paul Beer	jean-paul.beer@transavia.com
Leiden University	Pablo Mendes de Leon	p.m.j.mendesdeleon@law.leidenuniv.nl
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ILOT	Krzysztof Piwek	khp@ilot.edu.pl
RHT	Daniel ROHACS	d_rohacs@hotmail.com
RHT	Jozsef ROHACS	jrohacs@rht.bme.hu
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ILOT	Zbigniew WOŁEJSZA	zwol@ilot.edu.pl
ILOT	ŻÓŁTAK Jerzy	geor@ilot.edu.pl
IATA	Robinson Mike	
TU-Berlin	David Bieniek	david.bieniek@ilr.tu-berlin.de
CAAi	Jakimovska Vera	Vera.Jakimovska@caainternational.com
TU Graz		koglbauer@tugraz.at
TU Graz		r.braunstingl@tugraz.at
Airbus	Claude Lelaie	claudel@airbus.com
Jeppesen	Niels Stark	niels.stark@jeppesen.com
AAC	A. Coudek	a.coudek@aac.at

10.2 Airports Contacts

Name	E-mail Contact	Department	Position/Function	Airport
Carol Hutchins	chutchins@flyeia.com	Strategy and Air Service Development	Director, Route Development	Edmonton International
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Ayolt wiertsema	ayolt.wiertsema@wellingtonairport.co.nz	Airport operations	airport manager	wellington airport interntaional ltd
Wayne G. Sieloff AIA AAE NCARB	wayne.sieloff@wcaa.us	Strategic Planning & Development	Vice President	DTW and YIP
Piet Demunter	piet.demunter@telenet.be	Strategic Development / Airport Development	Head of Airport Development	Brussels Airport
John Greaud	johng@mscaa.com	Operations	Vice President	KMEM
Lissa Butterfield	lbutterfield@renoairport.com	Planning & Environmental Services	Airport Planner	Reno-Tahoe International Airport
schaafsma	schaafsma_m@schiphol.nl	corporate development	urban planner	schiphol
Jörger	andrea.joerger@zurich-airport.com	MCD	Senior Vice President "The Circle"	Zurich
Mike Brown	mike_brown@yvr.ca	Strategic Planning	Senior Planner	vancouver
William Allen	william.allen@portofportlan.com	Planning and Development	General Manager	PDX
Francisco Pita	fvpita@ana.pt	Lisbon Airport	Deputy Manager	Lisbon
Antoine Rostworowski	antoine.rostworowski@ADMTL.com	Public Affairs - Passenger experience and airport of the future	Diretor, Industry relations	YUL
Butch Gelband	butch_gelband@nashintl.com	Planning, Design, and Construction	Director of Planning	Nashville International Airport
Dwight Clayton	dwight.clayton@flyloUISVILLE.com	Engineering	Director of Engineering	Louisville International Airport (SDF)
Chris Styles	Chris.Styles@flyjax.com	Airport Operations	Director, Airport Operations	Jacksonville Int'l Airport
Joseph Medici	joseph.medici@austinTEXAS.gov	Aviation	Principal Planner	Austin-Bergstrom International Airport

Hedda Ulfsdotter	Hedda.ulfsdotter@sw.edavia.se	Project management office	Manager	Stockholm Arlanda Airport
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10.3 Contacts from Employees' survey

Type of company	Name of company	Email
Manufacturer/Supplier	Rolls-Royce plc	neill.forrest@rolls-royce.com
Other	GesNaer Consulting	jmperezgil@gesnaer.es
Airport	Tap Portugal	duarteafonso@gmail.com
Airline	TAP Portugal	jamfrade@gmail.com
Airport	Fraport AG	t.schaefer@fraport.de
Other	INTA, National Institute for Aerospace Research	Belén Gutiérrez gutierrezrb@inta.es
Airline	Orbest, SA	jpcarapeto@hotmail.com
Other	Altran	brraposo@gmail.com
Airport	ANA Aeroportos de Portugal SA	madalena.trindade@gmail.com
Manufacturer/Supplier	CEIIA	joaoclasen@yahoo.com.br
Air Transport Control and Management	Aena (Spanish Airports and Air Navegation Provider)	egmarcos@aena.es
Airline	Iberia Express	pgaunam@gmail.com
Other	IATA	roetgert@iata.org
Other	IN+/IST	anabela.reis@ist.utl.pt
Airline	TAP Portugal	fiatG91R3@gmail.com
Airport	Airport Ljubljana	taja.smolic@lju-airport.si
Other	Isdefe	dawnag2885@hotmail.com
Other	Aircraft Technologies and services	kqaraien@aircraft-technologies.com, kqaraien@hotmail.com
Other	BCD Business Consultancy & Development Ltd	alperelicin@gmail.com
Airline	IBERIA Airlines of Spain	rbejarano@iberia.es
Air Transport Control and Management	CRIDA A.I.E	amgalonso@e-crida.aena.es
Other	ONERA	antoine.joulia@onera.fr
Other	W AERONAUTICA	David Álvarez Morales General Manager W AERONAUTICA Viladecans Business Park Ed. Brasil C/ Catalunya 83-85 (abans Bertran i Musitu) 08840 Viladecans Barcelona T. +34 9 36 47 60 60 F. +34 9 36 47 60 61 M +34 653 825 499 e-mail: david.alvarez@waeronautica.com
Other	RWTH Aachen University	katsaros@airport.rwth-aachen.de
Manufacturer/Supplier	CEIIA	pedro.pp88@gmail.com
Other	Eurocontrol	eduard.porosnicu@eurocontrol.int

Type of company	Name of company	Email
Other	ONERA	axel.classen@dlr.de
Other	German Aerospace Center	facilisimodememorizar@gmail.com
Other	Arup	annette.temme@dlr.de
Air Transport Control and Management	Hellenic Civil Aviation Authority Directorate of Air Navigation	stathis.malakis@gmail.com
Other	ineco	dino.slavica@crocontrol.hr
Manufacturer/Supplier	thales	cbarbas@ineco.es
Manufacturer/Supplier	Polskie Zakłady Lotnicze Sp. z o.o.	jmccordero@e-crida.aena.es
Other	Crida	ruzica.vujasinovic@dlr.de
Other	Jeppesen	rglasheras@e-crida.aena.es
Airport	Athens International Airport S.A.	Nikolaos Iossif Emails: iosifn@aia.gr & nikiosif@otenet.gr
Manufacturer/Supplier	Harmonic Drive AG	peter.hastrich@gmx.net
Airport	Aeroporti di Roma S.p.A.	occhiato.d@adr.it
Manufacturer/Supplier	InfraTec GmbH, Dresden	b.vollheim@infratec.de
Airline	Meridiana Maintenance S.p.A.	fabio.caronti@meridianamaintenance.com
Other	National Institute of Aerospace Research - INCAS Bucharest	cdobre@incas.ro
Other	National Aerospace Laboratory NLR	Peter.Buist@nlr.nl
Other	EY Consulting	ak@eycon.eu
Other	Università di Modena e Reggio Emilia	michele.trancossi@unimore.it
Manufacturer/Supplier	INTESPACE	joseph.merlet@intespace.fr
Airport	Aéroports de Paris	Daniel SALLIER sallier.daniel@gmail.com
Manufacturer/Supplier	Zodiac Aerospace	tiana.tefy@zodiacaerospace.com
Manufacturer/Supplier	INASCO	general@inasco.com
Other	MTA SZTAKI	vanek@sztaki.hu
Other	National Research and Development Institute for Gas Turbines COMOTI	ionut.porumbel@comoti.ro
Manufacturer/Supplier	TEKEVER	andre.oliveira@tekever.com
Other	National Aerospace Laboratory NLR	michel.van.eenige@nlr.nl
Other	Isdefe	atorres@isdefe.es jrevuelta@isdefe.es
Other	USE2ACES b.v.	whuson@use2aces.com
Airport	Hellenic Civil Aviation Authority - HCAA Rhodes "Diagoras" Airport ATC section	istavlas@gmail.com
Airport	Athens International Airport	stamatopoulosm@aia.gr
Manufacturer/Supplier	SMCPFA	ctin_sandu@yahoo.co.uk

Type of company	Name of company	Email
Air Transport Control and Management	Aena	rcristia@aena.es
Other	INSTITUTE OF URBAN TRANSPORT (INDIA), PMU, MINISTRY OF URBAN DEVELOPMENT, INDIA	NAMIT KUMAR B-24/1, EAST OF KAILASH, NEW DELHI - 110065 MOB: +91- 9717849531 EMAIL: namitku@gmail.com namit_10@yahoo.co.in
Other	ICCS	Giannis Karaseitanidis, gkara@iccs.gr
Other	CIMPA	Roland.pick@online.de
Other	Self-employed, external expert for INDRA	tatjana.bolic@univiu.org
Other	Minerva Consulting and Communication	aera-pro@minerva-communication.eu

10.4 Contacts from Companies' survey

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Airline	Nortávia, Transportes Aéreos S.A.	Cassianor@nortavia.com
Air Traffic Control and Management	CRIDA A.I.E.	NSTETZLAFF@E-CRIDA.AENA.ES
Airport	Athens International Airport S.A (AIA)	aravanisa@aia.gr Aravanis Alexandros Chief Operations Officer Athens International Airport Spata Building 17/5th floor
Others	GOLDAIR HANDLING S.A.	e.spanou@goldair-handling.gr
Others	SICTA	cvaccaro@sicta.it
Others	Airport Research Center GmbH	michael.laubrock@arc-aachen.de
Others	German Dutch Windtunnels DNW	Christophe Hermans Deputy Director German-Dutch Wind Tunnels Voorsterweg 31, 8316 PR Marknesse, The Netherlands christophe.hermans@dnw.aero
Others	German Aerospace Center, DLR	kurt.klein@dlr.de
Airport	Osijek Airport Ltd.	telarovic@gmail.com
Others	Deep Blue	alberto.pasquini@dblue.it

Type of company	Name of company	Email
Manufacturer/Supplier	Airbus ProSky	frederic.rousseau@airbus.com
Others	Kelly Services HR Company	carlos.maio@kellyservices.pt
Others	Nommon Solutions and Technologies S.L.	ricardo.herranz@nommon.es
Airline	KLM Engineering & Maintenance	d.dam@klm.com
Air Traffic Control and Management	Hellenic Civil Aviation Authority	stathis.malakis@gmail.com
Others	ISA Software	sandrine@isa-software.com
Others	National Aerospace Laboratory NLR	micHEL.van.eenige@nlr.nl
Manufacturer/Supplier	HAVELSAN INC	apahsa@havel-san.com.tr
Others	NTU/BMTIM	Branko Kochovski, MBA Aviation bkochoVski@gmail.com Team Leader, Technical assistance to the Zambian Aviation Sector
Manufacturer/Supplier	Active Space Technologies S.A.	Rui Henriques rui.henriques@activespacetech.com
Manufacturer/Supplier	GMV Skysoft	jose.neves@gmv.com
Manufacturer/Supplier	Oxsensis Ltd.	Stephen.fasham@oxsensis.com
Others	Reggio Emilia Innovazione	tacchini@reinnoVa.it
Others	G4S	tesmojo7@gmail.com
Others		haysam.telib@optimad.it

10.5 Airport Contacts from ACI website

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Slovenia	info@maribor-airport.si
France	info@chateauroux-airport.com
France	info@bordeaux.aeroport.fr
Switzerland	info@gva.ch
France	communication@lyonaeroports.com
Italy	info@adr.it
Italy	info@sogaer.it
Italy	info@aeroporto.fvg.it
Portugal	info@anam.pt
Portugal	contactar@ana.pt
Spain	info@aeroports.cat
France	info@aeroportsdeparis.fr
Romania	office@bacauairport.ro
Romania	aeroportoradea@rdslink.ro
Romania	tmuresairport@rdslink.ro
Romania	contact@bucharestairports.ro
Italy	info@airgest.it
Slovak Republic	information@airportbratislava.sk
Czech Republic	placekt@airport-brno.cz
Poland	portlotniczy@airport.lodz.pl
Germany	info@allgaeu-airport.de
Netherlands	infor@schiphol.nl
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France	diralb@limoges.cci.fr
France	contact@marseille.aeroport.fr
France	contact@pau.cci.fr
Ireland	info@irelandwestairport.com
Netherlands Antilles	info@curacao-airport.com
Croatia	info@airport-dubrovnik.hr
Netherlands	info@eindhovenairport.nl
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United Kingdom	info@exeter-airport.co.uk
Finland	info@finavia.fi
Switzerland	info@flughafenbern.ch
Germany	info@dresden-airport.de
Germany	info@fly-away.de
Austria	info@flughafen-graz.at
Germany	fhg@ham.airport.de
Germany	info@hannover-airport.de
Germany	diwimberger@airport-cgn.de
Germany	mail_flh@leipzig-halle-airport.de
Germany	info@munich-airport.de
Germany	info@fmo.de
Germany	info@airport-nuernberg.de
Germany	info@rostock-airport.de
Germany	info@stuttgart-airport.com
Switzerland	info@unique.ch
Germany	info@fraport.de
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Italy	info@gesac.it
Italy	info@gesap.it
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Belgium	info@liegeairport.com
United Kingdom	info@londoncityairport.com
Switzerland	airport@lugano.ticino.ch
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Romania	aercj@codec.ro
Romania	secretariat@sibiuairport.ro
Latvia	office@riga-airport.com
Croatia	information@rijeka-airport.hr
Netherlands	info@rotterdam-airport.nl
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Romania	cism@cism.ro
Lithuania	airport@vno.lt
France	info@grenoble-airport.com
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France	contact@tjp.aeroport.fr
France	nice.aeroport@cote-azur.aeroport.fr
France	infos.aeroport@nantes.aeroport.fr
Luxembourg	mail@lux-airport.lu
Bulgaria	public@sofia-airport.bg
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Lithuania	info@kaunasair.lt
Lithuania	aerodromas@palanga-airport.lt
Sweden	swedavia@swedavia.se
France	informations@biarritz.aeroport.fr
United Kingdom	rwalker@tagfarnborough.com
Estonia	info@tll.aero
Turkey	info@tav.aero
Romania	office@aerotim.ro
Albania	info@tirana-airport.com
Austria	info@innsbruck-airport.com
Poland	marketing@gtl.com.pl
Poland	airport@airport.wroclaw.pl
Croatia	info@zadar-airport.hr

10.6 Companies Contacts from ACI website

Company	Product/Services	Email
3sixty	Information Technology Management consultancy Retail consultants	office@3sixty.co.uk
A.T. Kearney NV	Consulting services, forecasting and statistics	robert.tasiaux@atkearney.com tanja.wielgoss@atkearney.com
Acciona Airport Services	Ground handling	marketing@acciona.aero cnavasg@acciona.es
ACTM Netherlands BV	Management consultancy Retail consultants	martijn.steur@actm.sg belinde.bakker@actm.sg
Adecs Airinfra B.V.	Consulting services, forecasting and statistics Information Technology Management consultancy	pf@adecs-airinfra.nl kp@adecs-airinfra.nl
ADELTE Airport Technologies S.L.U.	Consulting services, forecasting and statistics Ground handling	fmamert@adelte.com jfloreta@adelte.com
AECOM	Architects Consulting services, forecasting and statistics Engineering Planning Project management	vittasg@dmjmaviation.com ric.paterson@dmjmaviation.com
AERO Training Center	Training and educational institutes	direction@camasformation.fr christel.barel@camasformation.fr
AERO-Clean	Cargo and general services Winter services	thomas.jessberger@aero-clean.de priscilla.neri@sasse.de
AERTEC Solutions	Consulting services, forecasting and statistics Design Engineering	abordallo@aertecsolutions.com mhorsman@aertecsolutions.com
AI-MS Aviation Infrastructure Management Systems GmbH	Management consultancy	w.edelmann@ai-ms.eu w.richter@ai-ms.eu
Air4casts Holdings Limited	Consulting services, forecasting and statistics	admin@air4casts.com jane.robinson@air4casts.aero
Airbiz Aviation Strategies Pty Ltd	Consulting services, forecasting and statistics	gfordham@airbiz.aero imunro@airbiz.aero
AIRBUS SAS	Aircraft engine and manufacture Airside services Design	info@airbus.com

Company	Product/Services	Email
airconomy aviation intelligence gmbH & Co. KG	Consulting services, forecasting and statistics Management consultancy Market research	tobias.grosche@airconomy.com
		Marczinowski@airconomy.com
Airmall USA, Inc.	Airside services Operation	m_knight@airmallusa.com
		j_ewing@airmallusa.com
Airpartners Consulting SL	Consulting services, forecasting and statistics	info@airpartners.es
Airport Commercial Development AB	Retail consultants	ian@airport-commercial.com
		mattias@airport-commercial.com
Airport Consulting Vienna GmbH	Consulting services, forecasting and statistics	office@a-c-v.aero
Airport Direct Travel	Car parking	marie.hart@airportdirecttravel.com
		enquiries@airportdirecttravel.com
airsight GmbH	Consulting services, forecasting and statistics	r.doerries@airsight.de
		h.schulz@airsight.de
Aldeasa	Product, suppliers and duty free	cristina.martinez@aldeasa.es
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American Express Foreign Exchange Services	International Currency Exchange	avinash.h.lalwani@aexp.com
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APCOA Parking AG	Car parking	bm.nierobisch@t-online.de
		gabriele.kerl@apcoa.eu
ARINC	Flight information display systems Information Technology Systems integration	matthew.saunders@arinc.com
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ASCEND Worldwide Ltd	Consulting services, forecasting and statistics	peter.morris@ascendworldwide.com
		airports@ascendworldwide.com
Autogrill SpA	Food and beverage Travel retail and other services	daniele.valori@autogrill.net
		michela-imelda.asiani@autogrill.net
Avia Solutions Limited	Consulting services, forecasting and statistics	seamus.kealey@viasolutions.com

Company	Product/Services	Email
		jkingham@aviasolutions.co.uk
Aviapartner	Ground handling	kris.geysels@aviapartner.aero
		info@aviapartner.aero
Aviation Media Ltd.	Event Management Marketing Services, Signs & Displays	jonathan@aviationmedia.aero
AviaVox B.V.	Flight information display systems	bob.jooren@aviavox.com
		johan.godin@aviavox.com
bagport Gmbh & Co Kg	Trolleys	info@bagport.co.uk
		svenja.s@bagport.com
Barco Orthogon GmbH	Information Technology	frank.koehne@barco.com
		Michael.eisele@barco.com
Belgian Sky Shops SA	Product, suppliers and duty free	alexandra.vandewalle@skyshops.be
		info@skyshops.be
Blender AS - Umoe Restaurant Group	Duty Free Food and beverage	ronny.gjose@blender.no
		joannis.vendrig@blender.no
Blue Eye Video	Consulting services, forecasting and statistics Information Technology	contact@blueeyevideo.com
Boschung Airport Division	Runways, aprons and taxiways Winter services	stefan.ganz@boschung.com
		stefan.ganz@boschung.com
Brio Bistro Ltd.	Food and beverage	peterboros@briobistro.hu
		marketing@briobistro.hu
British American Tobacco	Product, suppliers and duty free	jose_benikes@bat.com
		danika_ahr@bat.com
Brown-Forman Corporation	Food and beverage	tim_young@b-f.com
Cavotec Fladung GmbH	Airside services Ground handling Refuelling Runways, aprons and taxiways	bernhard.wuermeling@cavotec.com
		info@cavotec.com
Celebi Ground Handling Inc	Ground handling	talha.goksel@celebi.com.tr
		tunc.mustecaplioglu@celebi.com.tr
CFM International	Aircraft engine and manufacture	pierre.bry@sneema.fr
		sandrine.lacorre@sneema.fr
Chantry Corporation Ltd.	Car parking	john@chantry.com
		theresa@chantry.com
Cobalt Light Systems Ltd		paul.loeffen@cobaltlight.com
		ken.mann@cobaltlight.com
COFELY Services (GDF-SUEZ)	Operation	andre.bailleul@cofelyservices-gdfsuez.be

Company	Product/Services	Email
		piet.degrauwe@cofelyservices-gdfsuez.be
Combibox System Scandinavia AB	Runways, aprons and taxiways	leif.lindh@combibox.com
Compass International Media Ltd	Advertising Consulting services, forecasting and statistics Retail consultants	philip@compassintermedia.com
Concesiones Aeroportuarias, S.A	Construction	jmgarcia@conaer.aero
Concessionaire Analyzer+		jdj@concessionaireanalyzer.com
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Conrac GmbH	Flight information display systems	marketing@conrac.de
	Information Technology	p.ollhoff@conrac.de
Contrac Cobus Industries GmbH	Transportation	contrac@compuserve.com
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Cranfield University	Training and educational institutes	r.pagliari@cranfield.ac.uk
Danube University Krems	Training and educational institutes	drawer@mba.donau-uni.ac.at
		doris.burger@donau-uni.ac.at
Deerns Airport System Consultants	Consulting services, forecasting and statistics	airports@deerns.nl
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Doppstadt Austria GmbH	Runways, aprons and taxiways Winter services	info@doppstadt-austria.at
DROR BAR-LEV Professional Business Development e.k.	Information Technology Planning	db@drorbarlev.com
Dufry	Product, suppliers and duty free	anastasia.kuznetsova@dufry.ch
		lubna.haj-issa@dufry.ch
Egremont	Management consultancy Planning Retail consultants	info@egremontgroup.com
EMISENS GmbH	HBS, trace detection, TIP and screening	steve.cranstone@emisens.com
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Exambela Consulting	Consulting services, forecasting and statistics	david.feldman@exambela.com
Ferrovial Aeropuertos S.A	Operation	apalomares@ferrovial.es
Fly Holding S.r.l.	Baggage handling Trace	david.debach@flysafefebag.com

Company	Product/Services	Email
	Detection	gentile@flysafebag.com
G4S Security Services	HBS, trace detection, TIP and screening	martin.aggar@uk.g4s.com
Gael Ltd	Software	ashleym@gaelquality.com
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Gebr. Heinemann SE & Co. KG	Product, suppliers and duty free Retail consultants	j_degner@Gebr-Heinemann.de
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