Factors that influence the success of a KM-program in a small-sized airport

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Abstract

Purpose – *This paper aims to investigate the nature of what is referred to as the Knowledge Management Engineering & Maintenance Program, which is based on practices that influence the dissemination of knowledge in a structured and sustained manner within a small-sized airport. The air transport system has undergone important changes, particularly in the development of new knowledge management (KM) approaches. In practice, however, results have been mixed. Some programs have been successful, but implementation failures are common and the intended users are frequently reluctant to use such management structures. A possible explanation for efficiency and effectiveness gaps of services provided by these knowledge structures may relate to the advantages and disadvantages of the knowledge processes that airports highlight as a result of their differential structural properties.*

Design/methodology/approach – *Using data collected from the Engineering & Maintenance Department at a Spanish Airport, this work has examined how the existence of some knowledge structures is linked to knowledge transfer and how this component is linked to customer service (external users, e.g. passengers; and internal users, including any airport staff).*

Findings – *This paper reports a KM program, which is customized and based on four knowledge structures: technical infrastructure; people to facilitate and drive the process; a system that supports and rewards sharing; and the team leader.*

Research limitations/implications – *Conducting this type of single case study (an interview-based case study approach) is to be understood foremost as a prelude to further quantitative studies including common measures for passengers and users, staff, managers and board members.*

Originality/value – *In an applied sense, the model provides engineering and maintenance practitioners with identifiable factors, which enable the four frameworks and address the relevant issues by changing strategies at both the individual and the organizational levels. Without a KM program, practitioners may lose the ability to see the market signals stemming from the transport system members and they may decide to go solely by their own ways of doing and interpreting things.*

Keywords *Knowledge management, Airport Engineering & Maintenance, Leadership practice, Organizational strategy*

Paper type *Case study*

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1. Introduction

Airports are an essential part of the air transport system. They not only encourage economic development (Jarach, 2005) but also can provide substantial employment opportunities (Graham, 2003). Today, more than ever, airports have to be prepared to deal with new challenges and demands of its customers and stakeholders (Jarach, 2005), thus obliging airport administrators to develop and implement flexible and adaptive strategies in order to identify what kind of information is needed, collect it and analyze it properly to transform in good and actual knowledge to support decisions and strategies (Ribeiro De Almeida, 2012).

Knowledge management (KM) is often referred to as organizational learning, organizational memory and expertise management (Swee, 2002). KM programs can lead to a way for an

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airport to "know what they know and what they do not know", the need to share, retain and reuse the knowledge (Cheung *et al.*, 2007). As Martelo-Landroguez and Cegarra-Navarro (2014) point out, KM programs needs to become a stable resource if it is to be translated into a profitable venue for information sharing. This means that managing knowledge in an integrated manner is currently a challenge task for any airport, allowing it not only to know the demand and supply but also allow it to know the competition it faces (Ribeiro De Almeida, 2012).

The above considerations imply that it is crucial to develop a KM program that allows airports to store and recover the new knowledge for sustaining and maintaining organizational effectiveness. As Ribeiro De Almeida (2012) points out, in the case of airports, KM is of added importance and is a unique tool for the regular analysis of supply and demand, market trends or the analysis of competitors, information which is needed for the defining of action strategies.

A key component of airports' KM is the Airport Engineering & Maintenance Departments (AEMD) which is an innovation designed to deliver acute services to appropriate users. In the case of airports, engineering and maintenance resources are limited, and therefore, the identification of the true expense generators is necessary to be able to optimize resource use (Ribeiro De Almeida, 2012). Consequently, the key benefits of the use of a KM program for the AEMD are clear. The existence of these programs enable airport administrators to identify and replace poor practices and also avoids the loss of knowledge (e.g. by minimizing unnecessary work caused by the use of ineffective methods or employee turnover), reduces costs through better productivity and efficiency (improving services to customers) and increases profitability.

It should be noted here that many KM programs fail because the companies do not know what knowledge they have and do not have (Cheung *et al.*, 2007) or what knowledge is important (Guptara, 2000). Under this framework, it is difficult and risky for any AEMD to implement KM programs. It should also be noted here that due to the economic crisis in Spain, there is a growing rate of turnover among engineers, technicians and/or knowledge workers who accumulate organization-specific knowledge that is ultimately lost to the airport system (Graham, 2003; Jarach, 2005). Therefore, knowledge would have a relatively short half-life due to employee turnover and the passage of time.

A review of the literature has revealed a lack of attention to the success and failure of KM programs of AEMD by KM scholars and practitioners. Furthermore, it can be argued that the attention given to AEMD does not correspond with the importance of such a remarkably diverse group whose duties range from ensuring the quality of the airfield to issues related to all airport authority buildings including the landside and airside terminals.

Therefore, the purpose of this study is to contribute to the development of a conceptual model of KM in AEMD by conducting an empirical investigation of the practices and knowledge structures that this innovative department has used to manage its knowledge. To this end, this paper examines the knowledge and process management practices of the engineering and maintenance area in a small-sized Spanish Airport to provide efficient engineering and maintenance services. The next section presents an overview of current research literature addressing KM programs, including the potential knowledge structure

that may act as an enabler of a KM strategy. A study into a KM program is then detailed in Section 4 utilizing the methodology in Section 3. The findings are then discussed in Section 5, concluding in Section 6.

2. Conceptual framework

Over the past decade, interest on the concept of KM has grown in both the public and particularly, the private sectors (Jennex, 2005; Willem and Buelens, 2009). While at the macro-level, KM in the public sector is very similar to that in the private sector; at a micro-level, the details of the organizational system and goals differ. For example, knowledge sharing in the public sector is difficult because most people view knowledge as closely coupled with power, and related to their promotion prospects (Liebowitz and Chen, 2003). Organizational cultures and structures may also create different perceptions that keep public organizations from sharing knowledge (Jennex, 2005; Willem and Buelens, 2009) which, in turn, can lead to inflexible behaviours and routines (Seba *et al.*, 2012).

Public transport in Spain is characterized by an extensive network of airports. Today, air travellers have more meaningful choices among airports, and consequently, there's an increasing urgency among airport marketers to differentiate themselves from the opposition (Fodness and Murray, 2007). As for other transport systems, to ensure the provided service operating in a safe environment, there are many requirements for regulatory compliance that airports need to comply with (Cheung *et al.*, 2007), the mandate knowledge for crisis management, hazard mitigation, safety management, risk management, accident and handling incidents, just mention a few, are vital to the operators of the air transport system because they are needed to ensure a safe, comfort and reliable service to the public (Graham, 2003). It may also be noted that each of these requirements serves different purposes between the various destination stakeholders which, when combined, allow an interchange between overland and airborne means of transport. In addition, to provide quality services for all airport users, many infrastructures have been proposed and implemented, such as the processing of aircraft, passengers and cargo, aircraft parking apron areas, roads, passenger terminals and cargo terminals (Graham, 2003).

The considerations set out above lead us to expect the development of new knowledge and knowledge structures or the adaptation/modification of existing knowledge and knowledge structures in response to the necessity of adapting to different requirements and continuously changing environmental conditions. From this perspective, a KM program is of great importance to airports and can even be characterised as being a vital tool to evaluate the market and anticipate trends (Nahavandi *et al.*, 2013). Thus, as Ribeiro De Almeida (2012) noted, a KM program is of added importance in the case of airports and is a unique tool for the regular analysis of supply and demand, market trends or the analysis of competitors, information which is needed for the definition of action strategies.

To create new or modified services, strengthen stakeholder relationships and thus positively influence passenger and user satisfaction (Pitt, 2001), an airport must be flexible in configuring (combining) knowledge and knowledge structures in a way that is appropriate for delivering value to the user (Fodness and Murray, 2007). Knowledge work – that is the acquisition, creation, packaging or application of knowledge – is characterized by a variety and exception rather than routine, and is performed by professional workers with a

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> **"Managers must foster potential enablers so employees get easily encouraged to share knowledge."**

high level of expertise (O'Donohue *et al.*, 2007). The aim of the current research is to review the impact of these changes to create an appropriate work context for AEMD.

Although employees of the AEMD are knowledgeable about what is offered and what is lacking, the problem is that the existing knowledge is poorly organized and catalogued and is often inaccessible (Nahavandi *et al.*, 2013). Therefore, the challenge is not just to create new knowledge, as a vast amount of highly valuable knowledge already exists. The way forward is to develop a program to establish ways of discovering knowledge that already exists and organize it to make it accessible, ensure it supports the knowledge base to do the job and, in doing so, incentives are created to share the knowledge and maximise "spread" (Almeida *et al.*, 2005).

This paper presents a model of the factors that influence the dissemination of knowledge in a structured and sustained manner within an airport which was realized through a pilot study undertaken within the AEMD of Murcia-San Javier Airport in Spain. Murcia-San Javier Airport is a civilian passenger airport located in San Javier, 27 km southeast of Murcia, Spain. It is operated by Aena S.A. (Spanish Airports and Aerial Navigation Authority). The airport can handle aircrafts up to the size of a Boeing 757 or 767, and also has up to Category 7 fire cover by the IATA (International Air Transport Association). According to Aena S.A. (2013), passenger numbers jumped from just 88.608 in 1995 to 1.181.490 passengers in 2012 and exceeded two million passengers in 2007. The AEMD at this airport was established in January 2014 when other airports in Spain were starting to develop similar initiatives.

The establishment of AEMD at Murcia-San Javier Airport is an important mechanism for the provision of services to airport users. These divisions have the appropriate physical facilities and staff expertise to share, retain and reuse the knowledge (Ribeiro De Almeida, 2012). In addition to this expertise, however, they also need the external's knowledge of airport users to come up with new, applicable, successful developments. Therefore, AEMD members are much more in tune with user needs due to their proximity to end users and downstream research.

The essence of identifying and sharing efficient practices is to learn from others and to reuse knowledge avoiding waste. However, much efficient knowledge is tacit, that is held in people's heads, and not always easy to document. Regarding this, recent research into knowledge sharing in the public sector has focussed on some specific factors that might impact on knowledge sharing. For instance proposes that knowledge sharing requires the presence of three main types of organizational structures: dynamic structure, networking structure and object-oriented structure. Developing this theme, Martinez-Caro *et al.* (2012) propose that most KM programs combine two key elements:

1. formal structures for sharing explicit knowledge, such as a technology infrastructure (connecting people with information); and
2. informal methods for sharing tacit knowledge such as communities of practice (connecting people with people).

According to Cegarra *et al.* (2011), the above approaches are complementary. On the one hand, a technology infrastructure can provide enough information for a potential user of an efficient practice to find it and decide if it is worth pursuing further. On the other hand, the best way to share efficient practices is "on the job" and so using communities and personal

contact with others who have used the same practices. Building on the work of Swee (2002), Cegarra and Cepeda (2010) identify four main types of knowledge structures, which will determine the specific characteristics of knowledge sharing:

1. technology infrastructure;
2. system that supports and rewards sharing;
3. culture of the organization; and
4. leadership.

In Section 4, we provide an indication of the key enablers that characterize these four factors.

To facilitate learning and knowledge sharing, one of the most important factors that has surfaced in several studies is the technology infrastructure (Becerra-Fernandez and Sabherwal, 2010). It is frequently mentioned as the solution to intra-organizational knowledge transfer (Vouros, 2003; Gressgård *et al.*, 2014). Technology facilitates horizontal communication and makes it seamless and easy for employees to share and access information and knowledge databases through process management tools.

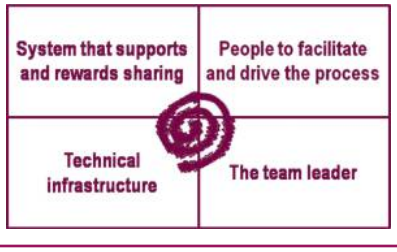
Rewards for knowledge sharing are also clearly another important factor (Yao *et al.*, 2007; Fathi *et al.*, 2011). This refers to the intrinsic factors (e.g. self-esteem or respect) and extrinsic factors (e.g. monetary or promotion) that can encourage employees to participate in communications efforts and motivating them to share interesting professional thoughts (Lee and Ahn, 2007; Gal, 2004).

The other factor that is widely recognised to be pivotal to effective knowledge sharing is the culture of the organization (Jennex, 2005; Willem and Buelens, 2009). If there is not a learning culture and people to facilitate and drive the process, then good practices will be slow to emerge and spread, as each part of the organization will defend its own way of doing things rather than learning from and sharing with others (Jones *et al.*, 2003). Thus, when people are encouraged to seek out knowledge and learning, efficient practices are more likely to emerge and spread.

Another factor that has been identified by several studies as being important for successful knowledge sharing is leadership (Singh, 2008; Seba *et al.*, 2012). Leaders play an important role in establishing some of the key conditions required to facilitate knowledge transfer; they have a major influence on the organizational culture and the support conditions needed for knowledge sharing. In addition, leaders will have to convey the attitude required to solve organizational problems and improve the organization's effectiveness at any level of the organization and not exclusively in the upper levels of the hierarchy (Singh, 2008).

This paper investigates the nature of what is referred to as the Knowledge Management Engineering & Maintenance Program (KME&MP), which is based on the aforementioned components (i.e. system that supports and rewards sharing, people to facilitate and drive the process, the team leader and the technical infrastructure). As shown in Figure 1, to

Figure 1 The Knowledge Management Engineering & Maintenance Program



implement a KM program in the airport business, we are going to use the program proposed by Cegarra and Cepeda (2010), which clearly relate to Swee's four-step factors. This model is flexible and could be easily adapted to airports integrated knowledge programs. The associated spiral in the centre of the matrix represents the dynamic that should exist to identify the new information that is needed, the best way to be collected, coded and analyzed and finally transformed into technical infrastructures that allow the airport to develop integrated strategies and correct actions for the future.

The next section presents the methodological background and the four different types of organizational structures and factors as constituting the "KME&MP".

3. Method

A qualitative research was used to show the tools and methods used in AEMD to manage knowledge (Yin, 1994). This study explores the perceptions on the critical role of knowledge and its management in these airport units. The goal was to elicit the perception of the key agents involved in the day to day work of the engineering and maintenance departments within a small-sized Spanish Airport. As noted above, the investigation was carried out in spring 2014 in a one million pax per year Spanish Airport. The airport was constructed and is operated to the required international standards and is the result of intensive planning, tireless efforts and diligent and devoted work exerted by all responsible authorities and employees of the Airport Corporation (Aena, 2014). It includes all necessary airport services and related installations and infrastructure according to its size. The KME&MP at this Spanish Airport was established beginning 2014, with no similar airports in the area developing such programs. Initially, this department was founded to improve internal and external customer service flow, creating greater acute engineering and maintenance service capacity. The AEMD at this airport was chosen for two main reasons.

On the one hand, in March 2014, the airport conducted a survey to examine the passengers and users' overall satisfaction including specific areas like infrastructures and comfort, despite passenger and user satisfaction being reported as being high, evaluation of the causes of high levels of satisfaction have been underdeveloped. On the other hand, the AEMD is an ideal platform to learn because two or more individuals (e.g. engineers, coordinators and technicians) are working together with different resources and complementary capacities, which are learning facilitator factors (Fenwick, 2007). In practical terms, this has sown the seed for knowledge to be made available not only for the AEMD members but also among operations members and other airport staff, to be actively directed towards the airport users in the form of strategic competence mapping, development and utilization.

Therefore, the AEMD at this airport is an appropriate setting for an investigation of KM practices and its impact on knowledge transfer. This is mainly because this department provides a "face-to-face" interaction allowing the exchange of information inserted into the social context of the airport users, not only among engineers, coordinators, technicians, operations members and other airport staff but also passengers and users, which, by its tacit character, is more difficult to imitate.

Details of the nature and aims of the study were sent to potential participants together with a written invitation to participate and follow-up was made with those expressing interest. Participants were assured of confidentiality throughout and signed consent was obtained.

3.1 Ethical considerations

Ethical approval was granted by the head of AEMD at Murcia-San Javier Airport. In addition, participants were assured of confidentiality within the confines of each interview, and in the gathering, handling and storage of data. Anonymity and confidentiality in reporting the findings of the study was guaranteed. The 11 participants included the

engineering and maintenance manager, the maintenance coordinator and nine technicians.

3.2 Context and data collection

Before undertaking the pilot survey, a plenary session with the AEMD staff of 60 minutes was undertaken to learn what they understood by KM. All mentioned: identification of information needs (e.g. procedures, maintenance plans, equipment manuals and graphical information), information acquisition, information organization and storage, information distribution and information use, as well as internal communication and support services and specifically identified two broad categories (i.e. the AEMD intelligence network and the airport operations intelligence centre). This plenary session also finds answers to questions on how KM is helping AEMD staff to reduce errors and improve infrastructure management and there of customer service. All mentioned that KM is related to a reduction of engineering and maintenance errors by making related reference information available to technicians at the point of decision, when they are attending incidences or carrying any other type of maintenance or infrastructure engineering.

To analyze KM practices and their impact on knowledge transfer in the unit, a day interview session was conducted. Participants were divided into three categories: engineers, technicians and coordinators. Interviews were semi-structured and open-ended, and they were developed from a number of general questions rather than from specific ones. All interviews were conducted face-to-face. The duration of the interviews spanned between 45 and 60 minutes. The coordinator and the engineering and maintenance manager are pivotal roles at the airport and both were striving to improve service, improve quality and control costs, three goals that have significant implications for the AEMD role. All interviews were carried out with at least two researchers. Interviews were tape recorded; extensive notes were taken during and after each interview and were transcribed verbatim.

The semi-structured survey questionnaire was provided to two different groups – Group "A" comprised nine technicians and Group "B" comprised the engineering and maintenance manager and the maintenance coordinator[1]. The selection of study participants was based on the extent to which they were affected by their duties and the degree of responsibility required in the performance of their jobs. In separate sessions, the same semi-structured survey questionnaire was administered to individuals in each of the two groups. Every effort was made to make the interviews as private as possible. Thus, the data relating to the semi-structured questionnaire used during the working group meetings were collected from different sources and we used answers from Group B as control answers (Karlan, 2001). In addition, a comparison between answers from the first and second groups yielded no significant differences relevant to the perception of how useful KM is, which suggests that non-response bias is not a problem (Michie and Marteau, 1999).

As indicated above, interviews were semi-structured and open-ended, and they utilized a number of relatively general questions. The complete set of interview questions is presented in Table I.

3.3 Data analysis

Verbatim transcriptions of interviews were checked, read through and listened to repeatedly to obtain a sense of the whole. Content analysis utilizing stages as outlined by Krippendorff (1980, 2004) was used. AtlasTI computer software package was used in the management and analysis of the data. Four themes were identified from the data:

1. technical infrastructure;
2. people to facilitate and drive the process;
3. system that supports and rewards sharing; and
4. the team leader.

Table I General interview questions

Technical infrastructure (with respect to AEMD members)

Interview questions:
1. What role does technical infrastructure play in your work?
2. What technical infrastructure have you used to quickly share information?
3. Tell us about any procedures you have implemented to improve network security.
4. How does this technical infrastructure help you in your work?
5. Tell us about the applications have been stored in you technical infrastructure.
6. Tell us about the best available technology.

(**Source:** Adapted from Hult *et al.*, 2004; Cegarra and Cepeda, 2013)

System that supports and rewards sharing (with respect to AEMD members)

Interview questions:
1. What does the airport administration do to encourage the AEMD team to exchange and share knowledge?
2. What difficulties, if any, does the AEMD team face in encouraging employees to exchange knowledge?
3. Tell us about potential barriers and enablers to foster knowledge sharing among the AEMD team.

(**Source:** Adapted from Seba *et al.*, 2012; Cegarra and Cepeda, 2010)

People to facilitate and drive the process (with respect to your airport)

Interview questions:
1. Does the AEMD have an explicit policy or strategy for the implementation of knowledge management?
2. Tell us whether changes should be made to implement knowledge management techniques.
3. Tell us whether knowledge management can be implemented into your airport.

(**Source:** Adapted from Seba *et al.*, 2012; Cegarra and Cepeda, 2010)

The team leader (with respect to the team leader)

Interview questions:
1. Tell us about the critical role that the leader of the AEMD plays in facilitating knowledge sharing within a team.
2. Tell us about the enablers and the required attributes for this role.

(**Source:** Adapted from Seba *et al.*, 2012; Cegarra and Cepeda, 2010)

Themes are presented in Figure 1. Following Granaheim and Lundman (2004), the concepts of credibility, dependability and transferability are adequately addressed in our study to achieve a trustworthiness measure or qualitative reliability and validity measures.

4. Findings: KM at AEMD

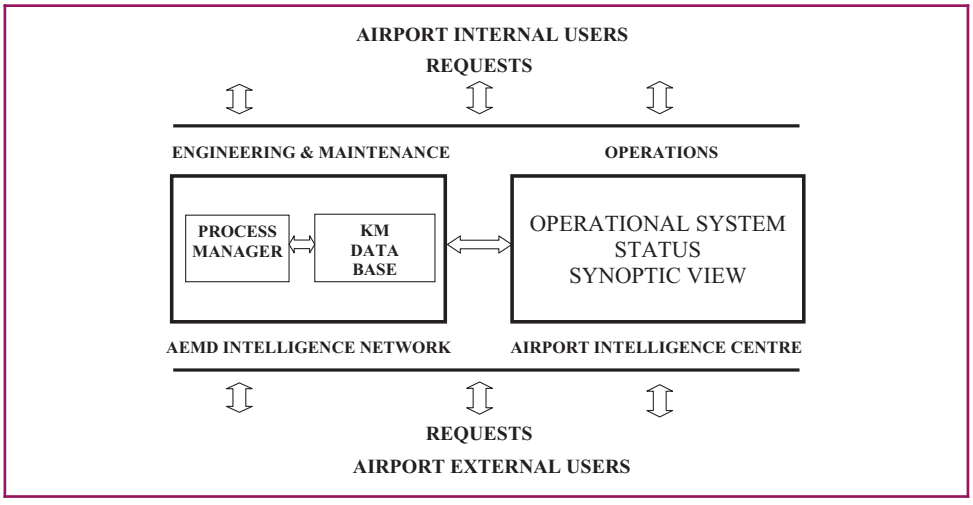
4.1 Technical infrastructure

Data results from interviews with the AEMD staff reveal how the AEMD team saw their technical infrastructure. They told us that: "it represents a knowledge base that can give them easy access to information that would otherwise require contact with another airport's staff". Figure 2 shows that the technical infrastructure at the AEMD is built around an intranet portal, and consists of two core structures developed through a web access data base, which this study refers to as a process and KM tool:

1. the department intelligence network, which is a password-protected executive corner for strategic information sharing and knowledge and process management within the unit; and
2. the airport intelligence centre for the coordination and distribution of on-line operational information.

In the first case, the system tool enables the task process management from airport incidence communication and register, through approval and team shift distribution, until task resolution and feedback communication, enabling KM through the data base addition

Figure 2 Technical infrastructure process diagram



process and sharing by email alerts within (e.g. specific problem process resolution) or outside the department if needed. In the second one, the system tool enables through the airport synoptic view the operational system online status (e.g. check-in counters, baggage systems, boarding gates and related sub-systems such as information and security systems) thanks to the integration with the process manager and KM data base tool. This way, every time an incidence affects any operational item or maintenance tasks are deployed, the synoptic turns its colour, showing the status change so that information is continually shared among shifts and thereof decision taking is properly carried out in every case even after a shift change, i.e. team members change either engineering and maintenance or operations' ones, by the operations coordination centre.

This network has allowed the airport to flatten its organization and decentralize its operations. The intranet is password protected and available on a subscription basis within the airport internal users and airport staff. This infrastructure encourages effective, person-centred, multi-disciplinary projects, the linking of quality, outcomes and infrastructure promotion activities in a unique database open to all members who, depending on the functional area (Engineering & Maintenance, Operations and other airport areas) and the level of responsibility (Airport managers and rest of airport staff), have access to different tools and related services whose administration rights are managed within the AEMD; being the airport external users requests processed through the corresponding airport managers or through the airport intelligence centre depending on the urgency and type of issue requested. The friendly design facilitates the growth of the initiative to accommodate other relevant data sources. In fact, in one interview, a technician said:

> [. . .] that the most important action to use the network was to make information easy to find and offer savings.

IPads connected to the intranet through WiFi are also bringing engineering and maintenance information not only to technicians but also to other team members at any point of the infrastructure.

"Having that information at hand contributes to general safety, efficiency and quality service both directly and indirectly," says an engineer, "because engineers and technicians can base decisions on the most up-to-date information, such as updated engineering and maintenance records".

In addition, the coordinators and technicians asserted that "[. . .] access to iPads were reducing the time spent on manually retrieving maintenance records and saved hours each

week as information was now accessible from everywhere. This in turn frees up time for engineers to focus on their primary functions of problem analysis and solving".

This study also explored what applications were being stored in their technical infrastructure. Based on interviews, information such as scheduled and non-scheduled maintenance reports; installation inspection results such as thermographic filming, material stocks, maintenance plans, safety procedures, maintenance registers, operative maintenance progress and other engineering reports; and administrative data are accessible through the system. Furthermore, applications submitted for inclusion in the database encompass key aspects of quality improvement, which may include some or all of the following: passenger and user focuses (their initiative identifies their needs); multi-disciplinary (all relevant installations have been involved); planned (the initial plan for change and reasons for its implementation are detailed); results/outcomes (key indicators used to – or proposed to – show the results of the changes detailed); and conclusions (lessons learned if the initiative can be deployed elsewhere are detailed).

Finally, the aspect of their technical tool that most differentiates it from other products and provides the greatest value-added, according to interviews, is the "linking technology". If an operations technician looks up a certain installation in the network, a link button appears that might reveal, for example, that there was a maintenance or failure alert on a certain sub-system that could affect operational decision taking under certain circumstances. Those connections reflect the associative way in which engineers' minds move through an analytical process, and eliminate the need to move from one application to another wasting time and affecting not only decision taking processes but also service quality.

4.2 System that supports and rewards sharing

Based on interviews, this factor can be broken down into three areas (i.e. organizational design, training and skill development and rewards). One comment identified training initiatives in technologies as being "common-points" to organized airport activity. A technician further suggested that the goal of these training initiatives were to provide the related airport staff with the ability to use the technical infrastructure effectively. At this stage, some interviewees suggested that: "skills training courses designed specifically for the AEMD team to help with the development of their work might be necessary". In fact, they suggested "some basic training in problem solving and group interaction".

It should be noted, however, that interviewees pointed out that: "sharing information to solve problems and to realize values such as improved infrastructure service should bring tangible rewards". In this regard, the team manager suggested that: "the airport should offer tangible rewards to those members who reinforce both the culture and the behaviours needed for effective knowledge transfer". He further suggested that "certain organizational design features should be addressed". For example, "the airport should design a way that encourages teamwork or cross-department specialist teams".

This study also explored what difficulties the AEMD team face in encouraging employees to exchange knowledge. Regarding this, one of the engineers argued that: "due to the pressure of work we don't have time to share knowledge". He further suggested that: "it is difficult to gather together all the AEMD team to speak about the concept of knowledge sharing due to the pressure of their daily duties".

The majority of the engineers also expressed support for the development of "poles of competence", whereas every team member must reach a certain minimum knowledge level on every installation but a high knowledge one on a certain area of expertise is a good example, i.e. electro-mechanics, electricity, electronics, communications and related installations (Thermal, Electromechanical, Access and security control, CCTV, IT, Fire-fighting, Electrical, Sewerage and storm water system, Aeronautical Lighting, External and internal lighting, Power generators, etc.). In addition, the participants noted that: "boundaries between work groups should be crossed without hierarchical barriers,

restrictions or formalized structures". In this case, they suggested that: "moving team members from one team to another, not also internally but even externally, for knowledge transfer and motivation is another good practice".

4.3 People to facilitate and drive the process

In this study, participants were asked to discuss how KM is implemented, whether changes should be made to implement KM techniques or whether KM can be implemented into their airport. All participants also confirmed the requirements for knowledge transfer. These requirements included improved transparency regarding their workforce's skills, qualifications, abilities and required training, as well as the potential to swiftly identify required resources within other areas of the airport. The main difficulties were seen in constructing a competence base relevant to the department process, while minimizing the effort for the team to update installation profiles. The research also found other important factors to consider in any airport including the characteristics of the knowledge recipient (e.g. airport users or passengers), the characteristics of the knowledge source and the context in which the transfer occurs.

Another important factor to consider involves the characteristics of the lessons learnt from working in new responsibility areas. "A problem can easily occur during maintenance operations over complex and new installations although extensive training courses have been carried out", said an engineer. When this happens, the participant suggested that: "many failures in maintenance can come from these transitions". In this regard, another participant suggested that: "the implementation of the process and knowledge management tool allowed them to address issues within the corresponding time frame and date thorough a calendar enabling the right answer at the right time at first, making also possible a better deployment of the poles of competence under certain circumstances".

Given the factors mentioned above, an engineer said that: "sometimes, a team member's lack of motivation can result in poor transfer of knowledge". "When this happens, their first reaction was to contact someone in the team", the engineer said. In this regard, one commenter pointed to "training initiatives in creativity and experimentation as being counter-points to organized airport activity, and that: "the AEMD tried to pay attention to the relationship between the knowledge giver and the receiver". In fact, many interviewees expressed the belief that their manager should be aware of the importance of KM and its processes and they suggested that: "if the relationship was distant and lacked communication, for example, then knowledge transfer was less likely to occur".

4.4 The team leader (leadership)

Many interviewees suggested that managers, at various levels of management, have an important role in encouraging employees to share knowledge. Regarding this, interviewees agreed that leadership practices and behaviours of the managers are a major factor in the success of knowledge sharing. The participants noted that: "the required attributes for this role included tolerance of mistakes, developing trust, increasing motivation to share knowledge, empowering subordinates and building a long-term perspective of the organizational goals among employees".

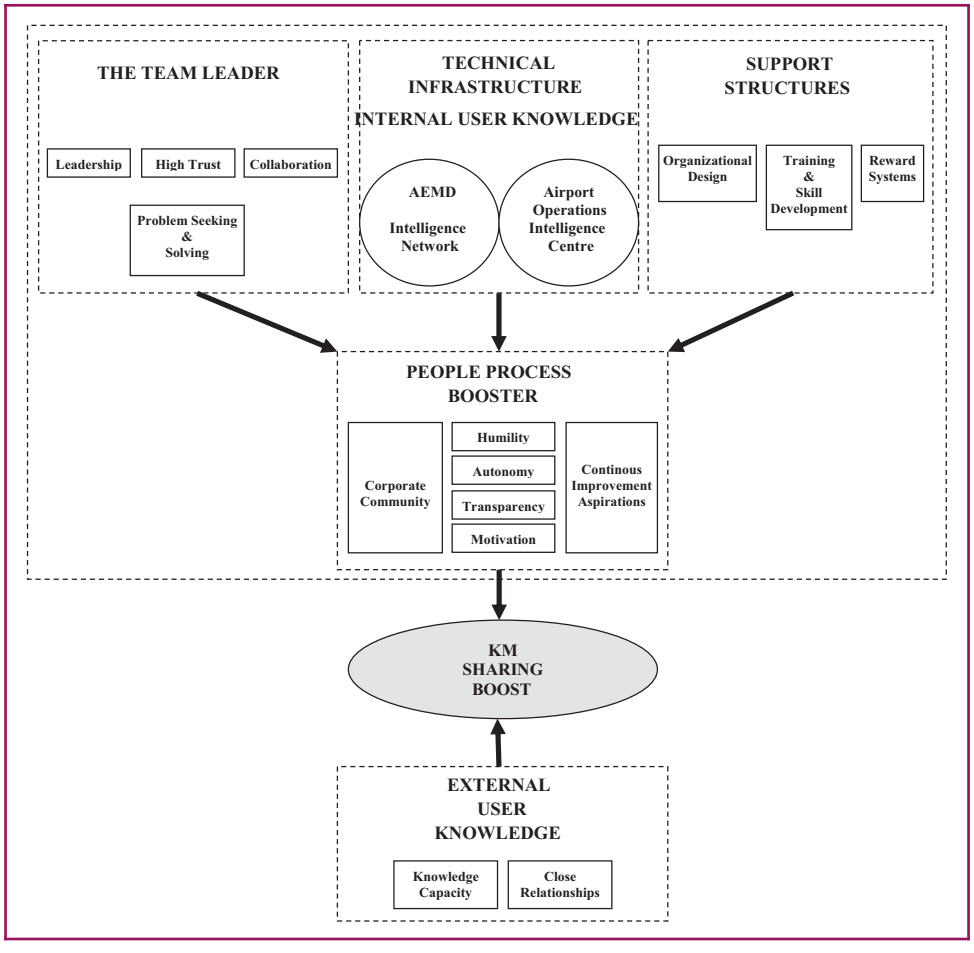
The manager suggested that: "one means of fostering knowledge transfer was to encourage a problem-seeking and problem-solving culture at the department. He further suggested that: "in their department all members were encouraged to adopt an attitude of a continuous improvement and learning. This attitude is focused on a value that is important to the airport, such as customer service". Regarding this, one engineer proposed that "today's airport system is production-centred rather than customer-centred, a model that creates fragmentation from the customers perspective". Therefore, knowledge sharing could then be encouraged around each value, a model that creates a complete picture of a customer's service path.

The manager also highlighted "the importance of effectively selecting issues and distributing responsibilities". The manager also identified a number of spontaneous knowledge and network management practices that had grown out of various engineering and maintenance actions, some practices of which have had a low level of formalization and explication. Furthermore, other engineer concluded that "some of the lessons learnt from working with one installation are readily transferable to other similar installations". In doing so, other commentators emphasised that managers should support "mentoring, teamwork, chat rooms, personal intranets and opportunities for face-to-face conversations such as group dialogue or personal reflections on experiences and lessons learned complementarily supported through the previously described knowledge management tools".

5. Discussion

The extreme variability in airport engineering and maintenance practices in which there is strong scientific evidence and a high degree of expert consensus about efficient practices indicates that current dissemination efforts fail to reach many users and passengers. It also indicates that there are insufficient tools and incentives to promote the rapid adoption of knowledge practices (Ribeiro De Almeida, 2012). Therefore, the first contribution of this research derives from the presented model. The framework shown in Figure 3 integrates the key factors discussed in the findings that can lead to more effective knowledge transfer in AEMD. The potential benefits of implementing this framework are multi-faceted and significant. First, while an engineering and maintenance process management technology

Figure 3 A framework for development of knowledge transfer by AEMD



system is a useful starting point, most AEMD may find it necessary to complement this system that supports and rewards knowledge sharing. Second, not only does this framework help the recipient dig beneath the explicit knowledge and gain more in depth insights, but it can also provide a two-way benefit in that dialogue between the conveyor of the efficient practice and the recipient can enrich the knowledge of other airport staff.

As shown in Figure 3, the context in which members are able to learn from infrastructure needs, is customized and based on four frameworks:

1. technical infrastructure;
2. people to facilitate and drive the process;
3. system that supports and rewards sharing; and
4. the team leader.

Based on the findings of the study, some recommendations were made for improving the knowledge processes of the AEMD. Moreover, and also in Figure 3, in an attempt to enable knowledge transfer, a special emphasis must be placed on the team leader and the technical infrastructure of the AEMD. Developing these key qualities has strategic importance for any AEMD, and offers clear benefits for all parties involved. Benefits include raising productivity, streamlining progress, fostering innovation, increasing department effectiveness and ensuring maximum competitiveness (Stefl, 2002; Brakensiek, 2002).

From the technician's point of view, the transfer of personal and scientific information will facilitate the understanding of the content of their engineering records and the options for future deployment. In addition, this may allow them to feel more comfortable and less anxious. Under this framework, the team is the source of control in contrast to the traditional airport services, where the coordinators determine the time, place and type of maintenance provided, fostering the required autonomy and thereof the desired efficiency and service quality. This confirms as the position adopted by Drake and Bethan (2006) when they argue that technicians perceive not only organizational benefits from the use of KM practices but also personal benefits such as reduced anxiety and feelings of isolation under certain circumstances.

At the organizational level, there is a potential problem with the above suggestions in the fact that mistakes identified by the AEMD may not indicate that an airport should change its existing routines and procedures. This observation is based on the fact that in complex environments, team interpretations may deviate widely and thus change may only be appropriate if there is some coherence structure at the organizational level (Martelo-Landroguez and Cegarra-Navarro, 2014). By doing so, this study unpacks the concept of a KM tool by identifying two broad structures (i.e. the department intelligence network and the airport operations intelligence centre) that facilitate the development and implementation of new knowledge at the organizational level. These results support the suggestion of Pavia (2001) that organizations need to be effective at collecting and analysing market data, screening and organizing these data into knowledge useful to decision-making at the organizational level.

The second contribution of this research is aimed at documenting the essential features of KM practices, giving pointers to relevant experts in that practice, deducing general guidelines, diffusing basic information and using subject matter experts to apply and adapt the practices in an AEMD context. This study supports that KM practices require to be actively promoted; otherwise, the AEMD team may end up with databases and people that are under-used and not fulfilling their potential. The results further suggest that AEMD must maintain an appropriate balance between external and internal sources of knowledge. While external triggers such as passenger and users' or internal triggers such as airport staff's complaints, suggestions or even questions are the main drivers for learning new critical norms and routines, internal processes to solve the needs of customers and other airport staff are the main enablers for the active and voluntary participation of technicians,

coordinators or engineers. This finding is important, as it is through people that deep knowledge is transferred. In doing so, AEMD leaders need to reinforce not only the KM-related tools but also, and even more important, the environment in which technicians, customers and other airport staff operate and provide them with the means to survive in the context of the competitive knowledge-based economy.

In practical terms, the AEMD leader plays a key role in identifying services that have been particularly innovative or effective in meeting specific airport needs. The leader can also encourage AEMD members to share their experience so that others can benefit by using or adapting original ideas to suit their own circumstances. From the user's point of view, the use of the KME&MP not only helps the AEMD members to delve beneath the explicit knowledge and gain more in-depth insights but it can also provide a matching benefit to airport users (e.g. passengers) in terms of the utilization of new routines and technologies.

These findings have a number of implications for both practice and research. Survival and success of AEMD in the long term requires airport administrators to meet the challenge of updating existing knowledge and combining it with knowledge created and acquired by the AEMD staff or external users. The skills and knowledge required of the AEMD staff are diverse and in general demand intuitive interpretations and process mapping which are all core ingredients for a KM program (Pitt and Brown, 2001). This study has closely examined how to counteract the negative effects of poorly organized knowledge in this particular context. Therefore, the airport industry and other service industries that have to face similar issues could benefit from the collective insights and the best practices shown in Figure 3.

In practical terms, mangers must foster potential enablers so that employees get easily encouraged to share knowledge. In doing so, this study posits evidence about how different organizational factors (e.g. mistake tolerance, leadership or problem-seeking and solving culture) can be managed to develop a knowledge culture and to enhance the understanding of a customer-centred value creation model in an AEMD. In addition, the technical infrastructure, built around an intranet portal over an access data base, is considered to be an easy-access knowledge base tool facilitating immediate information recovery and spread within the Intelligence Network and the Airport Operations Intelligence Centre (AEMD). This study has gone further to argue that supporting knowledge structures, such as organizational design, training and rewards, may improve process flow that enable an easy interaction between man and machine, which, in turn, can lead to the use of the technical infrastructure more effectively.

The AEMD is not alone in the challenge posed by balancing people and technology. Several authors have commented on this (Cegarra *et al.*, 2011; Vouros, 2003; Gressgård *et al.*, 2014). This sub-optimal equilibrium is evidence by the fact that many overburdened AEMD members are forced to curtail their activities with respect to searching for and investigating different source of knowledge. Thus, they may not be actively listening to their managers or other external users, they may be over-investing in the development of outdated initiatives or they may be under-investing in mechanisms to translate what is learnt from a particular situation into an appropriate action plan. In addition, time to knowledge share is seen as important by interviewees but being realistic time in AEMD is always a scarce commodity – so AEMD members need to be encouraged to facilitate the whole process. The presence of factors such as corporate community, humility, autonomy, transparency, motivation and overall continuous improvement aspirations enable AEMD members to overcome these challenges, replace poor practices and also reduce costs through better productivity and efficiency (e.g. by minimising unnecessary work caused by the use of ineffective methods).

The study has some limitations. Any airport organization wishing to implement a KM context must understand what the infrastructure service implies. Nevertheless, the response to this issue is complex, as the differential values that staff members have can be intangible and heterogeneous in nature. Furthermore, the management of these

elements will be different, depending on the type of speciality, its structure and the strategy of the department. Therefore, other factors which have not been included in this study are also likely to affect any knowledge transfer. Furthermore, conducting this type of single case study (an interview-based case study approach) should be understood foremost as a prelude to further study, i.e. as an exploratory device or a pilot case where issues are identified rather than hypotheses tested. Although subjective information is common in several studies, the inclusion of objective measures will add validity and reliability to the study. In addition, as our sample is composed by only 11 respondents, it would be good if the study goes a stage further and tests the model shown in Figure 3 with empirical data.

Taking into account its limitations, this study provides a clear indication of a variety of directions for further research potentially leading to practical improvements in this domain. One of such projects could aim at extending the range of indicators and measures by identifying common measures for customers, technicians, staff, managers and board members. Another possible research could examine how customers and technicians can contribute to knowledge transfer. For instance, even they could provide information about technologies and standardization issues. Technicians can disclose the problems that they have experienced by using technologies, as well as their countermeasures. Finally, future quantitative studies including common measures for customers, technicians, staff, managers and board members may help improve the rigour of the findings.

6. Conclusions

This paper investigates the nature of what has been referred to as KME&MP, which is based on four distinct components. In an applied sense, the model provides AEMD members with identifiable factors, which enable the four components of the program and indicating appropriate structures to develop new knowledge at both the individual and the organizational levels. Our findings suggest that AEMD require every department member to cooperate and communicate with all airport users, not only internal but also external ones under the required procedures and circumstances. This includes external users (e.g. passengers) and internal users (e.g. managers, engineers, coordinators, technicians and any other airport staff) that provide airport services not only to external customers but also to internal ones. By being closer to all stakeholders, an airport can work towards improved levels of service and the adoption of better knowledge structures for attracting traffic. Put another way, through cooperation and communication, the most comprehensive airport service will become more achievable.

The benefits of KME&MP are not limited to supporting AEMD members, their functions also act as a complement to airlines and passengers among others that contribute greatly to the development of the KME&MP. An example of this would be the technical infrastructure, one of the key structures of a KM program. This is where contacts with the external users are stored and AEMD plans are established. These varied outcomes of the AEMD plans potentially facilitate the improvement of quality, service flexibility, adaptability and effectiveness. However, despite the opportunities that KM programs potentially offers few, if any, studies have considered the ways in which airports can facilitate the implementation and use of these programs. With the ideas contained in this paper, it is taken a first step towards providing ways and approaches to make appropriate KM programs in the development of more useful, interactive and accountable services to small-sized airports.

Note

1. For stylistic parsimony, this study makes use of the term “manager” through, whenever it is referring to group “B”.

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