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An Explanatory Case Study on Passenger Service Systems Adoption: A Taiwanese Air Carrier

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Abstract

This study explains the adoption of Passenger Service Systems (PSS) in airlines through the lens of Inter-organizational Systems adoption and home-region orientation. It examined 20 causal factors influencing PSS adoption and tested an original research model in the technology–organization–environment context, by applying transactional cost theory and neo-institutional theory. Prior to a cross-case study across multiple airlines, the explanatory single-case research analyzed interview data from four informants with a Taiwanese carrier and multiple industry reports; the key findings highlight: (i) interoperable functionality and industry standards as external technological drivers strongly influenced full conversion to the PSS platform; (ii) within the organizational context, commitment to global network, organizational transformation and top management support were identified as salient internal factors in decision-making and resource allocation, while normative pressures from an alliance body exerted a stronger influence over the airline than any other isomorphic forces; and (iii) in the context of environment, full conversion was also facilitated by PSS vendors and powered by the need for mutual worldwide learning to effectively operate foreign markets from home region. This in-depth case study provides insights that PSS in a common-use environment can bring business value to PSS user airlines in accessing a broader global market, offering greater competitive services and expanding distribution channels. To increase causality and generalizability, future work involving an embedded multi-case study with three East Asian carriers will be undertaken.

Keywords: passenger service systems adoption, inter-organizational systems, home-region orientation, the TOE framework, explanatory case study research

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Introduction

"A significant majority of airlines are looking at the platform. The decision requires [sic] a very complicated process, probably the largest airline IT migration in history." (Iatrou and Oretti, 2007, p. 82).

Information Systems (IS) play a pivotal role in air travel distribution and passenger services (Belobaba and Odoni, 2009; Lee et al., 2017). The transformation of IS applications for online air booking, electronic ticketing, and passenger processing has been empowered by information technology (IT). Despite this, empirical research on the recent evolution of automated passenger sales and services has become limited (Benckendorff et al., 2014; Lee et al., 2015). Moreover, while airlines have adopted Passenger Service Systems (PSS), PSS-related literature is in infancy, and empirical research on PSS adoption has been rare (Iatrou and Oretti, 2007; Lee et al., 2017). An extensive literature review on IS adoption and International Business (IB) strategy leads to the following questions: *Why do airlines adopt PSS? How do different factors influence PSS adoption? How will PSS have an impact on the airline business?*

This work has twin goals to (i) test factors influencing PSS adoption and a research model within the technology–organization–environment (TOE) mode and (ii) identify business value from PSS; based on a single-case design, this explanatory study represents the interactions of PSS adoption factors in cause-and-effect relationships on the TOE framework.

This paper begins with a discussion on the industry background. Then, a series of literature review reporting the technological change as well as the competitive environment in airlines and the emergence of PSS continues. The next section presents the research framework in view of IS and IB, and the design of this study is outlined. An in-depth single case with a Taiwanese airline in a qualitative approach then follows to examine 20 causal factors in the adoption in the TOE contexts and portrays how PSS bring business value to the airline. The findings and conclusions, including a blueprint for following a multi-case study, are finally summarized. This empirical research significantly contributes to both academia and the industry; theoretical interpretation and in-depth analysis could offer transferable insights and knowledge to comparable practices in airlines, and potentially in other global enterprises.

Industry Background

Before proceeding to the literature review, it is important to understand a threefold challenge for the innovation in airline business: (i) transformation into open systems (Benckendorff et al., 2014; Merten, 2008); (ii) the formation of global networks with partners (Silva, 2012; Tugores-García, 2012); and (iii) seamless services using a common platform (Belobaba and Odoni, 2009; Iatrou and Oretti, 2007).

Transformation into open systems

One of the limitations to IT systems is that independently developed software in different organizations may be incompatible. Automated IS cannot fully communicate with each other when they are coded by different computer languages in a heterogeneous network (Merten, 2008). Similarly, airline reservation systems were programmed in the 1960/70s in incompatible legacy technologies and now-obsolete languages. The biggest IT challenge in airline distribution is making a synchronization of travel information in a cost-effective way among the different reservation software (Benckendorff et al., 2014). With the advent of the Internet, there has been a trend towards open standards that enable airlines not only to facilitate cross-platform compatibility and open-source access between the different channels but also to reduce the overall IT and transaction costs (Benckendorff et al., 2014). This fundamental shift to open architecture was initiated by an aviation authority, the International Air Transport Association (IATA), in the early-2000s;

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institutional changes have compressed airlines' legacy applications and components into the reservation systems which are due for a replacement to meet requirements for technical advances.

Global network with partners

International airlines have developed "a larger and denser global network" since the 1990s (Tugores-García, 2012, p. 49), seeking a global reach due to the impact of deregulation and the emergence of low-fare carriers; network refers to "a collection of actors who have joined together to share useful information/knowledge with other members to achieve organizational goals" (Hwang, 2004, p. 168). As such, international carriers operate a comprehensive distribution network with partners in collaboration, thereby achieving a global reach (Belobaba and Odoni, 2009). A strategic partnership in an alliance facilitates inter-organizational learning and knowledge sharing in organizational IT systems adoption (Cummings, 2004; Feng et al., 2014). As an example, code-sharing—a strategic agreement to jointly coordinate the flow of passengers as well as to share resources (e.g., customer profiles, check-in kiosks, and ground facilities) between two air carriers—is a typical case of enlarging a global airline network together (Silva, 2012). In this situation, an airline must consider both its own schedules and the coordinated schedules of its partners, so that a flight connection, seamless travel and shared services for passengers can be ensured across the globe (Benckendorff et al., 2014). The development of such a global network requires substantial investment and considerable time and resources for adopting a new IS with strategic partners.

Seamless and common services

Air carriers have been collaborating to adopt emerging technologies and cost-effective IT operations with their industry stakeholders. For example, in the early 2000s, a leading airline alliance and its multiple member carriers, together with IT service providers, launched joint projects to integrate passenger services under a joint plan for simplifying airline business, improving customer satisfaction and cutting back on costs. The vision that they proposed was a 'common IT platform' based on new industry standards; the platform provides all participating airlines with improved passenger flow and seamless air travel in a resource-efficient and cost-effective manner (Barnhart and Smith, 2012). In line with these initiatives, building a facility such as PSS "in a single, common-use resource with IT" (Briody, 2004, p. 1) was designed to enable collaboration in passenger sales and processing, enhance technical interoperability and lower development costs through common information management. Airlines are consequently required to migrate independent software and in-house databases to a shared platform and a single data repository for seamless and common services for travelers (Iatrou and Oretti, 2007).

Literature Review

Considering the research domain and context in an applied setting as an interdisciplinary study as shown in Figure 1, this section covers the review of the adoption of Inter-organizational Systems (IOS), the TOE framework, the tendency of home-region orientation (HRO) in airlines, key features of PSS and overview of existing studies on PSS adoption and two underlying theories.

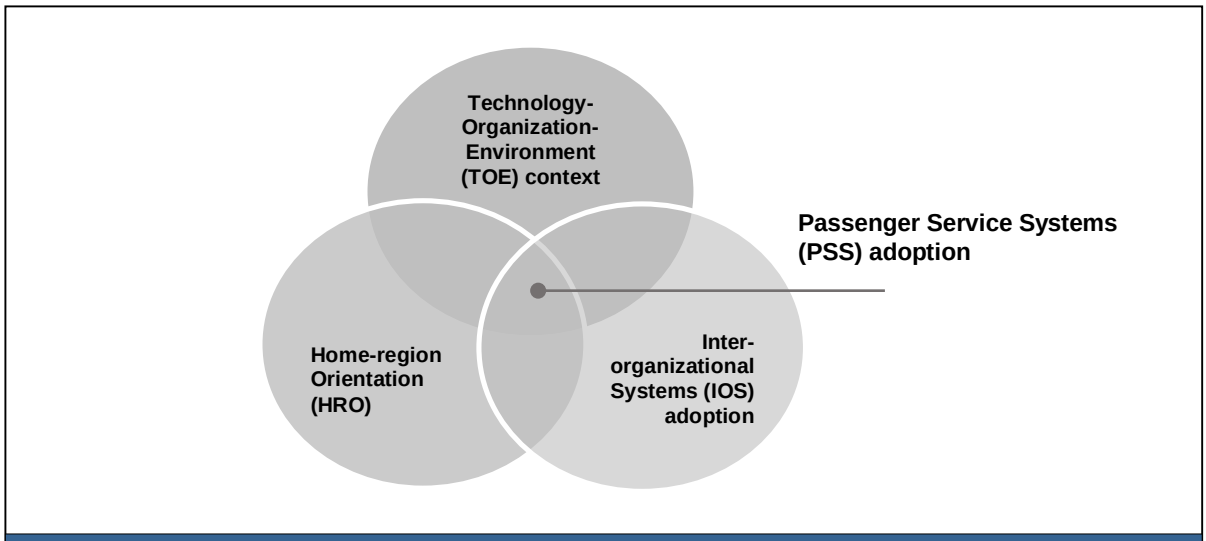

Figure 1 - Theoretical Positioning of the Research

Overview of IOS

IS researchers recognize airline reservation systems used in commercial airlines as a type of IOS (Chatfield and Bjørn-Andersen, 1997; Chismar and Meier, 1992; Lee et al., 2017; Swanson, 1994); an IOS is one of the IT systems that "interconnects different firms' internal systems to support information sharing" (Lee and Wang, 2016, p. 52). The key role of IOS is to enable organizations to enhance competitive advantage and improve the resource-efficiency (Cash and Konsynski, 1985). With the advances of the open standards, IOS adopters facilitate effective information-sharing and wider collaboration through the electronic integration, thereby providing themselves and their strategic partners with pooled information resources such as shared databases (Mandal, 2016; Robey et al., 2008).

Definition of IOS Adoption

Kwon and Zmud (1987) introduced a six-stage IS implementation model incorporating: initiation, adoption, adaptation, acceptance, routinization, and infusion. The model has been extensively applied to empirical studies on the implementation of IS (Lyytinen and Damsgaard, 2011). A four-stage model, including initiation, adoption, implementation, and routinization, was also examined (Vaidya, 2012). Although scholars split the IS implementation process into various stages, these models fit primarily into three phases, consistent with Rogers' (2010) model combining initiation, adoption and routinization stages (Hameed and Counsell, 2014). Similarly, IOS implementation can be seen as having three stages from a project management perspective: pre-adoption, adoption, and post-adoption (Zhu et al., 2006). In this case, the outcome within the adoption stage may involve three activities: (i) *decision-making* (i.e., a firm's managerial decision to be an IOS adopter); (ii) *resource allocation* (i.e., a firm's readiness of the materials and experts); and (iii) *full conversion* (i.e., a widespread use in a firm after the initial cut-over) (Lee et al., 2017); this definition is useful to explain the complex phenomenon of IOS adoption across different firms in different markets over time where diverse contexts overlap, such as PSS adoption by airlines (Lee et al, 2015; Vaidya, 2012).

TOE Framework

Many IS studies demonstrate that IOS adoption occurs at the individual level and/or at the enterprise level. The individual-level frameworks, including the Unified Theory of Acceptance, the Theory of Planned Behavior and the Technology Acceptance Model, have been used to explain an individual user's behavior over a generic set of technologies (Oliveira and

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Martins, 2011). In contrast, the TOE framework is known as a useful theoretical tool explaining the phenomena of IOS adoption on a firm level (Tornatzky and Fleischer, 1990). TOE boils down to the triad of a firm's context to identify context-specific factors by which the firm adopts technologies (Baker, 2012): (i) the *technology context* refers to both the characteristic technologies and emerging technologies, which can be internally appropriate and be available externally; (ii) the *organization context* is related to the characteristics and resources of the enterprise; and (iii) the *environment context* describes industry of market structure, institutional environment and stakeholder presence/absence (Baker, 2012). TOE has been supported in numerous empirical studies addressing different facets of the phenomenon of IOS at two loci simultaneously. Also, there is a strength that both quantitative and qualitative methods can be well incorporated in TOE supporting diverse forms of data (Abu-Khadra and Ziadat, 2012; Gibbs, 2002; Munkvold, 2005; Oliveira and Martins, 2011; Uwizeyemungu and Raymond, 2011)

HRO in Airlines

Most airline companies operate multi-nationally and own regional subsidiaries while having highly skilled personnel and automated equipment in the countries where their headquarters are located (Munkvold, 2005; Lee et al., 2017). In particular, major Asian carriers operate on an intra-regional basis, exhibiting a high-level regional nature in sales, assets, equipment, and resources within their home region—the Asia Pacific (Collinson and Rugman, 2007; Lee et al., 2017).

HRO in IB refers to the propensity of multinational enterprises to expand within their home regions (Banalieva and Dhanaraj, 2013; Rugman and Verbeke, 2008). Compared to manufacturing, this tendency is more intensified in the service sector, including the air transport industry (Lee and Marvel, 2009). The empirical evidence explains why full-service airlines have tended to focus on domestic markets or short-haul routes in a region (Rieple and Helm, 2008). Banalieva and Dhanaraj (2013) introduced a theoretical model that *technological advantage* and *institutional diversity* work as driving forces to a multinational company innovative transformation from its home region to global markets; the two constructs in HRO can be used to address a firm's global expansion and its business value. Their model outlines that a service multinational with a higher level of technological innovation and institutional landscapes might lead to a stronger global orientation (Lee et al., 2017; Wolf et al., 2012). Technological innovation derives from intangible assets, such as IOS and information in IOS, and institutional diversity comes to the variation in the institutional considerations across the foreign markets within the home region.

Consequently, a firm's innovation in a changing institutional environment provides its business with a competitiveness to (i) access global markets; (ii) overcome challenges when increasing distance from the home country; (iii) enlarge global distribution channels; and (iv) reduce the costs via the channels (Zahra et al., 2000). For instance, an airline's expansion into other countries and its wider global network can through scheduling inter-connection on a real-time basis be achieved by the airline's technological advancement and institutional diversity towards the target markets (Banalieva and Dhanaraj, 2013; Belobaba and Odoni, 2009; Button, 2009).

International airlines operate in diverse technical and institutional environments (Kostova et al., 2008). While experiencing IT-enabled transformations as well as regulatory changes in institutions, they expand their global reach (Brueckner and Flores-Fillol, 2007). When traditional airlines initially implemented their reservation systems in the 1970s–1980s, they focused mostly on 'domestic' markets and short-haul routes in 'one region', and mainly operated in 'a few countries' (Rieple and Helm, 2008). Due to the impact of deregulation (known as 'open skies'), the emergence of low-fare carriers and the expansion of alliances in the 2000s,

however, the liberalization of aviation industry has become a global phenomenon that airlines operate far from their home regions and pioneer for more profitable and less competitive markets (Tugores-García, 2012).

Today, such a globalization impetus brings technological challenges for evolving distribution channels in the regulated industry (Merten, 2008). In that sense, airlines may adopt the PSS platform to (i) raise global competitive advantage in air travel distribution; (ii) widen long-haul segments more efficiently; and (iii) reduce dependency on their home region (Belobaba and Odini, 2009).

Development of PSS

Technological innovation in airlines has reshaped overall passenger sales and services, and the proliferation of the air travel has made it indispensable for the airline industry to introduce new IT to cope with challenges of rising complexity, notably in *airline distribution* and *passenger processing* (Merten and Teufel, 2008). In the 1960s and 1970s, the development of the first-generation computer language and operating system on the mainframe computers revolutionized passenger sales and services (Copeland and McKenney, 1988). According to Merten (2008, pp. 81-82), "the first-generation airline reservation system" is referred to as an automated IT system which: (i) contains and simply handles flight schedules, seat availability and airfare/prices, (ii) enables airlines to book and issue coupons/tickets, and (iii) stores passenger name records. It is a combination of large IT/IS where every single air carrier either subscribes to an external platform communicated with multiple in-house facilities or operates its hybrid systems by making use of non-standardized data format for its own purposes (Rieple and Helm, 2008).

Meanwhile, in a bid to meet industry mandates (e.g., e-ticketing, online sales, and bar-coded boarding pass) and develop interfaces with the travel trade, air carriers might have invested significantly in their outdated central systems for the advanced distribution and service practices since the early 2000s. The emergence of the Internet in the mid-1990s also allowed airlines to refocus their strategy on technological innovation to raise competitiveness; a special focus was set on "the second-generation" airline core environment (Merten, 2008, p. 268) that enables airlines to (i) restructure central IS connecting complex distribution channels and passenger handling applications; (ii) reduce IT operating and distribution costs; and (iii) improve passenger services and satisfaction, by migrating from a stand-alone, legacy environment to a standardized, open-ended software commonly used with partners (Belobaba and Odoni, 2009). This revolutionary transformation was initiated by an airline alliance in the late 1990s; the founding members pioneered a new idea that a "common IT platform", which is based upon the same technology, might be used by the member carriers and even external airlines, thereby offering a seamless travel experience for customers through an industry-wide platform (Belobaba and Odoni, 2009, p. 453; Feldman, 2002, p. 59; Iatrou and Oretti, 2007, p. 81; Wu and Lee, 2014, p. 73). In general, a platform is designed to offer common services under shared subsystems (Meyera and DeToreb, 2001). Similarly, a PSS platform can provide multiple air carriers with interoperable functionality and commonly used technologies by sharing passenger information (e.g., about inter-line ticketing/pre-seating) through configurable applications on demand without technical intervention (Iatrou and Oretti, 2007), as shown in Figure 2.

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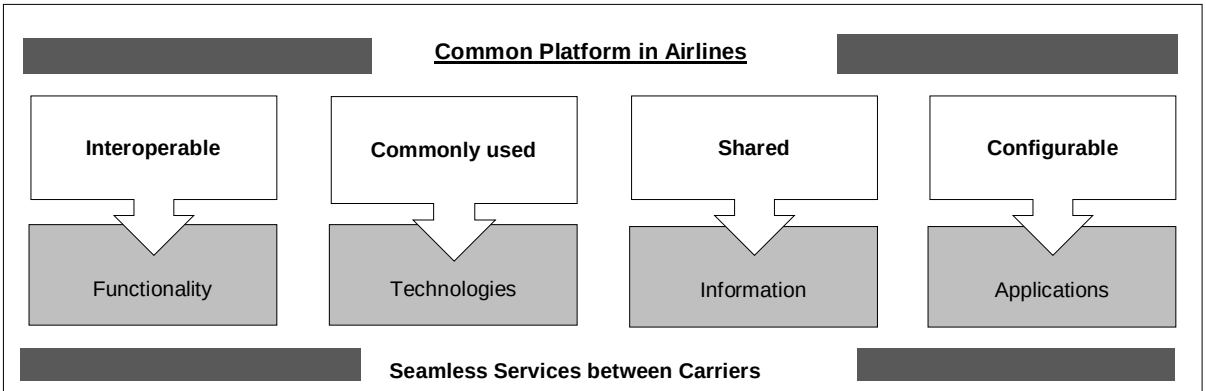

Figure 2 - Structure of PSS as Common Platform

These can function as *building blocks* that facilitate airlines catering to market demands and business strategies (Pandey et al., 2013). To sum up, PSS differ from legacy reservation systems in that: (i) they work as platforms that offer a set of *common application* and a *central repository of data*; (ii) the common platform is designed to provide *interoperable functionality* that enriches the industry mandate and *seamless services* between partners over the global network; and (iii) PSS based on *open systems* can be instantly and flexibly tailored by end users who are able to configure front-end applications without the need for specific assistance from IT developers in the airline (Benckendorff et al., 2014).

Studies on PSS Adoption

The evolution of air travel distribution and customer handling under the first-generation reservation systems has been subject to significant research (Buhalis and Laws, 2001; Chatfield and Bjørn-Andersen, 1997; Chismar and Meier, 1992; Copeland and McKenney, 1988; Inkpen, 1998; Prideaux, 2001; and Sheldon, 1997). However, while a multitude of quantitative research studies has been published, only a small number of studies on the related topic in qualitative research methods are identified. Moreover, the adoption of the second-generation distribution and IT service platform known as Passenger Service Systems[1] has been understudied (Lee et al., 2015; 2017). In the IS area, two of the few empirical contributions to unveiling features of PSS and reporting issues of PSS adoption in airlines are Källström's (2006) and Rieple and Helm's (2008) work. As an empirical case study with major European carriers in search of reducing costs and increasing yield, Källström (2006) interviewed with three PSS user airlines. His study claims that the PSS is designed to support strategic partnerships as well as to harmonize customer data across the adopters; the exploratory research revealed that 'the feasibility of a long-term cost reduction' and 'the access to leading-edge technology' worked as strategic drivers for selecting PSS. It also uncovered the expected 20 operational benefits as business value in terms of 'system-dependent', 'user-dependent' and 'business-dependent'.

Whereas relying on data from secondary sources, Rieple and Helm (2008, p. 281) released other case study findings on the motivation for PSS adoption where a descriptive comparative analysis was used. By investigating five legacy airlines—three from Europe and two from Australasia—, their study addressed that the adoption of a 'standard bought-in PSS' would enable the airlines to achieve 'significant cost savings' and remove 'redundant distribution costs' through more advanced distribution network within the PSS. It also found that sharing

[1] Even though this term has been used diversely in meaning by the aviation-related studies, it is commonly addressed in airlines and in academia, after a PSS vendor announced it in a press release: "Passenger service systems include reservation systems associated with inventory management and departure control…" (Finance, 2012, p. 2).

customer profiles through 'the highly compatible system' with 'strategic partners' for joint marketing might allow the five carriers to improve the competitive advantage over the 'off-the-shelf' product, as the PSS adopters could efficiently utilize it as an industry-wide platform.

Theoretical Frameworks

IOS-related studies have been interdisciplinary and multi-contextual where no single theory has dominated (Robey et al., 2008). As organizations linked by IOS become more globalized, it is advised that IS scholars: (i) capture the variety of IOS research domains; (ii) enrich theoretical development in the IOS area; and (iii) apply overarching theories in the field of global distribution to the themes of IOS (Elgarah et al., 2005). With a review of Vaidya's (2012) research on 32 theories about IOS adoption and Wolf et al.'s (2012) work on HRO deriving eight underlying theories, this study suggests applying two underlying theories from an interdisciplinary viewpoint of IS and IB (see Figure 3).

Transaction Cost Theory

Airlines have been constantly pressured by increased operation costs, hence lowering transaction fees and distribution costs for booking, ticketing and messaging via distribution channels becomes a critical managerial concern (Merten, 2008). In IS studies, transaction cost theory is widely used to analyze the impacts of IOS on transaction costs and structures; IS literature claims that IOS allows adopters to (i) decrease external and internal financial burdens associated with a transaction and (ii) increase operational efficiency (Vaidya, 2012).

From the IB perspective, a multinational service enterprise's transaction costs grow further when the country-level distance increases from its home region (Rugman and Oh, 2013); 'distance' refers not only to geographical distance but also to institutional distance. This implies that the firm's success in reducing the costs stems from its ability to adjust its firm-specific technological advantage (e.g., diverse technology standards, intangible proprietary assets, efficient distribution network) to the conditions that exist in its home region as well as to engage in institutional activities in cooperation with foreign partners (Banalieva and Dhanaraj, 2013); such firm-level technological capabilities in an institutional environment are interrelated to transaction cost reduction and global reach.

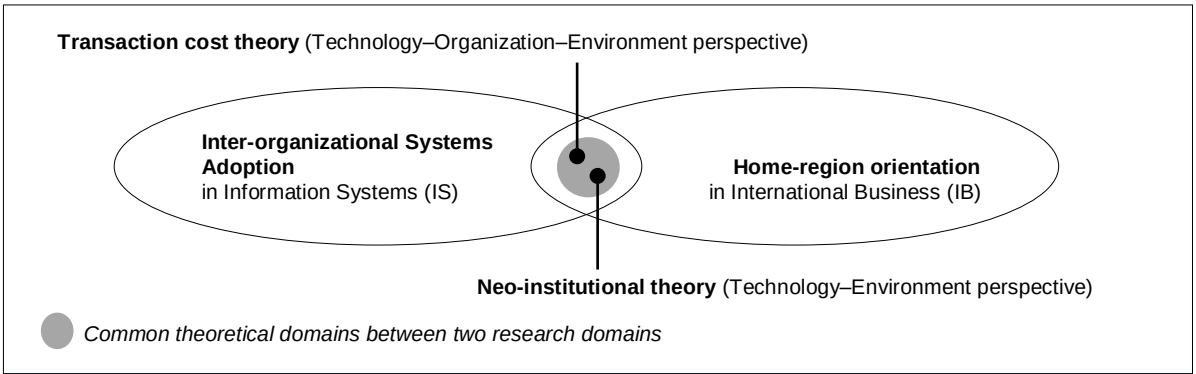

Figure 3 - Theoretical Commonality between IOS Adoption and HRO

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Neo-institutional Theory

Airline companies have experienced dramatic changes to the institutional and regulatory structures that govern travel markets and distribution networks (Button and McDougall, 2006). Institutional forces guide strategic changes and organizational innovation on multinationals (Vaidya, 2012). Neo-institutional theory represents organizations' adoption of rules and practices that may raise legitimacy in external stakeholders' points of view (DiMaggio and Powell, 1991). Many IS studies employ neo-institutional theory to investigate the influence of normative, regulative and institutional structures because an increased number of innovation-oriented firms suffer from isomorphic powers (i.e., normative, mimetic and coercive mechanisms) that trading partners and competitors intensively create (Dwivedi et al., 2011). In IS literature, this theory views IOS as organizational innovations and the isomorphic forces that influence IOS adoption.

Similarly, in HRO-related studies, the postulation of neo-institutional theory is that multinational executives cannot reliably judge the economic effects of their strategies (Banalieva and Dhanaraj, 2013). The theory argues that prior decisions and actions of partners, competitors and suppliers provide legitimization and information to a decision marked by uncertainty. As a result, in the case where a multinational's stakeholders become globally dependent, the firm may also have a strong tendency towards the global markets due to concomitant technical pressure and institutional concerns (Lee et al., 2017; Rugman and Oh, 2013).

(i) Technological context factors
(ii) Inter-/organizational context factors
(iii) Environmental context factors
(iv) Technological context factors
(v) Environmental context factors

IOS adoption perspective

HRO perspective

Design of the Study

A general principle for selecting case study protocol and instrument is to start with research questions (Nastasi and Hitchcock, 2015). Explanatory case study research seeks to explain why and/or how an event or events occurred. It presents "data bearing on cause-effect relationships" (Yin, 2012, p. 5); the case study should, therefore, be crosschecked with its research questions, and while the design of the study might be based on the nature of the research inquiries. In a bid to meet the aim of this explanatory study, the following a primary question and its sub-questions are proposed:

Research Questions

Why do airlines adopt PSS?
- How do different factors influence PSS adoption?
- How will PSS have an impact on the airline business?

PSS Adoption Factors

This explanatory case study is rooted in a deductive strategy to identify variables in PSS adoption within an *a priori* construct specification, examining them in accordance with a causal network of event-state display; an event-state network is used to display non-linear qualitative data in a flow of factors/outcomes (Miles et al., 2014). IS literature specifies diverse internal/external variables within TOE, and multiple IB studies on HRO also elucidate technology or environment variables that can be used as causal factors for this study; those factors can be arranged from the two theoretical perspectives:

Research Model

By referring to the literature on IOS adoption and HRO in multinational service firms, the *a priori* orienting constructs that may relate to PSS adoption are identified as theoretical variables through mixed coding skills in a deductive content analysis on secondary data sources and interview data (see Table 1).

Table 1 - Theoretical Constructs as Possible Factors in PSS Adoption

Locus	Context	Domain	**Variables** [20] * related to air travel & airline IT operation	Literature
Internal [10]	*Technology*	IOS	*Legacy systems**	Baker (2012) Banalieva and Dhanaraj (2013) Beckett and Myers (2018) Belobaba and Odini (2009) Benckendorff et al. (2014) Collinson and Rugman (2007) Curran and Thorpe (2013) Dimaggio and Powell (1983) Hassandoust (2016) Hwang (2004) Källström (2006) Kurnia et al. (2015) Laudon and Laudon (2005) Morton (1990) Munkvold (2005) Neiderman et al. (1991) Oz (2004) Reimers et al. (2010) Rieple and Helm (2008) Rugman and Verbeke (2008) Silva (2012) Tugores-García (2012) Vaidya (2012) Wolf et al. (2012) Zhang et al. (2013)
			*Common platform**	
			*IS personnel staffing**	
		HRO	*New technology development*	
			Functional differentiation	
	Organization (intra-)		*Top management support*	
			Expert training	
		IOS	*Global network**	
			*Seamless services**	
			Organizational transformation	
External [10]	*Technology*	IOS	*Industry standards*	
			Interoperable functionality	
	Organization (inter-)	IOS	*Normative forces (partners/vendors)*	
	Environment	IOS	*Mimetic forces (competitors)*	
			Coercive forces (regulatory)	
		HRO	*Foreign operations from home country*	
			Time-to-mark	
			Industry knowledge acquisition	
			Skills on a global scale	
			Mutual worldwide learning	

The rest of the factors, in the domain of air travel and airline IT operation, to be examined are also selected after the multiple coding works on the data sets. All factors within three TOE contexts (20 elements in total) are hence conceptually defined and addressed in meaning; they are listed in Appendix A. Based on the underlying models of IOS adoption and HRO, Figure 4 shows a synthesized research model that contains context-specific factors in PSS adoption. The original model differs from traditional TOE-based IOS adoption models in two points: First, the inter-organizational context is detached into an external PSS domain from the organizational context. It is because an IOS in a common-use environment enables adopters to engage in inter-organizational practices so that the IOS adopters can absorb the environmental/technological impacts resulting from the forces of trading partners (Lee et al., 2015; 2017).

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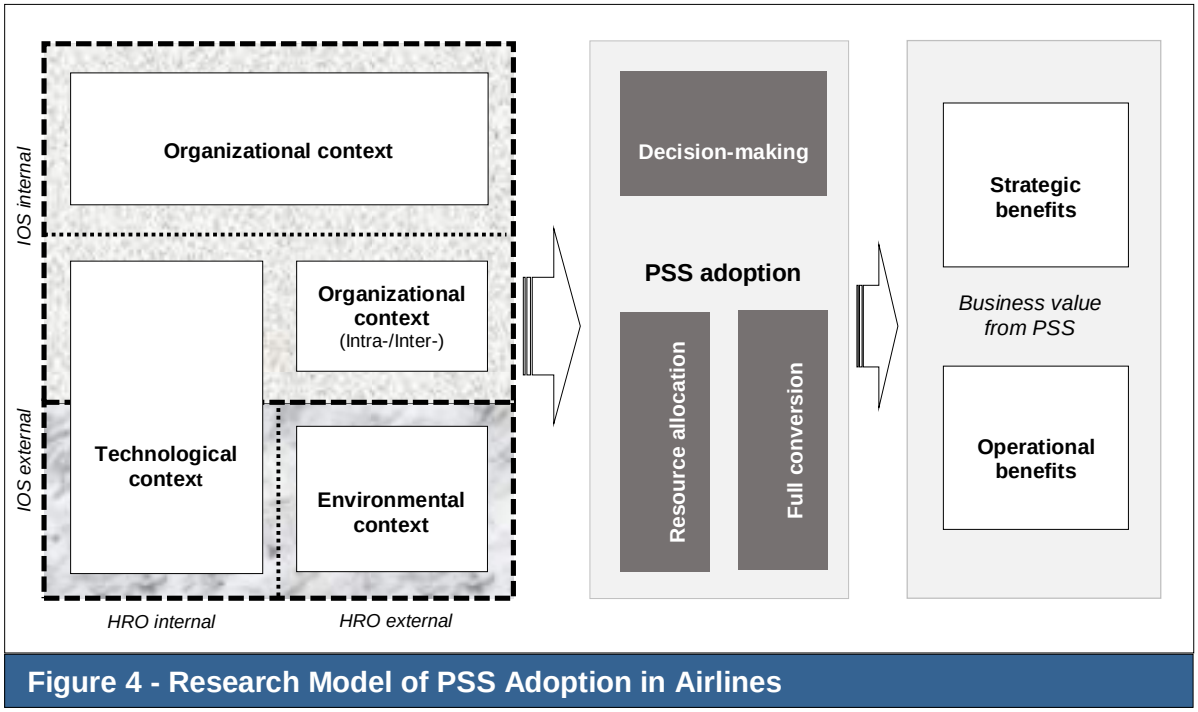

Figure 4 - Research Model of PSS Adoption in Airlines

Second, airlines expect to generate business value emanating from PSS in three dimensions (Dwivedi et al., 2011; Melville et al., 2004): (i) strategic benefits (e.g., competitive advantage, effectiveness); (ii) tactical benefits (e.g., quality customer service, a close relationship with technicians); and (iii) operational benefits (e.g., higher productivity, process efficiency). This study might focus on strategic and operational perspectives at the firm level, not on an individual/employee level (Robey et al., 2008; Vaidya, 2012). Hence, the business value after the adoption of PSS is more condensed into strategic and operational benefits.

Research Methodology

This section discusses the case study protocol, sampling, data collection, data analysis techniques, and qualitative coding skills.

Case Study Protocol

This research employs an in-depth single case study approach and adapts qualitative techniques, with a preliminary aim (i.e., within-case strategy) of testing identified causal factors in PSS adoption and explaining business value from PSS, prior to a multi-case study. Darke et al. (1998, p. 281) state that "single cases provide for an in-depth investigation and rich description, while multiple case-designs allow theoretical replication and cross-case comparison". This work is thus required to assure validity at the theoretical levels. To increase internal validity (i.e., causality) and construct validity in post-positivism, multiple sources of evidence are used (Bhattacherjee, 2012); the use of this multimethod research strategy for post-positivist case study is identified from the extant IS literature that sees IOS adoption in a firm; this tactic is relevant to encourage convergent lines of evidence by enabling investigators to address a broad range of managerial issues (Yin, 2009)

Sampling

Considering the nature of this study dealing with large-scale enterprise issues, the type of unit being analyzed is the *organization* (Yin, 2009). A qualitative case study at the organizational level usually works with small samples, by focusing on a case's unique contexts (Miles et al., 2014). This study uses reputational case selection, one of the strategies of purposive sampling, in choosing its interview participants; purposive sampling is appropriate in qualitative research for the selection of

information-rich cases where a researcher may use content analysis in particular and identifies a specific case for in-depth investigation (Neuman, 2003). In this study, voluntary interviewees were selected, by means of reputational case sampling, on the recommendation of key experts in the topic (Miles et al., 2014). They were therefore selected on a basis of professional skills; the participants, with their good command of English, were all airline IT and Sales professionals belonging to core teams in charge of the PSS Project Management Office in the airline.

Data Collection

Multiple data sources were used in this study, which included various secondary data and interview data (i.e., transcripts and field notes). Prior to collecting primary data through site visits, the secondary information was gathered from internally and publicly available sources: minutes/memos, industry reports, business websites, newspaper accounts and so on; the volume of secondary information was used for 'pre-understanding' of the in-depth case issues (Gummesson, 2000). Then, along with the consent forms, written interview questions combining eight open-ended and seven semi-structured questions were distributed to key informants by mail two times. The on-site interview in the head office of a Taiwanese airline ensued in May 2016. It was carried out in a natural setting, and all conversation was digitally recorded and documented in writing to be used as field notes. Each interview with senior-manager-level /middle-executive-level participants took about 60 minutes. Based on the general transcription conventions, transcript materials from the four respondents[2]were produced with minor editing work because of a few grammatical issues.

Data Analysis

In seeking to test theory, this study analyses two different data sets (i.e., primary data and secondary data) in *deductive content analysis*. Content analysis as a deductive method is chosen when research aims to test a previous theory in a different situation, by developing a temporary start list of codes based on theoretical evidence from secondary data (Elo and Kyngäs, 2008). With the provisional code list, interview data were closely reviewed for content/coded for exemplification of the identified categories. Figure 5 illustrates the process of content analysis used in this study.

Multiple Coding Methods

Coding in a quantitative manner refers to the process of converting data into a code using analytic techniques (Saldaña, 2003). Coding is a method that enables qualitative researchers to organize chunks of data (i.e., similar data) into categories in one stage or two stages: By grouping them together, categories appear like as "families" that share common characteristics in a repetitive pattern (Miles et al., 2014, p. 71). Categorizing is "how we get up from the diversity of data to the shape of the data, the sorts of things represented" to develop *themes* from categories (Richards and Morse, 2012, p. 157); themes are a set of extended phrases that identify what a unit of analysis is about, and a theme is used as an outcome of analytic reflection (Miles et al., 2014).

[2] According to an alliance's PSS Committee meeting minutes, most member airlines, except for a small number of mega carriers, have one or two director(s) and fewer than four project managers in the office.

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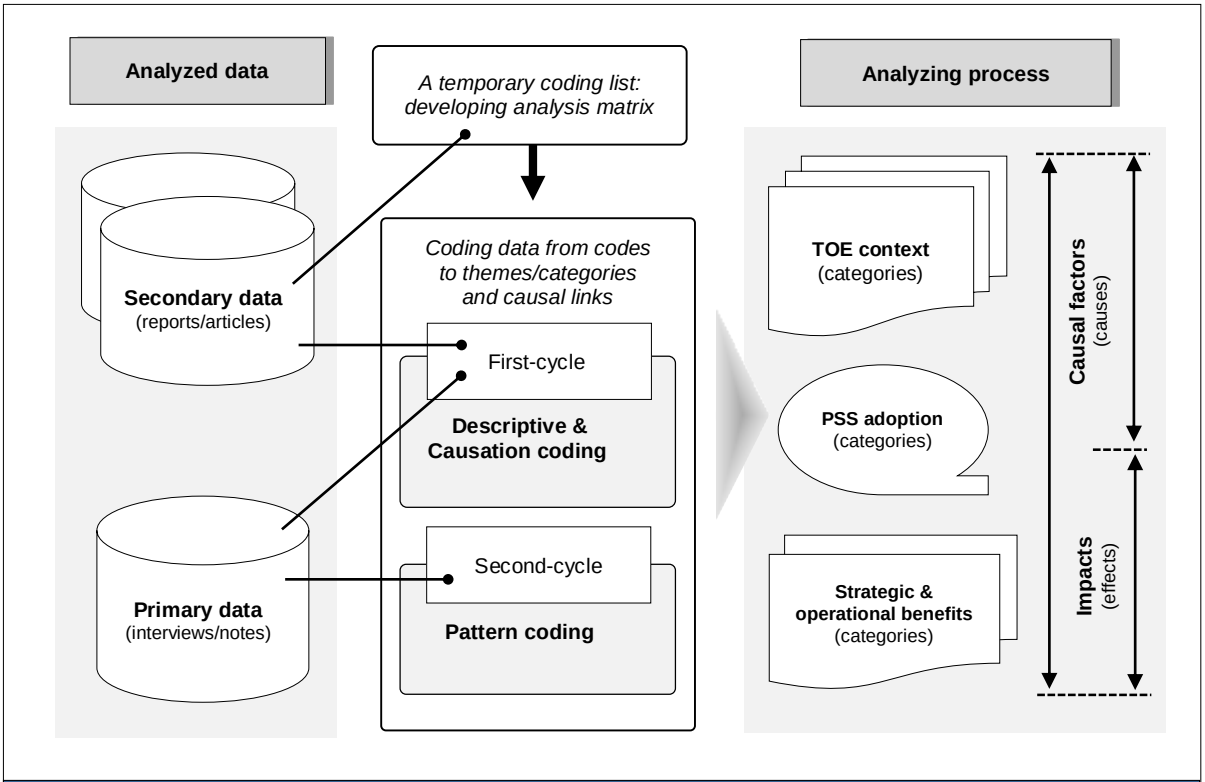


Figure 5 - Multiple Data Coding and Deductive Content Analysis

In this research, data coding was multiply undertaken, in two stages, along with an *eclectic coding* approach that combined *descriptive coding* and *causation coding* as the first-cycle codings. A *pattern coding* technique was then used in the second cycle; eclectic coding is applied when one coding method alone will not suffice, and two or more coding skills are desirable to capture the complex phenomena or processes in the data (Saldaña, 2015). Within the study, data coding was systemized by means of NVivo 10™. A spreadsheet table from MS-Excel and MS-Word were also used to develop the analysis matrix during the two-cycle coding stage as well as to assist data visualization.

First-cycle Coding

Descriptive coding "summarizes in a word or short phrase" and produces "codes that are identifications of the basic topic, not abbreviation of the content" (Saldaña, 2015, p. 88). This coding method is the essential groundwork for the second-cycle coding when researchers first analyze interview transcripts, field notes, reports and the data collected across various time periods.

Causation coding is generally applied during the next first-cycle coding process to extract causal beliefs from data and show why/how particular outcomes occurred. Saldaña (2015) claims that causation in today's interconnected world can range from individual issues to organizational phenomena, to other factors in various combinations. A causation coding skill is appropriate for discerning the complexity of influences on phenomena from institutional policies, international issues, and technological impacts, and for evaluating the efficacy of programs through visual means (Maxwell, 2012). Causation coding extracts three elements of an attribution: *the cause*, *the outcome* and *the link between the causes* and *the outcomes*, thereby attempting to map a three-part process in sequence: CODE 1 (antecedent variables) > CODE 2 (intervening variables) > CODE 3 (outcomes).

Second-cycle Coding

Pattern coding is involved in at the final point to pattern the codes and explains the flow of events and states; for instance, in what way the factors influenced PSS adoption, and

how such outcomes and business value from PSS came about. Likewise, descriptive coding, causation coding and pattern coding were used in a two-cycle coding stage of the study. Based on verbal expressions in transcripts and non-verbal motions or signals recorded in field notes, if necessary and meaningful, each variable was supplementally rated (e.g., critically, strongly) during the coding process. Some examples of coded, themes, categories and variables used within this study are listed in Appendix B.

Site Selection

A key to selecting a case site is the researchers' interests to explain the information-rich practices of PSS adoption. Against this background, Air Lepus, the pseudonym for a Taiwanese air carrier, was selected for the following reasons as a right study target. Air Lepus (ALP) is/was: (i) a full-service carrier and part of a leading alliance; (ii) home-region oriented; it currently holds the majority assets and where sales rely on its home country, while seeking a solid foundation in global network; (iii) an optimum comparable firm in business size and market position with those of the other two airlines for a subsequent multiple-case study; and (iv) keen on this research, thereby willing to share information on its PSS experience at the organizational level.

Company Overview

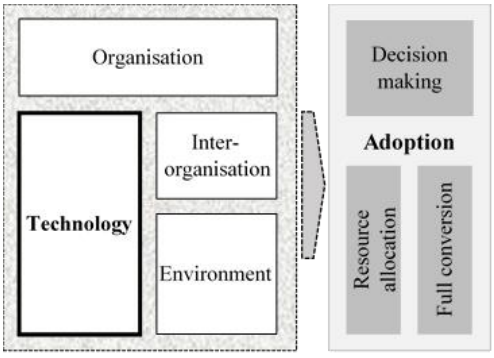
Air Lepus (ALP) was formed in 1989 as Taiwan's first privately owned commercial airline, headquartered in Taoyuan City. Currently, ALP owns regional head-offices in China and the United States. Since its first scheduled flight in 1991, Air Lepus has focused on short-haul services within a well-developed local air network, while continuing to establish a worldwide network of destinations across the globe and stretching from East Asia to Europe and North America; ALP's rapid expansion and increased capacity has been boosted after joining an airline alliance, in contrast to its regional competitors. With a two-year evaluation, Air Lepus adopted its PSS over three years, by issuing decision-making in 2013, allocating human/financial resources a year later and completing a full deployment on its domestic operating subsidiary in 2016 (see Appendix C); hence, its adoption stage fits into the aforementioned three phases. Air Lepus is one of the early PSS adopters within the East Asian region. It was publicly reported that the airline would select a full suite of PSS with the object of (i) improving the efficiency of its whole passenger processing; and (ii) expanding its global customer base (Amadeus, n.d.). Appendix D shows that its PSS consists of seven pivotal modules—three central systems of reservation; inventory management and departure control and four core subsystems, including air/non-air distribution channels; airline alliance applications; online sales software called as e-Commerce; and a set of value-added and ancillary packages.

Case Study Findings

This chapter presents the findings based on multiple secondary data sources and the interview responses, providing quotes from four voluntary research participants (see Appendix E) and further remarks identified within industry reports. Relying on 20 variables in Table 1, each non-linear causal mechanism is articulated through the refinement of analyzed themes and causal links, and then described within the TOE contexts.

Technological Context Factors

We have a distinctive vision and philosophy to manage flexible and huge IT systems. (Chief Executive Officer, Air Lepus; Amadeus, n.d.).



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Interoperable functionality and *industry standards* are integral technological factors in supporting the instantaneous processing and transmitting the critical data between strategic partners (Baker, 2012; Benckendorff et al., 2014). interoperability refers to the ability, through industry-wide standard and structured interfaces, of a system to work seamlessly with other systems (Roberts, 2015). This implies why full-service airlines reply on simultaneous processing to exchange numerous flight and passenger data. Before joining a leading global airline alliance, Air Lepus was facing the necessity of coordinating massive flight schedules in a standard setting and integrating common passenger services together with alliance carriers. In the words of Junior Vice President (JVP) of Computer Division:

"The external requirements of interoperable functionality and industry standards are key drivers behind [the adoption of PSS]. Because it was impossible for us to develop all requirements for industry mandates such as e-ticketing, code-sharing with partners and new service rules in airport processing <interoperable functionality>*. In the airline sector, that's why there is a recent trend moving to open platforms [that can] support common and industry standard* <industry standards>*."* (JVP, Computer Division)

It is because PSS on the basis of *common standards* and a shared infrastructure are designed for adopters to raise the level of interoperability and enrich compliance to the new mandates in the airline industry, thereby enabling airlines to replace *legacy reservation systems* on individual premises (Iatrou and Oretti, 2007). Senior Vice-president (SVP) with Computer Division added:

"*Well … eventually, these [two factors] worked a bit on our top manager before a decision [on PSS adoption] was made. Back in 2012, there was no choice when more than 80 requirements were given to join the target alliance, due to a lot of technological restrictions from our reservation systems software* <legacy systems>*. Technically, we realized that our mainframe applications were limited to support alliance compliance and common standards* <common platform>*. It was not a simple matter of reprogramming codes [in use] from scratch."* (SVP, Computer Division)

From several industry reports, it is identified that shifting to new industry standards has been strongly driven by the IATA, regulatory bodies and aviation authorities (Benckendorff et al., 2014). Likewise, ALP exemplifies why PSS adopters should facilitate seamless, integrated functions and open standards infrastructure for a high level of interoperability (Belobaba and Odoni, 2009).

Banalieva and Dhanaraj (2013) claim that *the development of new technology* and *demand for differentiation* are drivers of technological innovation because two factors can be converted into intangible assets that lead to competitive advantage and global orientation of service firms in international markets. From the onsite interview at Air Lepus, however, the respondents expressed considerably opposing views against what key studies on HRO have found. Meaningful comments from two informants, General Manager (GM) and SVP were as follows:

"Developing [something] new was a separate issue. Not necessarily we should consider new technology development on the past systems <new technology development> *because we only focused on using PSS well in future, and no more would waste money on hiring legacy systems programmers and old skills* <IT personnel staffing>… *Also, all users should know how to handle the common platform without a costly, complex process of customizing functions for us* <common platform>; <functional differentiation>*."* (GM, Program Development)

"The topic of developing new technology was not mainly considered during the decision-making process <new technology development>. *Requirements for airline IT become similar these days, and there is little [technological] difference between this PSS and that PSS* <functional differentiation>*. So, we reported to our top manager that without [additional] changes we would be*

satisfied with the quality [of PSS] … Once launched, a full implementation should be made over all [offices] to share common services with important partner airlines <strategic partners>." (SVP, Computer Division)

These intricate responses give this study alternative views and meaningful rival explanations that new technology development and functional differentiation as instances of technological innovation within the common environment of a service firm (e.g., an airline's PSS adoption) can be limited. In other words, this implication corresponds to the limitation of findings on the impact of HRO, and the phenomena of IOS adoption should be further empirically generalized in terms of service firms in a strategic partnership.

In sum, a combination of causal visual links in Figure 6 offers clearer evidence in a narrative mode: Two IOS-related antecedent events worked out first; *industry standards* driven by regulatory mandate of the aviation industry, coupled with the requirement of *interoperable functionality*, initially caused a strong, positive argument for replacing *legacy systems* in use. These two external trends eventually resulted in the aggressive full conversion of PSS as *common platform* that was also powered by ALP's partners. Another set of two antecedent variables (i.e., *new technology development* and *functional differentiation)* related to HRO were also identified.

The elements were understood to be more effectively supported by Air Lepus' in-house, independent IT environment; however, it turned out to be inviable options with PSS in which a philosophy of the common service processing was centered. In the meantime, the two technological factors led to another organizational concern in nature—*IT personnel staffing*. In conclusion, despite the identified advantages, all technological factors were analyzed as weak influences on the decision-making phase; together with *normative forces*, they positively influenced *full conversion* at the final stage of PSS adoption.

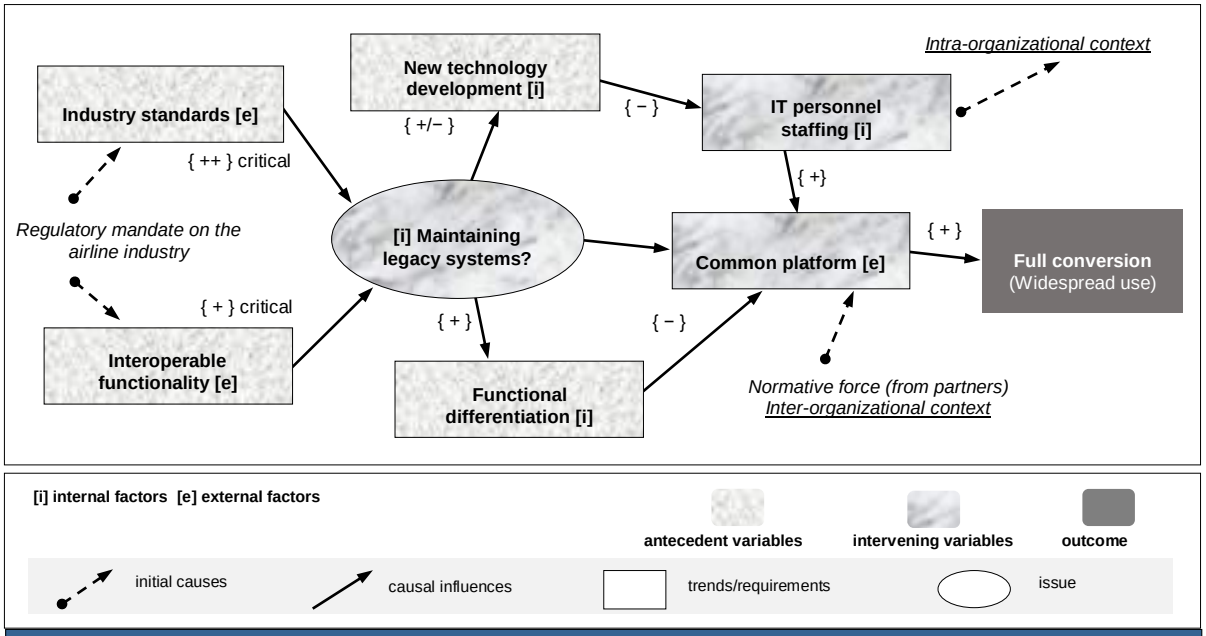

Figure 6 - Causal Map: Event-State Display in Technological Context

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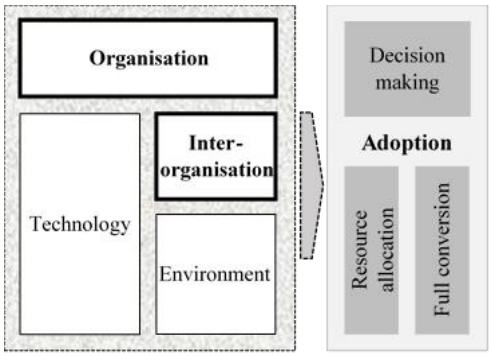
Organizational Context Factors

Marinus [pseudonym] is the ideal choice for our needs, particularly as the PSS has already been implemented by many of our partners, thereby allowing us to focus on delivering new initiatives and to enhancing partnership opportunities across the global alliance members. (Amadeus, n.d.).



Since the 1990s, many airlines have prospected a larger network and denser connections due to the impact of 'open skies' policies and the rise of low-cost carriers. They have turned their attention to *global reach,* by providing a comprehensive distribution network to customers worldwide (Belobaba and Odoni, 2009; Tugores-García, 2012). ALP's Executive Vice President (EVP) of Project Division spoke in a PSS-related industry seminar:

"We will have [destinations] over in 190 countries and more than 1,300 cities around the world. We are very confident that the change in IT platform will allow us to further expand our quality-focused service network and global customer base <global network> *and to ensure greater co-operation with the alliance. I am proud to say this is a right decision that we have made."* (EVP, PSS Project Division)

He continued to discuss *seamless worldwide services*, in particular, that:

"It is the obvious choice to improve our end-to-end customer services and offer a seamless experience together with members at a worldwide level, by making easier to issues tickets to passengers all the way to final destinations <seamless services>*."* (EVP, PSS Project Division)

In this context, there might be a theoretical thread of connections between the EVP's remarks and findings of Briody's (2004) and Silva's (2012) that airlines' innovated IT solutions would provide customers with seamless travel and enable the airlines to improve passenger flow and satisfaction. In addition, the need for greater strategic partnership, as an example of normative pressure from partners, through a broader range of collaboration via electronic integration is identified as an inter-organizational factor (Rieple and Helm, 2008). This external characteristic is differently addressed by the interviewees according to their responsibility and roles, however. This situation was revealed during the conversations:

"Pressure from our partners? … {with a wry smile} No! I don't think we have felt such pressure from the [alliance] members. Our decision-making was not influenced by our partners, because we focused on the internal objectives and simply studied the potential value [of PSS]. So, enhancing partnership was not related to this <normative forces: from partner>." (JVP, Computer Division)

"Well, this topic is complicated … partners are our allies. On the other hand, they may be competitors as well. In fact, one of our partners has a higher landmark, and the others are stronger than us in [terms of] customer services. We have felt some pressures from them. This is why I can say their decisions on PSS adoption might affect us <normative forces: from partner>." (GM, Program Development)

Deputy Senior Vice President (DSVP) in charge of the PSS project team agreed to GM's views, by adding that:

"Some partners moved to PSS first, and then [they were] looking for a greater collaboration within the alliance. So, they influenced our decision-making, actually. Because [of joining] a bit late, we should quickly catch [on] the common goals < normative forces: from partner>*."* (DSVP, PSS Steering Committee)

These different views are identified as mixed influences that can be explained by a firm's *strategic orientation*; according to Miles et al. (1978), a strategic orientation is an indicator of the process developed to integrate new information, to coordinate decisions and to assess new projects. This means that owner, senior managers, and employees in a firm may differ in their strategic orientation, thereby viewing their external pressures in different ways.

It has been revealed that the air travel industry is one of the human resource intensive industries (Benckendorff et al., 2014), and a strategic use of IT/IS in airlines heavily relies on internal experts (Buhalis, 2004). Källström (2006) ascertains that, when it comes to maintaining the legacy reservation systems for airlines, the preparation of skilled employees has become a major issue within the organizational context. Two managers mentioned:

"The more up-to-date business rules from partner, for example, code-sharing [we received] further complex applications we had to develop quickly. However, it was not that easy for us to catch up [with] their timeline … At last, we identified that 'Yes! we are doing airline services, not doing IT business'. So, [we do] not necessarily hire costly people <IT personnel staffing>." (JVP, Computer Division)

"In the recent open [systems] environment, the most difficult thing was recruiting experienced legacy language programmers and qualified mainframe analyzers. The reason is the legacy systems [that] we were maintaining had become outdated, and as far as people get more used to things new, year by year, we have much fewer trained experts who want to be developers in the mainframe computer technology <expert training> … Fortunately, our PSS enables IT people, I mean existing IT manpower, to switch themselves to a new platform environment. So, IT and user sides started internal transformation and moved to the next <organizational transformation>." (GM, Program Development)

These messages implicitly offer an alternative evidence that the lack of skilled professionals in outdated technology worked as a positive factor in influencing the adoption of PSS. However, most importantly, top managerial power is decisive in organizational changes and necessary resource allocation (Hassandoust, 2016; Vaidya, 2012; Zhu et al., 2006), and thus *top manager support* was a key to the firm's PSS adoption. When a crucial decision on a large-scale IS adoption is made by management on behalf of a firm's employees, resistance in an organization can be observed. From the staff perspective, they are concerned with the impact on their role and responsibility and resource change at the post-adoption stage (Hung et al., 2013). Because of a powerful leadership, however, Air Lepus demonstrated a successful organizational transformation after a series of unfruitful internal discussions on the selection of PSS products. According to a DSVP, PSS Steering Committee:

"Before the final decision was made, for several years, Business and IT departments were involved in the evaluation. Between [the] two units, there was a mutual understanding that {by snapping fingers} 'Yes! It is the right time to improve our IT competitive power'. But the project teams could not reach a big conclusion … Then, based on our evaluation reports, the decision to move to PSS was made by our top manager, totally by CEO! <top management support>*."* (DSVP, PSS Steering Committee)

Top manager's support leads to a strong commitment across the entire organization and presents the firm's vision to the innovation when organic, decentralized organizational structures are intricately involved in the adoption process (Baker, 2012). This is also confirmed by ALP's Senior Manager that the initiative of PSS in Air Lepus was strongly advised by top management:

"From our management [point of] view, for example, new technological implementation on PSS now is not a major concern <top management support>*. If [the] right PSS*

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accommodates our needs, it should be enough. It means if key functions in the PSS work on our services strategies well and meet business objectives, they will be happy. That's all." (JVP, Computer Division).

By all accounts, these meaningful conversations can be encapsulated by the following narrative paragraphs and the causal map presenting the salient factors and the subsequent outcomes in the inter-organizational context (see Figure 7).

Air Lepus' strong commitment to *global network* led to the initiative of *seamless services* that should generate business value within the airline; however, this challenging task entailed the issue of *training experts* who could technically support the initiatives. Meanwhile, *strategic partnership programs*, an inter-organizational requirement, were encouraged by Air Lepus's top management. Consequently, together with external forces by *strategic partners* and an internal issue of *IT personnel staffing*, the concern about *expert training* was considered by top management, and then led to the action of *organizational transformation*. Later on, such organizational changes resulted in a successful *resource allocation* to the IT unit and end-users after the decision-making phase. Overall, this indicates that *top managerial power* was critically decisive in decision-making as well as resource allocation for ALP's PSS adoption in the context of (intra-/inter) organization.

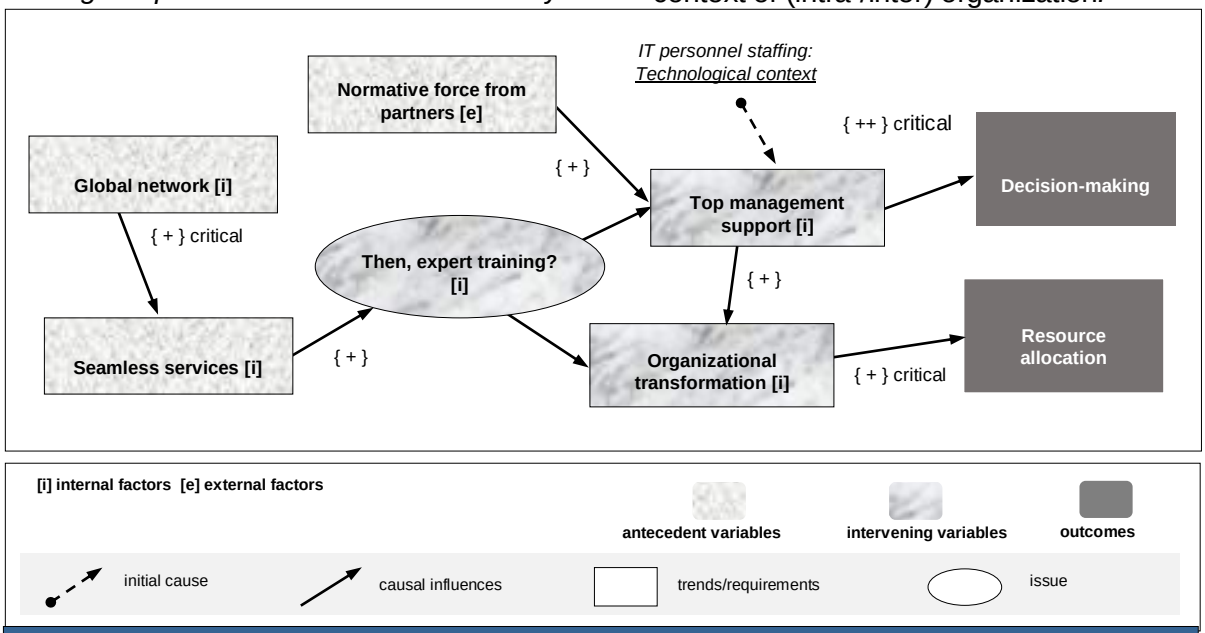
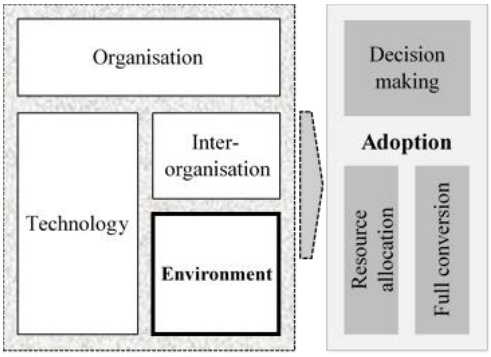


Figure 7 - Causal Map: Event-State Display in Organizational Context

Environmental Context Factors

The decision of Air Oceania [pseudonym] as the first Asian carrier to choose its PSS, will be viewed positively by other airlines in the Asia-Pacific region. (Amadeus, n.d.).



IOS adoption is rather seen as being a result of institutional forces (Robey et al., 2008); coercive and mimetic forces that arise from

government policies and competitors are examples of those (DiMaggio and Powell, 1991). Under the growing cooperation and competition of the aviation market where environmental uncertainty exists, vendors' power might be also considered as strong external enablers in a commitment to an airline's innovation (Merten and Teufel, 2008). Two Air Lepus respondents addressed:

"We are in the process [of migrate] our host to PSS in a multi-carrier community environment to meet the industry-wide requirements … The provider will bring us and our subsidiary on to the common platform that is already used by many airlines <normative forces: from vendors>." (EVP, PSS Project Division)

"Regarding the supplier's pressure, I think the vendors have it. Because of the economy of scale, actually they want to collect more PSS customers <normative forces: from vendors>*."* (JVP, Computer Division)

This evidence indicates that ALP and its affiliate was attentive to vendor support. Vendor support is a mix of timely supports from vendors vis-à-vis technology, training and relationships (de Guinea et al., 2007). In adopting an IOS, a vendor plays an important role in ensuring the right service delivery to its customer and the customer's partners (Ng and Kankanhalli, 2012). In a similar vein, PSS vendor supports in airlines are indispensable as far as the development of airline distribution is closely dependent on technological cooperation, which is based on standardized digital protocols (Roberts, 2015). For example, an advanced form of sharing data in real time (e.g., Electronic Data Interchange, EDI) and exchanging booking status, check-in process and security-related data have become a major technological trend. An executive member of Air Lepus commented:

"As a shared platform, our PSS allows for enhancing interconnectivity and also acquiring industry knowledge between partner airlines <industry knowledge acquisition>." (EVP, PSS Project Division).

Data synchronization in a structured message (through EDI in Extensible Mark-up Language formats) is a key service that PSS offers towards homogeneous platforms at an additional charge. This means that the same adopters using a particular PSS are able to share best practice and service experience as *industry knowledge* with little cost. From an industry report, this can be supported by the opinions of Vice President (VP) of a leading airline alliance, as follows:

"Free data transfer is more important for airlines than price, but there is no free information exchange channel between different airlines systems, so the only solution left for them was to pick one and use only that. PSS vendor is the only one that offers the full suite of PSS in an integrated package. It was an important knowledge <industry knowledge acquisition>." (VP, Vision Alliance (pseudonym).

On the other hands, in response to pressure from regional competitors, two managers with ALP holds differing views on it. Subsequently, an interviewer dropped a hint as to another respondent's talk as follows:

"Well, regarding pressure from competitors, I would say it is not really significant. Because, in Taiwan, we are the first mover [to a PSS], even in the Asia region. Our decision-making point was a bit earlier than global airlines, because [we did] not necessarily we [keep] our eyes on competitors' decision[s] much and spent our time … We knew what we should do by ourselves, and how to achieve the objectives based on our internal study <mimetic forces>*."* (JVP, Computer Division)

"… In the region, some airlines in the other alliances shared their PSS experiences with us at PSS user meetings for the alliance members. Because … we are in the same boat. In that case as PSS users, not our competitors, they affected us a little bit <mimetic forces>." (GM, Program Development).

Mimetic isomorphic mechanisms result as IOS adopters respond to uncertainty by

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mimicking the actions of other firms as a competitive necessity. However, this case implies that the forces might be limited when normative mechanisms in a specific inter-organizational network permeate through the channels of professional groups and the user conferences hosted by market leaders (Liang et al., 2007).

From an HRO perspective, firms that look for global expansion tend to locate *foreign operations from their home country* and exploit valuable *skills on one country to another country* (Banalieva and Dhanaraj, 2013), as they face higher costs than local firms due to a lack of local information and knowledge (Cerrato, 2009). Therefore, in a bid to acquire knowledge about new destinations with less cost as well as to obtain *mutual worldwide learning opportunities*, multinationals firms are motivated to seek efficient electronic information channels (Banalieva and Dhanaraj, 2013; Berger et al., 2000). Air Lepus' JVP and GM stated:

"*…. Overseas market operations in our home region, it's very important for us* <foreign operations from home country>*. More and more, we have complex rules and unfamiliar cases we haven't met before. For our global business, we must catch up industry skills for new solutions, collect other airlines' practices, select wider possible options also. This is very much related to our skill-up process, I mean globally* <skills on a global scale>." (JVP, Computer Division)

"{By stating emphatically} Taiwan is a small country, and the number of [its] outbound travelers is not growing. So, from our [point of] view, we should carry more foreign passengers. Our headquarters and Marketing department want advanced tools like Origin-Destination [based] revenue management to sell more seats to foreign countries, from Southeast Asia to other regions. That's why our PSS is the key IT [that] offers [a] new concept of selling space <foreign operations from home country>." (GM, Program Development)

The airline industry is not truly global, as airlines institutionally face significant restrictions when operating in foreign markets (Clougherty, 2001). For this reason, to be successful in foreign markets, they need to leverage on proprietary knowledge that gives them "the resources and competitiveness to expand in all regions and to benefit from the scale economies of a global plant configuration" (Belderbos and Sleuwaegen, 2005, p. 579). After chatting about the cost-effective foreign operations through electronic links, JVP added the importance of timely offering rights services using PSS in foreign operations from ALP's home region:

"We also believe that our company will improve time-to-market by using our PSS <time-to-market> … *So, to meet changing needs and access global markets very quickly, all offices are taking actions to set up new processes as soon as possible* <full conversion>." (JVP, Computer Division)

It is known that air distribution is a typical example of the impact of IT/IS on inter-organizational relations, and it has mutually created the knowledge-based global market (Sigala, 2003). However, this study identified from the conversation that, in the past Air Lepus had trouble producing "technology-generated information" (Stonehouse et al., 2001, p. 116) through their old systems:

"Regarding TSA's and key security regulations before PSS, we were not able to easily gather necessary resources and useful information about [institutional] requirements. However, once all PSS carriers are there, [in a platform], now we learn [the] right sources available for new updates to [access] global markets <mutual worldwide learning>." (SVP, Computer Division)

Stonehouse et al. (2001) claim that the utilization of technology-generated information via distribution channels has become a powerful means of creating new knowledge to enhance a competitive performance and the conversion of subsequent information into knowledge more rapidly than competing airlines is a key to maintaining a competitive edge in the technology-dependent airline industry. This view can be supported by EVP that the

common platform along with knowledge of specialized products and target long-haul destinations could play important roles in fostering organizational learning and reaching global markets:

"Fortunately, we have more and more global alliance airlines using our PSS. Because we and they can exchange different sales patterns like how to do up-sell, cross-sell … and even sell more seats at a higher price <mutual worldwide learning>. *That's why our offices … all points of sales, airport service desks and regional offices, are moving quickly and, they are training to use [our PSS]* <full conversion>." (EVP, PSS Project Division).

Based on of the empirical evidence, taken as a whole, the seven environmental factors in a causal relation (see Figure 8) that influence full conversion can be illustrated by the narrative as follows: *Power of PSS vendors* exercised a strong influence on Air Lepus that had managed a *limited industry knowledge*. In contrast, mimetic forces—*pressure from competing airlines in the region* other than airlines in partnership—exerted little power over ALP's adoption of PSS. Through electronic means and resources via PSS, *foreign operations from home country* effectively led to a search for solving *skills on a global scale* in a cost-effective way and also improving *time-to-market*; these two intervening variables eventually contributed to ALP's full conversion of the PSS products overall points of sales/services. Within Air Lepus, as a result, *limitation in acquiring industry knowledge* through the old reservation systems, coupled with *lack of skills on a global scale*, caused a strong demand for *mutual worldwide learning* to diffuse information about emerging destinations and new institutional rules around the globe through the PSS network.

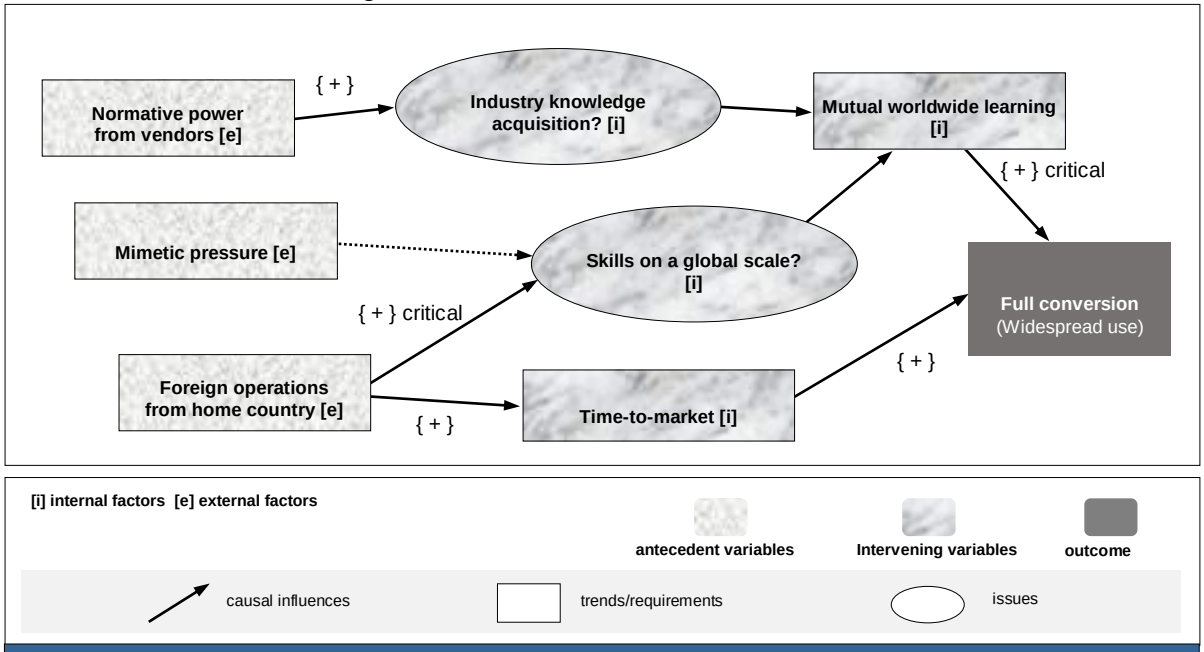

Figure 8 - Causal Map: Event-State Display in Environmental Context

Synthetically, the former three causal maps in Figure 6/7/8 can be integrated into one single causal network (see Figure 9). The causal network displays 20 adoption components in the context of TOE, showing the multi-directional influences on PSS adoption of Air Lepus within (1) decision making, (2) resource allocation and (3) full conversion. An abstracted, inferential display, a causal network is used to explain a phenomenon in a causal relationship across factors and outcomes; it organizes causal links of a single case in a coherent way, by combining multiple maps (Miles et al., 2014).

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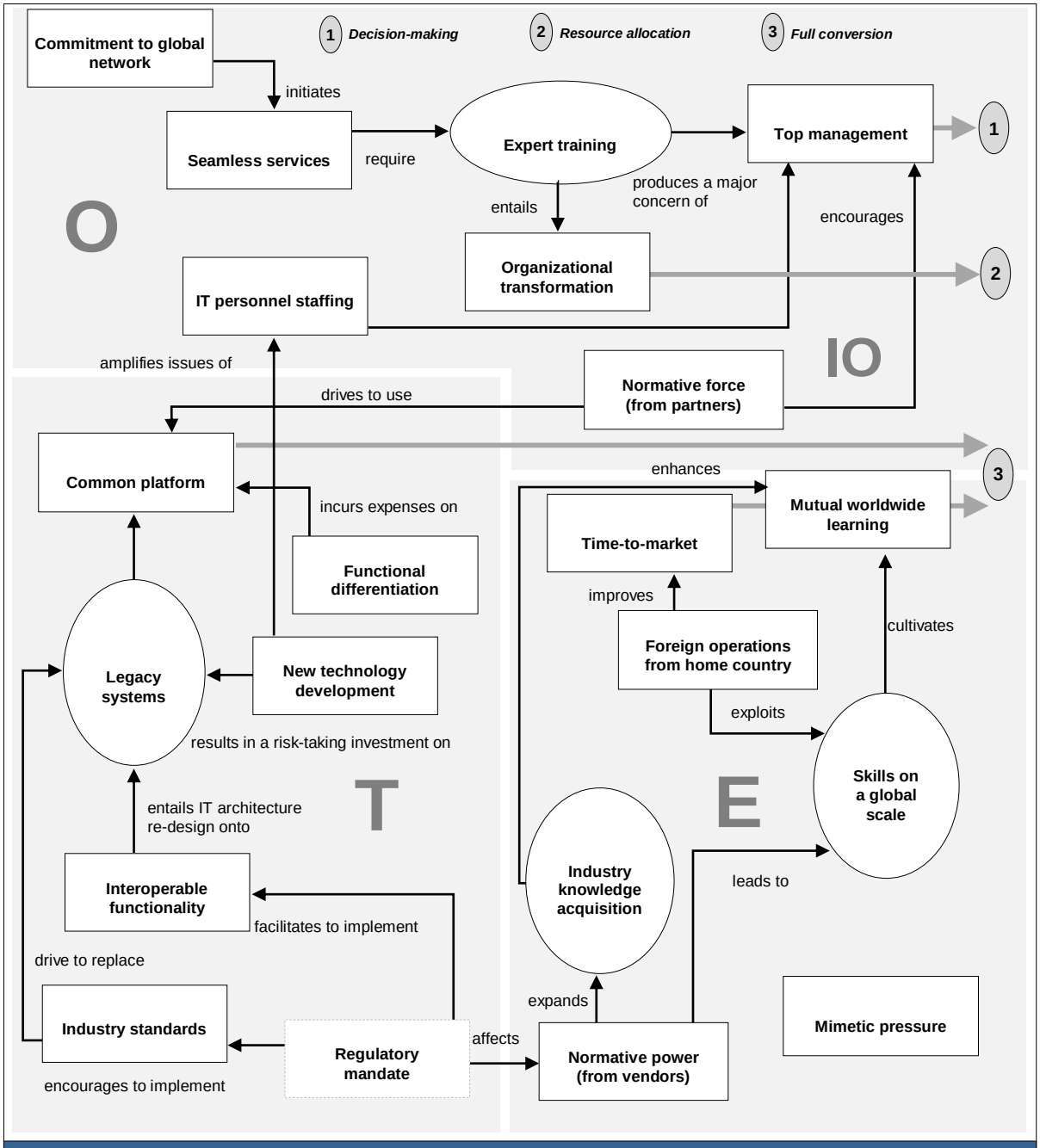


Figure 9 - Integrated Causal Network of PSS Adoption (Air Lepus case)

Strategic Benefits

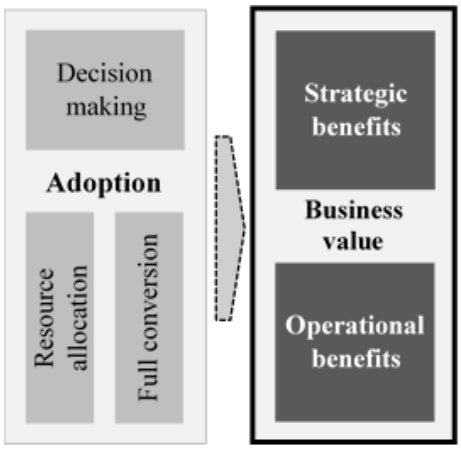
Strategic benefits for the effects of IOS include the opening of a new global market and the development of advanced products and services (Robey et al., 2008). These benefits result from interfacing with a broader range of potential trading partners on a global scale and hence IOS adopters can strategically obtain greater opportunities for the global marketplace with similar partners (Zhu et al., 2006).

In airline distribution, efficient access to a *wider global network* (Roberts, 2015) and greater access to *competitive services* to offer to passengers (Silva, 2012) are identified as strategic benefits of sharing advanced booking platforms and distribution channels. For instance, seamless connectivity through the homogenous platform allows airlines much-improved control over their seat inventory between strategic partners over the global network (Belobaba and Odoni, 2009), and the implementation of value-

added solutions enables a right response to customer-focused products such as interactive sells and branded fares (Chatfield and Yetton, 2000). Two key informants briefly mentioned how ALP's PSS affects business value as follows:

"Our PSS is a useful tool to widen global networks <a wider global network>. *Before PSS adoption, even though we already maintained [the] necessary products for co-operation with the alliance, common functions used by the alliance members can give us more flexibility and opportunities. So, we can easily look for the emerging market[s] and new global partners*." (GM, Program Development)

"I think this [strategic benefits] is outstanding. We know new systems bring us better and more competitive ways of development O&D based inventory management, ancillary services and streamlined passenger services <competitive services>*."* (DSVP, PSS Steering Committee)



Operational Benefits

Operational benefits in the IOS environment refer to more efficient operations and increasing cost efficiency through the value chain (Robey et al., 2008). Direct benefits from PSS include expected operation efficiencies like *reduced transaction costs* through *extended distribution channels* which would bypass the intermediaries (e.g., travel agents); this is because the interoperability of PSS also enables participants to experience a fall in transaction cost, due to a close interplay with connected marketplaces (Roberts, 2015). However, two informants deferred their answers about the effects of PSS adoption and impacts on ALP's operational benefits:

"… *Differences in transaction cost, it is too early we can compare two systems* <reduction of transaction costs>*. It is hard to judge now [whether] we can save the money in operating [new] systems because variable costs to maintain PSS are based on the number of passengers boarded. But, the cost structure of operating old in-house systems was fix-based. We [will] fully implement the platform this year and need more time to gauge it."* (JVP, Computer Division)

In a platform-based computing environment, enterprises may use IT services from their providers on a pay-per-usage basis known as a passenger-boarded basis in case of the PSS services, relying on the IT service providers (Kumar et al., 2017). Thus, the advantage of usage-based pricing can be greater over time, in a case where the airline has a sizable network by having more interline connections and code-share flights through the strategic partnership.

"Transaction costs [on our PSS] vary <reduction of transaction costs>*. [Due to PSS], the total cost of ownership is probably much higher. However, we are selling more, generating a higher yield from new total solutions and carrying more passengers at a global level. Also, using alternative channels available on e-Commerce, new ways of distribution can provide us with direct sales and powerful links to other online markets* <extension of distribution channels>*. So, our PSS is worth it."* (SVP, Computer Division)

The aforementioned findings are summarized the causal interactions (issues, drivers and barriers) involved in influences on outcomes (PSS adoption) and impacts (business value) as Table 2 shows. The total of 20 drivers, including seven salient positive factors and two

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DOI: 10.17705/1pais.11102

barriers as negative factors in adoption and the expected strategic/operational benefits from PSS are empirically tested and explained by the collected data for this single case study. Based on this analysis and findings, the completed research model of this study can be visualized in the form of 'causes-and-effects' (see Figure 10). It presents a simplified multidirectional causal mechanism in the TOE contexts, illustrates in what way context-specific factors exert influence on PSS adoption, and how PSS generates business value, including strategic benefits and operational benefits.

Table 2 - Factors in a Cause-and-Effect in PSS Adoption (Air Lepus case)

Causes		* salient / # tepid
Issues	Drivers	Barriers
Technological context *Legacy systems [i]*	***Technological context*** *Industry standards* [e]* *Interoperable functionality* [e]* *IT personnel staffing [i]* *Common platform [e]*	***Technological context*** *New technology development [i]* *Functional differentiation [i]*
Organizational context *Expert training [i]*	***Organizational context*** *Commitment to global network* [i]* *Organizational transformation* [i]* *Top management support* [i]* *Seamless service initiatives [e]* *Forces from partners [e]*	
Environmental context *Industry knowledge acquisition [i]* *Skills on a global scale [i]*	***Environmental context*** *Foreign operation from home region* [e]* *Time-to-market [i]* *Mutual worldwide learning* [i]* *Power of IT/IS vendors [e]* *Mimetic pressure# [e]*	
Effects		
Outcomes		
***PSS adoption**: Decision-making, Resource allocation and Full conversion*		
Impacts		* identified / # reserved
Strategic benefits *Wider access to global markets** *- through common functions used by global alliances* *- using free-flow code-sharing products* *Greater competitive services** *- by Origin & Destination oriented inventory control* *- facilitating ancillary/value-added services*	***Operational benefits*** *Reduced transaction costs#* *- based on passenger-boarded payment* *- focusing on community-based cost structure* *Expanded distribution channels** *- using powerful direct/online sales* *- by inking to non-air players (e.g., hotels, car rentals)*	

Notes: [i] internal factors; [e] external factors

Discussion

This case study was conducted with the first PSS adopter in East Asia, a Taiwanese international air carrier—Air Lepus. Based on the previous findings from public reports addressing the goals/background of PSS adoption and interview data, this section provides a discussion by answering the given research questions, as the study is designed.

Why did Air Lepus adopt PSS?

The reasons why Air Lepus adopted PSS are that the Taiwanese airline should (i) meet the business requirements for the collaboration with strategic partners, (ii) expand the global customer base in distribution, and (iii) improve the efficiency of its end-to-end services, using the

platform that can handle the increased number of interline flights and value-added products.

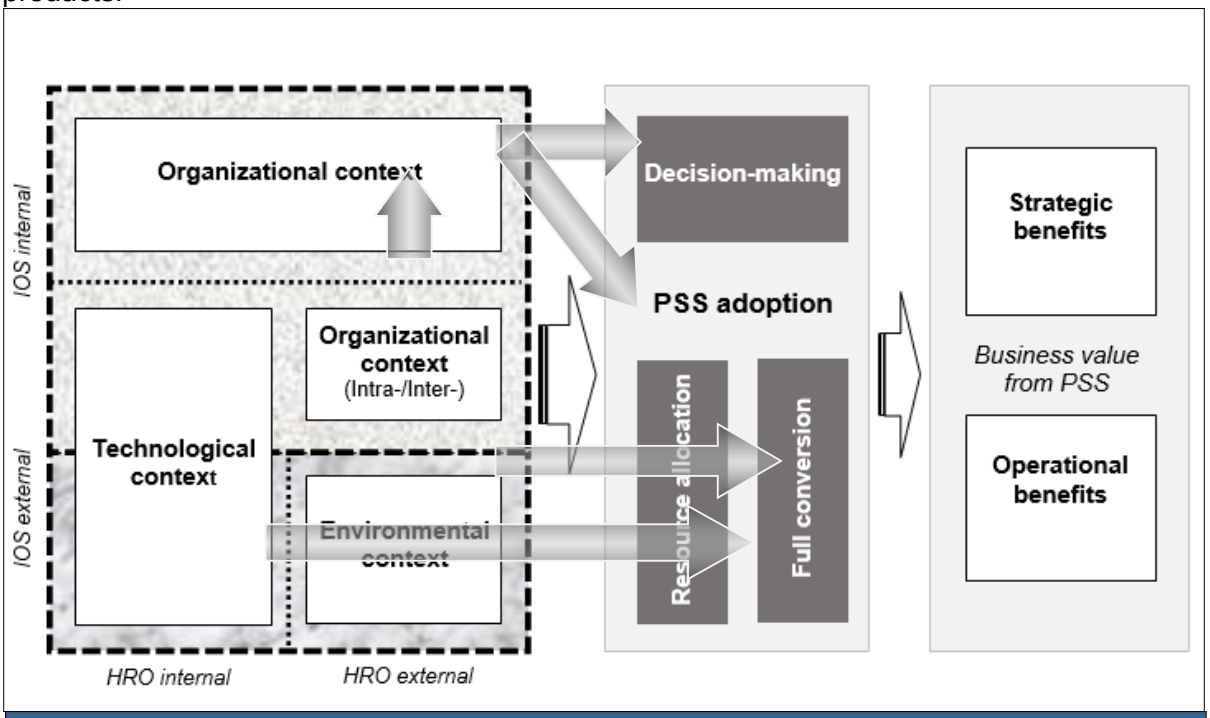

Figure 10 - Completed Research Model: PSS Adoption (Air Lepus case)

How did different factors influence Air Lepus' PSS adoption?

As Figure 9 presents, the causal network displays 20 adoption components in the context of TOE, showing the multi-directional influences on PSS adoption of ALP within (1) decision making, (2) resource allocation and (3) full conversion.

Technological factors – (3) Full conversion: The need to adhere to technology standard and interoperable functionality in the airline industry exercised a strong influence on Air Lepus: to go with PSS rather than continue operating its own system would be favorable, in terms of differentiation in technology and new technology development. But, due to the heavy maintenance burden of the legacy systems, ALP was challenged by IS personnel staffing. Encouraged by a commitment for strategic partnership and the advantage of technology standard, the Taiwan carrier started to consider adopting an airline common system and made the decision to adopt the PSS platform. ALP would need expert training to prepare workaround procedures for end-users and IT staff by giving up new technology development and functional differentiation.

Organizational factors – (1) Decision-making and (2) Resource allocation: From the organizational perspective, decision-making and resource allocation were initially led by the desire to deliver a global network and seamless services. These two key drivers would allow ALP to be a global leader in the air travel market. But, these two streams, together with IT personnel staffing in the technological context, should ensure expert training; this critical factor brought about the top manager's concern over the timely adoption. Facilitated by the necessity of strategic partnership, Air Lepus' top manager made the decision to go with PSS and approved a transformation within the organization between IT and business units. His charismatic managerial power influenced resource allocation at the right time.

Environmental factors – (3) Full conversion: Because the PSS vendor (normative forces) had demonstrated great support in catering

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DOI: 10.17705/1pais.11102

to the airline IT sector, the vendor support factor eventually worked as a driver to full conversion. Also, Air Lepus' needs for global reach, foreign operation from home-region, industry knowledge acquisition and skills on a global scale, influenced ALP's adoption process. Time-to-market and mutual worldwide learning also accelerated a prompt full conversion. However, the influence of mimetic forces on the adoption was insignificant as the airline was a first PSS adopter in the East Asian market.

How would PSS impact Air Lepus' airline business?

Based on the evidence from Air Lepus, this in-depth case study identifies that there would be the following anticipated and potential benefits as impacts on the business value by adopting PSS.

Strategic benefits: In airline distribution, Air Lepus predicts that access to global market and greater competitive services would be key strategic benefits; the benefit of access to the global market will stem from the strategic practices such as additional partnerships using the widened distribution channels and the PSS alliance functionality, as well as customized add-on services through the efficient electronic channels.

Operational benefits: According to the informants, reduced transaction costs and expanded distribution channels for online marketing and non-air content sales will be two of the strong impacts of PSS on benefits. Air Lepus predicts that cost reduced operation will be embodied in the long-term by maximizing the effect of cost reduction on volume-based usage fees.

Conclusions

Based on the causal displays (Figure 6-9) and narratives reported in the prior sections, this chapter offers conclusions addressing several meaningful findings first. In the case of Air Lepus, while 20 antecedent/intervening variables are examined as causal factors in line with the key contexts (i.e., technology, intra-/inter-organization, and environment), there are four factors that cause issues, one external environment factor that exerts an insignificant influence on the adoption and two internal technology factors are identified as barriers.

Firstly, (i) legacy systems, (ii) expert training, (iii) industry knowledge acquisition and (iv) skills on a global scale were identified as causal factors that had led to constructive debates or long-term evaluations prior to the PSS adoption; they were intensively stated in the form of 'because/so/the reason/that's why' by the key informants as an explanatory case study.

Secondly, Air Lepus did not perceive significant pressures from competitors, and hence mimetic forces seemed an impertinent factor in its PSS adoption. This means there could be a broad distinction between this finding and the existing empirical evidence from the IS literature that claims mimetic behavior in adopting IOS; with reference to several statements from the interviewees, two explanations are possible: it was because (i) Air Lepus was an early PSS adopter in its home-region, and/or (ii) ALP's alliance partners exerted stronger influences on the adoption stage than the competitors did. Instead, normative mechanisms extensively permeated through reliable communication channels where the PSS community had established accordingly.

Thirdly, two HRO-related factors in the technological context (i.e., new technology development and functional differentiation) worked as inverse causal influences—that caused a revaluation of the legacy reservation systems—on Air Lepus. According to Banalieva and Dhanaraj (2013, pp. 94-95), new technology development and demand for differentiation are core facilitators in raising the technological advantage of multinational service firms so that the companies can 'access global markets', 'overcome the challenges of increasing distance from home market' and 'find more efficient global distribution channels' against rising competition from their home region. An alternative view can respond to

this finding in ALP's case however that an individual adopter's requirements on the collaborative technology platform are costly and lengthy (Roberts, 2015), and thus future-oriented IT development based on the common platform will be primarily focused on the widely used industry standards (Baggio, 2014). In this sense, the two technological factors pertaining to HRO should be further examined in particular situations where common standards around IOS are centered in the cooperation of stakeholders seeking greater global scope.

Lastly, a total of 13 elements among 20 internal and external factors are confirmed as drivers that facilitated subsequent events and positively influenced ALP's PSS adoption; seven are viewed as salient (i.e., critical) factors according to the intensity of expression or the degree of agreement from respondents: industry standards and interoperable functionality as external technology factors; commitment to a global network, top management support and organizational transformation as organization-specific internal factors; and mutual learning on a worldwide scale as an external one in the context of environment.

Before this work, a great multitude of factors emanating from the research in relation to the adoption of IOS had been explored. Nonetheless, systematic explanations of the causation of IOS adoption at the firm level is conspicuously absent in the IS literature. Furthermore, empirical findings on PSS adoption in airlines have remained elusive since the advent of the industry-wide platform in the mid-2000s. Until now, only a few exploratory and descriptive case studies (mainly on European airlines) reveal the strategic drivers for implementing PSS and reported the expectations from a managerial perspective, while the industry has argued about transformation into open systems, a global network with partners and seamless services through common IT platform.

Against this background, in the realm of IS and IB, an interdisciplinary approach was thus arranged to explain why airlines using existing reservation systems adopt PSS in a global competition, and how they benefit from the platform in a changing business environment. To achieve this, explanations set out (i) to examine a combination of theoretical factors and potential empirical evidence that influence the adoption stage, which is defined as decision-making, resource allocation and full conversion over time and (ii) to describe examples of business value combining strategic and operational benefits. As such, through the theoretical lens of IOS in a common-use environment and an emerging topic of HRO in international expansion strategies, two underlying theories over two themes were tested within the context of technology, organization, and environment. An integrated research model in the form of the causal network was also examined. Then, an in-depth single case study on a home-region oriented airline based in Taiwan was undertaken; in conducting single case research, multiple data resources, including on-site interview data were analyzed. To build on a solid theoretical foundation, content analysis was carried out by using *a priori* orienting code lists in a deductive method.

As a consequence, eleven selected theoretical factors from the literature of IOS adoption literature as well as nine identified temporary factors from empirical evidence of multiple data sources were tested together; multiple causal maps and a causal visual link showing a non-linear causal relationship across a total of 20 context-specific factors were produced. This evidence was described together with the course of events and issues that Air Lepus experienced in its PSS adoption. Research findings identify that the major drivers that can facilitate PSS adoption are confirmed by causal explanations based on causes-and-effects. Four impacts relating to business value from PSS were empirically described as well in the category of strategic benefits and operational benefits.

Contribution and Implications

This case study will be able to offer both scholarly contribution and managerial implications. Specifically, it can provide the

https://aisel.aisnet.org/pajais/vol11/iss1/2
DOI: 10.17705/1pais.11102

IS academia with a meaningful TOE-based research model in the form of a non-linear causal link. Such a visual logical chain of evidence hitherto unreported in the IS literature might be utilized as a meaningful conceptual framework that offers important insights through a complex business world to see why enterprises adopt complex IOS in a common-use philosophy, and how they create business value from the IOS used in common with partners. Therefore, empirical findings will contribute to a better understanding of IOS used in a multilateral environment and also confirm the usefulness of the context of TOE. They may also apply to IS research on other forms of firm-level IOS adoption and the different types of PSS adoption in other home-region oriented airlines. This work expects to provide practical implications for business leaders and managers working in large-scale organizations with a useful executive summary, and theoretical interpretations from the interviews will offer transferable insights and knowledge to comparable practices in airlines and potentially in other global enterprises seeking a large-scale IOS adoption. Lastly, IS practitioners will motivate to conduct additional case studies on towards different air carriers in the East Asia region.

Limitations and Further Work

Generalization might be seen as a weak point in qualitative case research using a small sample; considering this was in the nature of a single-case study, the research contains a weakness in its lack of causality and generalizability, and the majority of explanations are idiographic or nomothetic (Yin, 2009). As such, replication of case study methods can achieve broader generalizability of findings and inferences, and multiple-case design is appropriate for theory testing and establishing greater external validity. In qualitative positivist research, this research will require the use of multiple case sites with replication logic to refine the research model and the causal network used in this within-case analysis. To address this, future work will employ a cross-case analysis in a multiple-case setting with three East Asian air carriers.

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https://aisel.aisnet.org/pajais/vol11/iss1/2
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List of Acronyms

ALP	Air Lepus
EDI	Electronic Data Interchange
HRO	Home-region orientation
IATA	The International Air Transport Association
IOS	Inter-organizational systems
IS	Information Systems
IT	Information technology
PSS	Passenger service system
TOE	Technology-Organization-Environment

Appendix A: 20 Contextual Factors in PSS Adoption

Technology Context

Legacy systems: IT systems that have been "in existence for a long time and that continues to be used to avoid the high cost of replacing or redesigning it" (Laudon and Laudon, 2005, p. 217).

Common platform: A standard IT system that is commonly used in a business group/industry (Oz, 2004)

IS personnel staffing: The process of "specifying, recruiting and developing IS human resources" that are suitable professionals with a new set of business skills and technical expertise in response to the advent of open IS (Niederman et al., 1991, p. 480).[3]

New technology development: The development of non-existent products, processes, and services that are created by technological innovation or using a technical skill (Meyers and Wilemon, 1989).

Functional differentiation: An achievement by providing customers with unique IT-assisted experience based on differentiated technological components from those of competitors (Reimann et al., 2010).

Industry standards: A set of industrial, technical guidelines, which can be used as common requirements in a specific industry (Kroenke, 2012).

Interoperable functionality: The functional ability, through industry-wide standards and a structured interface, of offering a necessary functionality and working seamlessly with other systems (Roberts, 2015).

Organization Context

Top management support is defined as "sustained management commitment and leadership from the top of the organization". It is one of the most critical organizational factors in IS projects (Beckett and Myers, 2018, p. 45).

Expert training: The provision of professional training programs for individuals at a sufficient level by an organization to use a specific IT system (Chang and Lung, 2002).

Global network: A collection of actors who have joined together to share useful services with other members to achieve common goals across borders (Hwang, 2004; Silva, 2012).

Seamless services: The provision of cross-border connection services by partnering with foreign airlines (Tugores-García, 2012).

Organizational transformation: A strategic move in an organization to transform business processes, work practices, internal culture and individual roles by the effective use of IOS to achieve organizational change (Morton, 1991).

[3] In this study, this factor is classified as organizational factor in accordance with the interviewee's responses.

Environment Context

Isomorphic pressures (i.e., mimetic, coercive and normative forces from partners): Institutional forces at organizational, industry levels; this isomorphism includes mimetic (competitive) force, normative (industry/market) force [4] and coercive (regulatory) force (Dimaggio and Powell, 1983; Vaidya, 2012).

Foreign operations from home region: Business operation from the home base using the cost-effective direct distribution channel on a global scale (Banalieva and Dhanaraj, 2013)

Time-to-market: "The time between generating an idea for a product and completing a prototype" (OZ, 2004, p. 721).

Industry knowledge acquisition: Knowledge acquisition on an inter-organizational level is defined as a set of activities to acquire knowledge via internal and external IT systems and distribute the knowledge to relevant members of the organization (Nambisan et al.1999).

Skills on a global scale: A firm's ability to combine its knowledge across the border, finding more efficient global distribution channels (Banalieva and Dhanaraj, 2013).

Mutual worldwide learning: The process of applying valuable skills created in a country to another country (Banalieva and Dhanaraj, 2013).

[4] In the research, it is also regarded as inter-organizational factor based on analyzing interview data.

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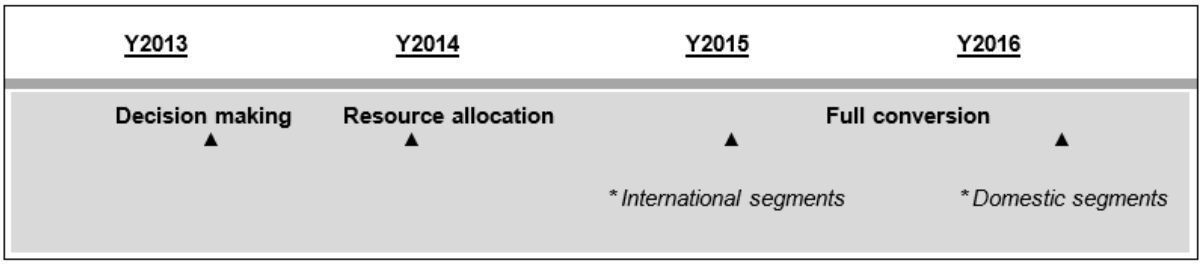
Appendix B. Examples of Codes used in the Study

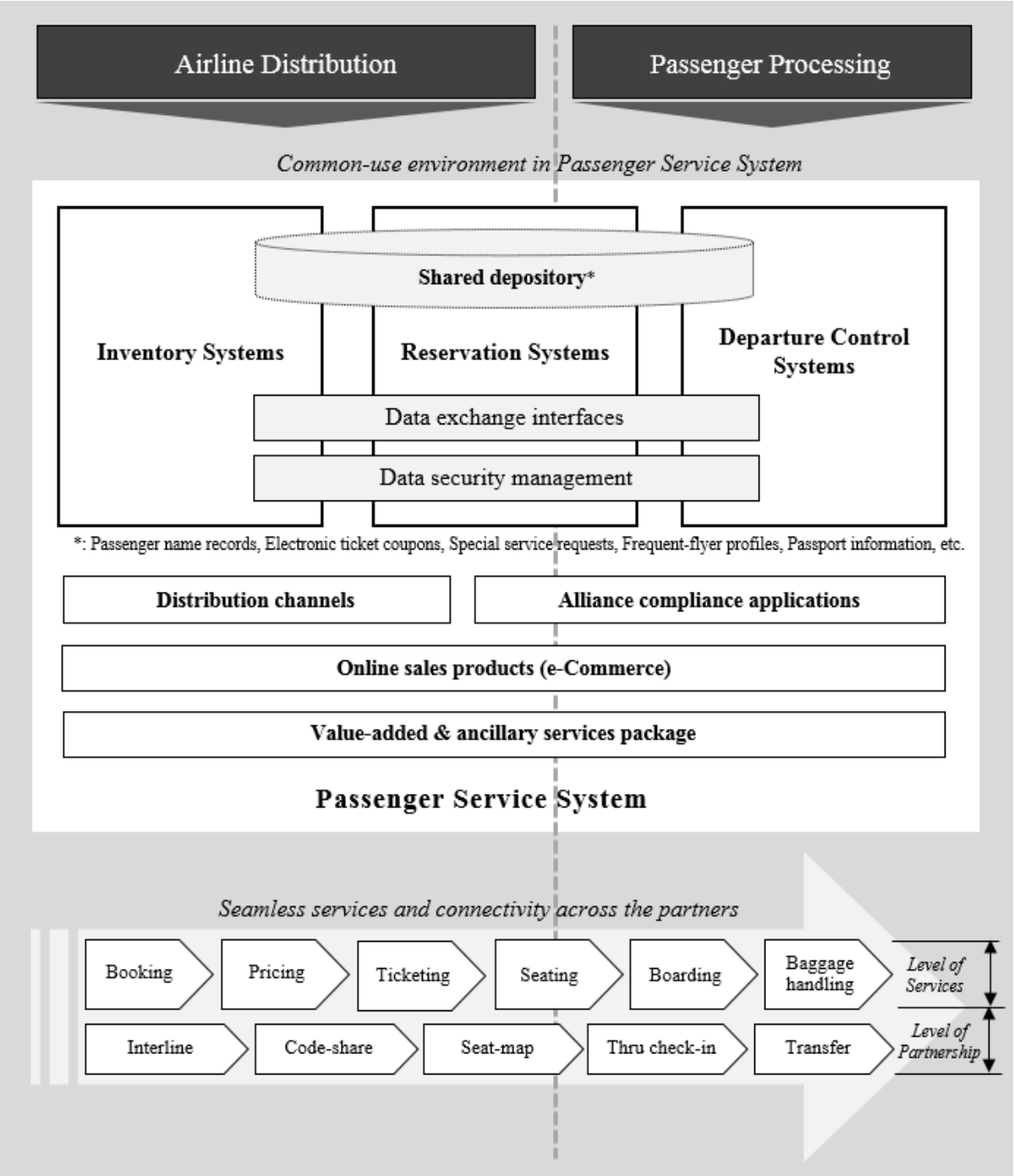
Examples of the Coding Results from used in the Study

Coding	Conversation	Codes/Themes	Categories	Variables
[First-cycle] **Descriptive coding** (a code in a word or short phrase)	*moving to open platforms supporting common and industry standard …*	PLATFORM; INDUSTRY STANDARDS; OPEN SYSTEMS;	Technology	Industry standards
	the decision to move to PSS was made … totally by CEO	DECISION-MAKING; TOP MANAGER	Organization	Top manager support
	Regarding the supplier's pressure, I think the vendors have it. …	PRESSURE; VENDORS	Environment	Coercive pressures
	taking actions to set up new processes as soon as possible …	FAST IMPLEMENTATION; NEW PROCESSES	Adoption	Full conversion
	technological supports to continue with our plans for global market operation …	TECHNOLOGICAL SUPPORTS; PLANS FOR GLOBAL; MARKET EXPANSION	Strategic benefits	Global expansion
	differences in saving transaction cost, it is too early we can compare two systems …	TRANSACTION COST SAVING	Operational benefits	Transaction cost reduction
	very positive … *important/relevant …* *not really …* *negatively affects …* *not specific influence …*	{ ++ } critically or strongly positive { + } positive/favorable/advantageous { − } negative/disadvantageous/adverse { − } negative		
Causation coding (a code that can be a state or an event as a causal set of antecedent factor > intervening factor > outcome + rating	*a key to decision-making… the reason is legacy systems we were maintaining has become outdated … we have much fewer employees who want to be experts in the mainframe computer …*	LEGACY SYSTEMS > OLD TECHNOLOGY EXPERTS > DECISION-MAKING { + } Critical	Intra-organization	Expert training
	A partner has a higher landmark, and the others are stronger than us ... We have felt some pressures from them … their decisions on PSS adoption might affect us	NORMATIVE PRESSURE + PARTNERS > DECISION-MAKING { + }	Inter-organization	Force of strategic partners Decision-making
[Second-cycle] **Pattern coding** (a code, including action with effects from causes, to examine pattern of relationships)	*- industry standards are key drivers behind …* *- because it was impossible to develop all requirements…* *- that's why our PSS is the very key IT offering new …* *- the reason is the legacy systems we were maintaining …* *- so, we reported to our top manager …*		INDUSTRY STANDARDS → COMMON PLATFORM EXPERT TRAINING → TOP MANAGER SUPPORT	

Appendix C: PSS Adoption Progress in Stages – Air Lepus



Appendix D: PSS Modules and Core Services – Air Lepus



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Appendix E: Profiles of Research Respondents – Air Lepus

Organization	Title	Roles (PSS adoption phase)
Program Development	General Manager (GM)	Application Migration
Computer Division	Junior Vice President (JVP)	PSS Technical support
PSS Project	Deputy Senior Vice President (DSVP)	Alliance IT committee
Computer Division	Senior Vice President (SVP)	Migration management

* Interview on 10 May 2016 (at a meeting room in Air Lepus Headquarters)

About the Authors

Don Dong-hyun Lee is a professional IT consultant, studying for a doctorate at Auckland University of Technology (AUT). Mr. Lee has 18+ years of industry experience in air travel distribution, passenger services and airport automation combining cutting-edge technology. Don's recent career highlights include his role at an international airline as Program Director responsible for IT services implementation and an independent consultant with a US-based expert network firm. He acquired a master's degree in Tourism and an MBA by research. He runs an industry-university collaboration research business, teaching AUT students as IS workshop lecturer. Don is good at both quantitative survey research and qualitative case study research.

William Yu Chung Wang is an Associate Professor with Waikato University. With the experiences of being an IT engineer and corporate consultant, William has supervised research projects and provided industrial consultancy in Australasia and Asian regions regarding supply chain management and business process re-engineering. He has a number of PhD graduates working in the universities, research institutes, and the industry. He also has experience in practical projects in Enterprise Systems such as the planning of implementing SAP and MS Dynamics. These projects have highlighted the interdisciplinary issues related to B2B integration, enterprise systems adoption, and supply chain configuration for large firms and SMEs. He serves on the editorial board/advisory board of several international journals. His research interests cover Supply Chain Management, Digital Innovation, Business Intelligence, and e-Heath Management.

Paul Leong has worked in the IT industry since 1980. Dr. Leong's work encompassed the areas of IS Management and IT Human Capital in the Asia Pacific region. He held technical as well as managerial and consulting roles throughout his professional career. During this time, gaining experience working in the various aspects of IS/IT techniques and industry methodologies, Paul worked in both public and private sectors, including training/financial institutions, telecommunication firms, government bodies, and airlines. His work focused on IS project management, strategic plan development, business process modeling, IS solution deployment, solution advisory, quality assurance, and IT Policy. In 2009-2018, Dr Leong, as Senior Lecturer, was involved in teaching at AUT, currently belonging to AUT's Software Engineering Research Laboratory.

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