

**Passenger Service Systems Adoption in the Context of
Inter-organisational Systems and Home-region Orientation:**

An explanatory embedded case study with three alliance airlines in East Asia

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DEDICATION

To my parents and parents-in-law,

And also to my wife, *Dr Susan Soon-jeong Cho*; my only child, *Soho Lee*;

and my elder brother, *Dr Dong-oh Lee*.

ABSTRACT

This study explains the factors that influence Passenger Service Systems (PSS) adoption by mainly revealing ‘why’ and ‘how’ international airlines adopt PSS. Since the mid-2000s, many commercial carriers have operated PSS, which is known as a platform-based airline distribution and passenger services solution. Recent Information Systems (IS) research on air travel and passenger services has focused on investigating online users’ behaviour and on exploring individual factors in the use of PSS, mostly relying on quantitative techniques. Importantly, a small number of PSS-related studies on a company level illuminate the cases of airlines in the Western world, while similar topics on the Asian carrier cases in English are sparse.

Adopting a qualitative positivist paradigm, the present researcher conducted an explanatory embedded case study with three East Asian carriers within a global alliance. In systematically explaining their PSS adoption in a three-stage process—decision making, resource allocation and full conversion—this study is rooted in the theoretical foundation of Inter-organisational Systems (IOS) adoption and home-region orientation (HRO) in the context of international business to identify possible factors of IOS adoption and HRO in the extant western literature. It then explains causal influences on PSS adoption in the technological, organisational and environmental contexts and also uncovers strategic and operational benefits of business value from PSS. To do this, a multi-case study carried out, involving three international airlines in East Asia. After three on-site interviews with key PSS-related personnel of the allied airline in Japan, Korea and Taiwan and secondary data collection from industry reports, business websites and newspaper accounts, it employed deductive content analysis using multiple qualitative coding skills and a cognitive causal mapping approach to visualise the influential relationships in a non-hierarchical network form.

The key findings across the target airlines explain, firstly, the common reasons for adoption PSS were to (i) develop their global network, (ii) provide seamless travel services, and (iii) establish a strategic partnership. Next, *interoperability* and *common platform* in the technological context influenced their decision making; thereinto, *expert training* and *top management support* were core organisational drivers for decision making and resource allocation. Also, within the environmental context, while *mimetic pressure* and *vendor support* were examined as major influential factors in decision making and full conversion, *coercive forces* showed little influence on PSS adoption. Lastly, business value from PSS reveals not only wider access to global markets and greater competitive services at a strategic level, but also overall cost reduction at an operational level; the size of lowering the operation cost in the long-term varies by airline.

This empirical study significantly contributes to academia and the industry; in particular, transforming a static model of IOS adoption factors influencing outcomes to a dynamic model showing the PSS adoption mechanisms should be of value to qualitative scholars and professional practitioners whose research interests include PSS adoption. Theoretical interpretation from the in-depth interviews with key members of PSS decision teams and a wealth of secondary sources could offer transferable insights and knowledge to comparable practices in airlines, and potentially in other global enterprises. This thesis should be useful for home-region oriented airlines to understand better the phenomena of PSS adoption and impacts on airline business.

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LIST OF ACRONYMS

API	Application Programming Interface
ARS/RES	Airline Reservation Systems
CEO	Chief Executive Officer
CIO	Chief Information Officer
CRM	Customer Relationship Management
EDI	Electronic Data Interchange
ERP	Enterprise Resource Planning
FSC	Full-scale carrier
GAA	Global airline alliance
GUI	Graphical user interface
HRO	Home-region orientation
IATA	The International Air Transport Association
IB	International Business
IOS	Inter-organisational Systems
IS	Information Systems (IT systems)
IT	Information Technology
LCC	Low-cost carrier
MNE	Multinational Enterprise
n/a	not applicable
NIT	Neo-institutional theory
PSS	Passenger Service Systems
QDAS	Qualitative Data Analysis Software
RPK	Revenue passenger kilometre
SCM	Supply Chain Management
TCT	Transaction cost theory
RFID	Radio frequency identification
TOE	Technology–Organisation–Environment
XML	Extensible Markup Language

LIST OF PSEUDONYMS

Air Lynx (ALX)	A Japanese full-service air carrier
Air Libra (ALB)	A Korean full-service air carrier
Air Lepus (ALP)	A Taiwanese full-service air carrier
ComPozer	A Passenger Service System service provider/vendor
OrcheStra	The ComPozer's OrcheStra Suite as a Passenger Service System
Vision Alliance	A global airline alliance

ATTESTATION OF AUTHORSHIP

“I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.”

Don Dong-hyun Lee

22 November 2018

CHAPTER 1: INTRODUCTION

1.1 Outline of the Chapter

Chapter 1 starts with an explanation of the context and reasons for this research. Section 1.2 introduces the background of the study, including motivation leading to this research project and the research context. Section 1.3 discusses the rationale and significance of the study, including knowledge gaps. Then, Section 1.4 provides the research objectives and Section 1.5 presents the scope and assumptions. Section 1.6 outlines the expected contributions, followed by the thesis structure and a summary of this chapter.

1.2 Background of the Study

Our objective is to provide advanced technology solutions to airlines around the world, to help them evolve in line with the changing needs of the industry so that they can continue to exceed the demands of their passengers.... We are currently working with leading airlines across the Asia-Pacific region in particular, and our commitment to Asia has never been higher. Both in Asia Pacific and beyond we are helping our customers to better connect.... In parallel, as our technology is based upon open systems we are confident that it will deliver the flexibility, responsiveness and scalability required to cater to their evolving commercial requirements. (Senior Vice President, ComPozer)

The airline business is heavily technology-dependent. Modern airlines use information technology (IT) for a wide range of applications at each stage of providing passengers with their products, ranging from flight schedules, air tickets, travel information to ground services; they would not survive without sophisticated IT systems to ensure efficient airline distribution and automated passenger management (Benckendorff, Sheldon & Fesenmaier, 2014). Nonetheless, in a bid to simplify IT service processes, improve operational cost efficiency and lower software development expenditure, the cost of IT services in airlines is under pressure (Rapajic, 2016). Moreover, the commercial aviation sector has been deregulated around the globe, and many more players have appeared in

the air transport market. After the open-sky policies enabled regional airlines and low-cost carriers, national flag carriers have united to expand global outreach by sharing common-use resources with partners and organising global airline alliances (Tugores-García, 2012). This situation prevails in the East Asia region where the airline market has become more competitive in IT services, alliance evolution and multilateral liberalisation than in any other region (Doganis, 2006; Williams, 2016). As such, these technological, organisational, inter-organisational and institutional environmental considerations in the airline business and operation have surrounded the inside and outside of innovative IT systems, including Passenger Service Systems (PSS), in airline distribution and passenger services since the 2010s.

1.2.1 Motivation leading to the research

This researcher was responsible for adopting PSS when working at a full-scale airline based in South Korea. By the mid-2000s, only a few air carriers had implemented such large, complex systems. PSS was and is one of the new airline business systems, replacing the conventional reservation systems that were developed using old technologies of 40-50 years ago. The up-to-date IT platform of PSS consists of a sales and distribution system, inventory management system, departure control system and ad-hoc systems for collaboration; it helps international airlines unify the flow of passenger sales and services from seat reservation to baggage claims (Källström, 2005). Throughout the decision-making process, the researcher was able to recognise that there might be specific similarities and differences in the causes and effects of the adoption of PSS within particular contexts across the Japanese, Korean and Taiwanese member carriers that belong to the same airline alliance, when the airlines commonly implemented the identical PSS product in 2013–2017. These unusual experiences aroused his critical thinking in ‘By the way... why, and how... they have in common adopted this IT system?’ and

encouraged him to look into this phenomenon through the interdisciplinary lenses of Information Systems (IS) and International Business (IB) rather than from a software development point of view. As a returning learner who is studying late for his doctorate in the Western world, this researcher has undertaken a series of extensive overviews on research methods and data analysis in a qualitative strategy, relying on the guidelines of distinguished scholars in empirical case study research; this approach allows the present researcher to be a truly independent person of learning with a solid theoretical foundation.

In the IS academia, examination of the phenomenon of PSS adoption from the theoretical and industrial perspectives has been sketchy due to the short history of PSS deployment and the limited number of experienced practitioners in industrial settings involved in PSS-related projects. Based on the researcher's international academia-industry background, he therefore determined to deeply look into the reality of PSS adoption by three leading airlines in East Asia by travelling to Tokyo, Seoul and Taipei in person to interview key informants and collecting the secondary data online and from the target airlines. In order to meet the expectations of doctoral study, however, this practice-based original work requires theoretical, methodological and conceptual rigour in the design of the study and research methods. By carrying out these challenging and sustained academic tasks, on behalf of a small number of the hands-on experts in PSS, he was motivated by a strong desire to contribute to extending the body of knowledge of IS adoption literature. His academic journey, for the collection of interview data overseas in particular, was onerous and costly in terms of effort and time, but ultimately rewarding and fulfilling. Starting with draft research questions and a working title, the researcher was faced with two major theoretical matters in his work during the literature review stage, as he discovered a wide gap between his experience in the real world of PSS adoption and the academic findings

from western literature; both were related to the definition of technology adoption across the target organisations and the theoretical foundation of PSS.

1.2.2 Context of the research

When the researcher was leading the PSS project and sharing general progress reports on PSS exercises with the neighbouring airlines, in terms of the adoption of technology, he realised that one air carrier viewed *technology adoption* in the sense of ‘signing a contract’ for the purchase of a technological product, while another carrier ambiguously used it to refer to the point ‘when a decision is made’, ‘when resource allocation starts’ or ‘when the service enters the full-scale cut-over phase—the time when the new software fully replaces the old one in service’ within the organisation. The third airline had yet another different approach to technology adoption, according to the properties of a product, understanding it as a technical or a commercial term between IT unit and business units. This was a critical issue in designing the study prior to data collection by interview. Therefore, it was essential to establish an applicable scope to ‘the adoption’ of PSS for clarity within this study by reviewing relevant literature in IS adoption and justifying the relevant definition that should be generalisable. Furthermore, a PSS is a specific business system only used in the air transport sector. The service-oriented solution in airlines was developed by a limited number of IT providers or PSS vendors and comprehensively released in the late 2000s. Hence, finding true theoretical identity amongst the research on Inter-organisational Systems (IOS) and e-business was also a challenge, because the PSS application software—widely unknown yet—is a huge IT system only used in the airline industry. It features various roles as distribution and service channels for passengers on a cross-functional platform that offers data transmission via web services and information exchange between airlines.

It is known that the adoption of a large-scale IS within the international business context, including PSS adoption, involves complex decision-making activities in an organisation. In particular, high-ranking managers at the upper level of an organisational hierarchy make different types of decisions and control different types of processes (Oz, 2004). In order to minimise internal/external technological challenges as well as institutional environment risks, this upper management involvement is diversely identified in the East Asian firms (Chatterjee & Ravichandran, 2004; Thatcher & Foster, 2003). Furthermore, the type of decision on adopting computerised systems that perform the daily routine transactions and serve the organisation's organisational level such as reservation systems is structured, while the decisions that senior management make are generally unstructured (i.e. there is "no well-understood procedure for making decisions") in choosing a large-scale IT system, allocating resources and implementing the IT solution (Laudon & Laudon, 2005, p. 90; Oz, 2004). Between these two diametrical phenomena, it is unsure as to whether the adoption of PSS in international airlines involves a definite routine (i.e. structured), no agreed-on procedure or a mixed format. This is another strong motivation leading to this research to unveil the examples of organisational IS adoption and address the theoretical gaps, and this researcher thus turns his attention to the intriguing issues.

1.3 Rationale, Relevance and Significance of the Study

1.3.1 Rationale of the Study

The idea for this study was conceived during a series of business conferences on PSS adoption in 2006-2013, when this researcher, an airline IT consultant, worked for an airline alliance together with IT board members of the East Asian airlines. During the review meetings, every single airline introduced its own internally-developed private model in presenting PSS adoption factors from a narrow view of technical drivers and managerial powers as well as in predicting the impacts of PSS based on each of the

different value proposition models. After the meetings, some of the conference attendees suggested this researcher to attempt a literature-based study developed by a proven academic theoretical framework, not by their own in-house analytic tools and internal reporting frameworks that western consultants developed, to integrate an understanding of PSS adoption for target airlines in a specific region. The research was encouraged that an academic response to such industry needs would be meaningful. Therefore, this case study research with East Asian airlines was designed to use deductive methods in applying findings reported from a western cultural context, due to a relative dearth of evidence in the related Asian contexts.

This researcher decided to select a deductive method by reviewing IS, IB and airline business literature, including the previous case studies on PSS accordingly that (i) airline reservation systems are classified as IOS (Chatfield & BjØrn-Andersen, 1997; Chismar & Meier, 1992); (ii) international airlines are home-region oriented, increasing global connections (Banalieva & Dhanaraj, 2013; Cerrato, 2009); (iii) IOS adoption might be analysed from a transactional view of IOS based on transaction cost theory and/or a non-transactional view of IOS rooted in neo-institutional theory (Chatterjee & Ravichandran, 2004); and (iv) the adoption variable of IOS at the firm level can be examined in the contexts of technology, inter-/organisation and institutional environment (Källström, 2005; Lyytinen & Damsgaard, 2011; Malagas, Kourousis, Baxter, Nikitakos & Gritzalis, 2013; Rieple & Helm, 2008; Vaidya, 2012). While the contextual adoption variables (i.e. pre-determined codes in the IOS adoption contexts) as PSS adoption factors are tested, a theory-based prediction from the selected cases is also applied to address impacts of PSS (i.e. their business value) based on a pre-defined domain within strategic benefits and operational benefits (Robey, Im & Wareham, 2008; Vaidya, 2012). The transformation of IT applications for airline-specific booking, automated ticketing and passenger

processing has in the last decade been empowered by technological innovations and strategic cooperation between major western airlines (Merten, 2008). Traditional computerised reservation systems have been gradually replaced by PSS, which is an open, common-standard technology platform, to re-engineer complex air travel distribution and personalised passenger services as well as to accommodate business needs such as global networking and connectivity. The introduction of PSS has been a matter of great concern to many international airlines, and it is of value to understand why/how different carriers in a different geographic region adopt and operate the integral systems for the future-driven airline business. Notwithstanding this, empirical research on the recent evolution of airline distribution and passenger services is limited. Furthermore, PSS-specific episodes of the East Asian airlines published in English, as an international language, are still sparse. More importantly, prior research on PSS adoption practices has been heavily weighted in favour of the cases of European and Australasian airlines from a western cultural and managerial perspective.

Many phenomena in IS are interdisciplinary, and as such studies should rely on a wide range of sources (Rowe, 2014). According to the Boell and Cecez-Kecmanovic's (2014) systematic literature review process in IS, the protocol-based literature review approach executes the following four steps to ensure the rigour of the search process. With research questions and topics, in Step 1, researchers decide which search engine(s) should be selected. Database searches are conducted using the subject and specific search terms, including related abbreviations, during the second step. In Step 3, retrieved publications are then screened by abstracts, titles and keywords. Based on the selected literature, results and evidence are summarised in the last step. In systematically reviewing literature, this thesis firstly searches two article databases, SCOPUS and Google Scholar. The Google Scholar database is used to retrieve information about Japanese, Korean and

Chinese language literature by each local language. Next, the primary literature review results for this study discovered that the SCOPUS database lists over 47,000 papers with ‘Information Systems’ as a primary keyword that have been published from 2006 to 2017 since the first PSS-related article was introduced. Throughout the same period, abstract, title and keywords pertaining to PSS adoption in the area of airline distribution and passenger management occur in only a small number of papers¹, indicating an insignificant impact on the IS research. An additional search of Google Scholar by local languages produces a similar result of the inquiry, fewer than three articles, including the studies released in East Asian local languages². Also, by extending the topic into airline reservation systems’ adoption on a firm level and the search period up to the 1990s, another search reveals fewer than 20 matches, including three Asian context articles, in the subjects of business information systems, international business, business case studies, management, travel & tourism and computer sciences. The phenomenon of PSS adoption is relatively new; this research also draws on dissertations and industry journals. The PSS-related review covers a period of 10 years while other topics, such as typical airline reservation systems, cover up to 30 years. Based on the evidence, this research came to understand the results, limitations and gaps of past studies within the research streams and then identify the possible contributions. Likewise, PSS-related literature in the IS area is in its infancy, and explanatory case studies in particular are exceedingly

¹ Even though the term is used differently in meaning by authors in aviation-related studies, it has been widely addressed in airlines and academia, after a leading PSS vendor announced it in a press release in 2003: “Passenger Service Systems (PSS) include reservation systems associated with inventory management and departure control. These are integrated with ticket sales and reservations ...” (Finance, 2012, p. 2). However, the same acronyms are also used in the other areas where in-flight entertainment (IFE) and security control at airports are studied, addressing PSS in a different meaning as IFE ‘passenger service system’ and ‘passenger security system’ respectively (Lee, Wang & Leong, 2017).

² In addition to the international journals, the literature search extended to access to the local East Asian region journals; each retrieval in Japanese, Korean and traditional Chinese was resulted by the keywords, including “航空予約システム”, “旅客サービスシステム”, “항공예약시스템”, “여객서비스시스템”, “航空豫約系統” and “乗客服務系統” on Google Scholar.

rare; in that respect, the researcher's own empirical research, business insights (related to target firms), logical argument (supported by on-site data) and other fragments of evidence (publicly available) are combined into this work to address why and/or how PSS adoption occurs in commercial airlines.

This explanatory case study applies the use of deductive methods to enable an understanding of real examples of PSS adoption in eastern cultural contexts. An existing body of theory and knowledge in the areas of IS and IB, as well as industry practices in the airline business, are referred, and research propositions are then developed towards the adoption of IOS and home-region orientation. At the industry level, the past IT systems (RES) in airline distribution and passenger services were developed by the western IT companies between 1970-1990. During that period, many studies on RES adoption were made within the western and eastern contexts. However, adoption factors considered in this research has limits in applying to PSS studies, because the RES applications were based on old technologies, former institutional environments and a single organisation (i.e. a single airline company) with few instances of collaboration, irrespective of the type of contexts. Once each Asian airline adopted its RES and customised the application of the RES, most of the RES-related research across Asian airlines then focused on the use of RES and its specific applications, investigating phenomena at the individual level. With technological advancement and the change of business environment, such as growing strategic collaboration, the airlines began to consider replacing their ageing RES by PSS developed by western PSS providers (e.g. Amadeus, Sabre, SITA in Appendix E). Studies on PSS adoption needed a different approach.

1.3.2 Apparent knowledge gaps

Adopting various IT systems to achieve business benefits in airlines is one of the subjects that IS researchers have been seeking to better understand for more than a decade. To date, there has been a number of empirical studies on the adoption of Customer Relationship Management (CRM), Enterprise Resource Planning (ERP) and Supply Chain Management (SCM) systems in the airline business context contributing to the body of knowledge in IS research (Hendricks, Singhal & Stratman, 2007). They involve (i) ERP adoption cases at the organisational level (from the finance team to the maintenance/repair unit) toward the Middle East air carriers, leading African airlines and the US-based regional carriers; (ii) in-depth studies on CRM or E-CRM (unknown as more customer-oriented CRM) solutions adoption that aim to enhance online customer services and create competitive advantage within the Asian air travel market; and (iii) theoretical research into SCM adoption for air logistics or sustainable SCM issues in air cargo. Some of them reveal the relationship between contextual adoption factors and IT systems adoption other than PSS; in addition, the impacts of CRM, ERP and SCM in airlines have been investigated in academic research. However, within the airline business boundary, PSS differ from CRM, ERP and SCM systems in that PSS is one of the IT systems that are specific to the airline industry (Lee et al. 2017). PSS is an advanced form of reservation system; its functions can personalise seamless passenger services using a single data repository and its ancillary applications across the distribution channel. The use of PSS ranges from online booking to ground handling where transactions in passenger sales and services take place within specific organisations of an airline company. As shown in Appendix B, an international airline is an enterprise that uses many different business systems, including ERP, CRM and SCM for cargo, revenue accounting (for billing and settlement for interline partners).

With more demonstrations of real-world cases, IS literature can be grown in many directions to address various practitioner concerns. Furthermore, until now, only a few western studies on PSS adoption have been undertaken across industry and academia, illustrating its infancy. Across East Asia, Japanese, Korean and Chinese business leaders have different behavioural styles, in terms of power distance, uncertainty avoidance, individualism and collectivism. Cross-cultural researchers on IS have claimed that Chinese, Japanese and Korean managers possess a distinctive prevailing decision style while their managerial style reflects different cultural values from those of western countries. For instance, in resource allocation and IT systems implementation, East Asian managers consider differences in a regional context, organisational dynamics and strategic fit (Wei & De Boer, 2002). Martinsons and Davison (2007, p. 285) also claim that “East Asians typically think more holistically and contextually whereas many North Americans concentrate on foreground items and specific details”.

In an Eastern cultural background, there have been few works on IOS adoption and HRO from the airline business perspective. Therefore, this study develops six research propositions (see Chapter 3) based on the perspective of IOS adoption, home-region orientation and airline business by employing a deductive method. To address this gap, this study proposes an integrated research model to analyse multiple data that contains the PSS adoption practices. The present study bridges these knowledge gaps and the industry needs for academic work on PSS adoption cases. It develops and utilises a TOE-based framework for PSS adoption into knowledge that leads to outcomes and results in business benefits for international airlines. This work sees this absence of discussion as a significant gap in the IS discipline related to the airline business. The researcher believes it is critical that additional cases, further to a small number of western cases and their understandings, are as diversely laid out as possible. This study addresses such core

aspects by testing pre-determined adoption factors in a specific region to provide a fuller understanding of PSS adoption in the airline market.

1.3.3 Significance of the Study

Benckendorff et al. (2014) claim that PSS primarily differ from traditional reservation systems in that their products form a platform that provides a set of standardised technologies and a shared repository. Also, they assert that the PSS delivers interoperable functionality that enriches the industry mandates and their application modules in a block-like structure and the front-end functionality, which are configurable, can be managed by end users without remote support from IT experts in airlines. These factors suggest that PSS adoption research should be approached by a different paradigm, in terms of understanding the classification of such a system, the strategies of adoption and the structure of context. As mentioned in the previous sub-section, the adoption of IT systems in general entails complex organisational activities and inter-organisational processes. Therefore, (i) contextual factors in causal relationships that influence IOS/IS adoption could be more generalised by target system, adoption stage and business context; and (ii) different types of benefits from the adopted IS could be also further explained by business value. New insights such as these are potentially important for scholars studying IS management/operation, practitioners in charge of IS adoption and top managers in international business to understand better because decision making in adopting an enterprise system is a challenging undertaking, and the cost of IT system adoption is very high as are the costs of getting it wrong. In terms of PSS used by international airlines, this study is thus designed to fill a specific theoretical gap in the IS discipline and contribute significantly to the body of relevant IS knowledge in terms of an in-depth examination of PSS adoption factors, the outcomes of that adoption, and factual impacts on airline business value as well as alternatives/complements to the related findings. In

particular, this research would be a meaningful case study on PSS adoption based on the integrated TOE model that combines the technological, organisational, environmental context to test related contextual factors, considering a three-stage process of the PSS adoption phase and strategic and operational benefits to predict impacts of PSS.

1.4 Objectives of the Study

To cater for more complex business needs for air travel distribution in international airlines and passenger services in partnership, PSS are designed to provide seamless passenger processing and global network services, playing much more than a traditional RES role (Belobaba & Odoni, 2009; Benckendorff et al., 2014; Silva, 2012; Tugores-García, 2012). Through the interdisciplinary lens of IS and IB, this case study with three East Asian airlines explains PSS adoption at the enterprise level and proposes a conceptual framework in line with a theoretical domain of PSS adoption. From the traditional IS view, PSS can be considered as a specific type of Inter-organisational Systems (IOS), which is a network-based IT system on an open standards platform (Chismar & Meier, 1992; Lee, Wang & Leong, 2017; Lyytinen & Damsgaard, 2011; Vaidya, 2012). From the IB perspective, most international airlines are home-region oriented, expanding their business within their home region (Rugman & Oh, 2013). Based on the interdisciplinary approach, this research narrows down to the socio-technical phenomenon within the context of technology, organisation and environment using Tornatzky and Fleischer's Technology-Organisation-Environment (TOE) framework, which is used for classifying technological, organisational and environmental adoption factors at the firm level and draws on transaction cost theory and neo-institutional theory³

³ Transaction cost theory is an economic theory stating that "firms grow larger because they can conduct marketplace transactions internally and more economically than they can with external firms in the marketplace" (Laudon & Laudon, 2005, p. 84). Neo-institutional theory is a social theory that explains organisational behaviours are influenced by wider social forces or interactions with other organisations (Lounsbury & Zhao, 2013). In broad outline, within this study, the former theory relates to the theme of

(see Figure 1). As a multi-case study across three home-region oriented airlines, it then examines the relevance of PSS adoption factors referred to in IOS adoption-related literature, as viewed from a western perspective, and considers the business value emanating from PSS. Therefore, this study aims to integrate a better understanding of IS and IB in explaining the PSS adoption phenomenon.

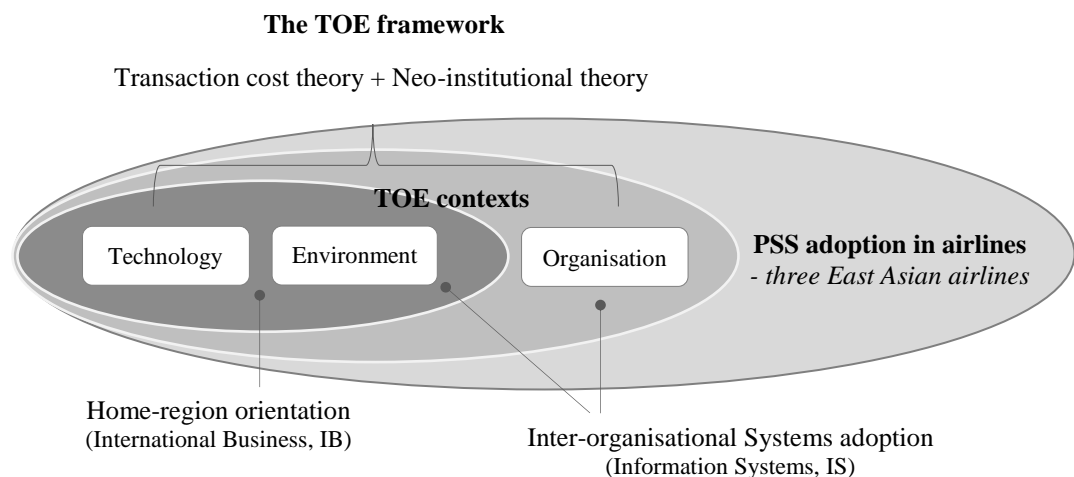


Figure 1. Objective of the Study – A Holistic View

1.5 Scope and Assumptions

This study includes an explanation, examination and representation addressing PSS adoption via empirical case study research across a trio of the allied airlines in Japan, Korea and Taiwan where the airline companies adopted the same PSS and belonged to a global airline alliance; therefore, the scope of this research is confined to a particular PSS and three of the PSS adopters as members of the same alliance. The target PSS within this study is the OrcheStra [pseudonym] suite. The researcher's focus is not primarily on discussion about the particular functions that the OrcheStra applications provide the specific business units (e.g. Flight Availability on the OrcheStra Reservation module),

passenger sales in airline distribution, while the latter one has concern with a collaboration in passenger services.

but is to holistically illuminate the PSS adoption practices and the usability of the PSS products; OrcheStra comprises multiple products, including a Reservation module, Inventory module, Departure Control module and multiple ancillary services such as alliance support, electronic commerce software (i.e. e-commerce). However, the OrcheStra PSS does not include customer relationship management software or frequent flyer applications that are regarded as independent in-house IT systems to be operated on the basis of marketing strategy in commercial airlines.

In a similar vein, the specifics of the infrastructure design and the PSS software functionality at the user level are outside the scope of this study; this is because, for instance, different internal/external organisations for airline IT services are responsible for managing infrastructure in the light of IT systems integration and operation, and each airline's contact centre uses its own in-house customer services software for customised passenger management. Also, the actual PSS usage at touch points (i.e. point of sales/services) on an individual level is not a focus.

Also, in explaining cause-effect between influences and results, this work is focused on the interrelation between contextual adoption factors and adoption outcomes. In other words, representing which of the adoption factors within the context dimension are specifically influential to business value within the value dimension is out of scope for the study. This is because impacts of PSS on business value must rely at the present stage upon prediction and expectation, as the effects will appear at the post-adoption stage (e.g. PSS infusion) in each airline. Therefore, business value defined as strategic benefits and operational benefits in this study is presented by practice or by example based on the participants' accounts.

In addition to delineating the scope of this study, several central assumptions can be addressed at large as follows:

1. The PSS adoption activities across the three airlines would be completed or in the final stage. In fact, just before an initial series of interviews, one airline had completed the final task of their adoption (defined as full conversion: see Chapter 2), while another carrier was in the full conversion stage, and the third airline was in the process of finishing the second phase (specified as resource allocation) by carrying out its migration to the new PSS with unexpected months delay of the challenging process. Fortunately, by the time of analysing data of this study, the third airline's PSS adoption also came to a successful close.
2. All key informants as interview participants, responsible for the adoption stage within their units in each airline, have a similar experience in the airline business, professional expertise in the OrcheStra products and common understanding of the PSS adoption stage that this research defines. In this respect, their responses were assumed to be informed, truthful and reliable in the form of shared perceptions and experiences in passenger IT services.
3. There were no group dynamics that might work as negative elements in adopting in the phases of decision making and resource allocation in particular; such social and personal factors within an organisation were not considered in producing the interview questions for the study.
4. Critical economic factors on a country level (e.g. level of inflation, price of air fuel and rate of interest) that might influence the expectation of each airline's business value and the operation size such as revenue sales were regarded as constant for all three airlines.

1.6 Expected Contribution of the Study

Although many IS-related studies have dealt with adoption issues concerning diverse IOSs, such as PSS used in airlines, there is a shortage of evidence-based literature in IS and business research due to the difficulty of access to empirical research. This research context in theory and practice is original because of the richness of the interplay amongst contextual factors; with a socio-technical approach, a theoretically synthesised conceptual model is combined with three key contextual elements (i.e. technology, organisation/inter-organisation and institutional environment) as possible adoption factors from the IOS adoption perspective and home-region orientation (HRO) in airlines through the lens of international business. Adopting a multi-theory perspective, the research contexts include: (i) the application of two dominant theories (i.e. transaction cost theory and neo-institutional theory) in order to systematically explain the adoption of PSS used as a standard platform in airline distribution and passenger services; (ii) the use of the broader foundations of the TOE framework to complementarily incorporate salient factors that represent influential relationships and organisational interactions in IOS adoption and HRO in airlines; (iii) the provision of PSS impacts on business value combining strategic benefits and operational benefits; and (iv) an embedded qualitative case study in multiple contexts with three home-region oriented and allied air carriers in East Asia.

By testing the possible adoption factors based on the new conceptual model where the detailed mechanisms support reconstruction at the static level, this empirical case study with real-world data delivers an explanation of causal relationships in PSS adoption and potential impacts from PSS on airline business. The theoretical potential contribution is therefore transforming a static model of IOS adoption factors influencing outcomes to a dynamic model showing the PSS adoption mechanisms by which this takes place. It is

also designed to make an original contribution to filling a gap in the discipline knowledge in the IS area; its in-depth examination of how technological–organisational–environmental factors work on PSS adoption in leading East Asian airlines should offer a new understanding of the IOS adoption case to IS literature. A rich description of why home-region oriented carriers adopt the PSS also will build a bridge of understanding of a particular enterprise IT system adoption between the IS discipline and the IB area. As such, the goal of the study is to integrate a better understanding of IS and IB in explaining the PSS adoption phenomenon. This work should encourage practitioners in academia and advanced specialists in airline IT to develop more opportunities for case study research in PSS-related issues within the IOS adoption and HRO contexts.

1.7 Structure of the Thesis

This thesis comprises eight chapters, including this Introduction chapter. The following overview presents an outline of each chapter.

Chapter One (I) – *Introduction* provides the overall context of the study, including the research background and motivation, and identifies rationale, relevance and significance of the study, followed by the research objective. The introduction chapter also clarifies scope and assumptions and then discusses the expected contribution to the body of knowledge and industry practices in relation to contemporary IS research.

Chapter Two (II) – *Literature Review* presents a comprehensive review ranging from academic literature in IS/IB to airline IT-related professional journals from a western cultural and managerial perspective; its sub-sections address the innovation in passenger sales and services, the evolution of PSS in the air travel sector, the adoption of IOS, the phenomenon of HRO, including HRO in airlines, and two underlying theories. This chapter also offers a brief discussion on theoretical considerations related to the study.

Chapter Three (III) – *Research Model* starts with the key research questions driven by the industry needs. The chapter reveals how this researcher designed the study based on a deductive approach and discusses applicable factors to PSS adoption that draw from a rigorous literature review based on IOS adoption and the phenomenon of HRO. Two highlighted sections sketch the conceptual research model combining three dimensions in the draft framework: the context dimension, the adoption dimension and the value dimension. The chapter also develops six research propositions and discusses the manner of a visual representation in line with a qualitative cognitive mapping approach.

Chapter Four (IV) – *Methodology* discusses the research methodology; it sets forth the research approach by describing philosophical assumptions and research paradigm. The chapter also intensively covers research methods for this qualitative explanatory multi-case study, followed by three key sub-sections about case research design on the basis of three evaluation criteria in IS case research. After addressing bias and ethical considerations, the chapter ends by showing a summarised roadmap of the research methodology that constitutes this thesis.

Chapter Five (V) – *Data Analysis Strategy* clarifies a strategy of qualitative content analysis and a multiple coding procedure—a coding skill incorporating provisional coding, descriptive coding, causation coding and pattern coding—applied to this explanatory deductive study in the two stages of the First Cycle and the Second Cycle skills. The chapter continues with a detailed account of the use of coding tools in analysing primary and secondary data and examples of extensive data analysis. The last section outlines a causal display method—a cognitive map using a process model technique—to present interrelations across the factors.

Chapter Six (VI) – *Case Study Results* reports three sub cases with three target carriers in the same airline alliance as one of the integral chapters of this multi-case research. The chapter begins with a brief pre-discussion on the logical process of embedded case study (i.e. multiple units of analysis in a specific alliance) and the case analysis background. After a snapshot of the company, each of the within-case discussions focuses on explaining the adoption factors, interactions and relationships in the TOE context (i.e. technology, organisation/inter-organisation and institutional environment) as well as on predicting the impacts of PSS on business value. Relying on interview data and secondary data sources, the case report is based on a visual display and causal narrative to give an explanation of a cause-and-effect relationship and possible factors and to enumerate the impacts of PSS. Lastly, a fishbone diagram in each sub case is presented to provide a more abstract view of the relation of contextual factors and business value.

Chapter Seven (VII) – *Discussions on Findings* comes with a discussion strategy and introduces three within-case discussions, followed by a cross-case discussion. The sections argue key findings of TOE-specific contextual factors on adoption and business value of PSS in the search for similar patterns and results to follow a literal replication design. The chapter also offers answers to the research questions. It then debates rival explanations by considering applicable rival theories as they relate to this study's findings and alternative views to the existing body of knowledge in the adoption of IOS and home-region oriented airlines. The chapter enables the researcher to discuss implications for theory as well as practice and suggestions to prospective top managers/practitioners in charge of PSS adoption.

Chapter Eight (VIII) – *Conclusions* provides an overview of the research and summarises the generalisability and usability of the developed research framework in explaining PSS

adoption. The conclusion also highlights academic contributions to the knowledge gap and the related industry. The final chapter comes to an end with a few words related to limitations of the study and recommendations for future research in the IS discipline.

1.8 Summary of the Chapter

This chapter presented the introduction of the study, ranging from the context to the structure of the thesis. Modern commercial air carriers have adopted PSS to ensure efficient airline distribution and passenger services, which is fully IT-based (Benckendorff et al., 2014). Meanwhile, the existing several studies on IOS adoption and IB (mainly in the airline business) claim that air carriers have allied to improve their competitive advantage through PSS, expand their global network in a cost-effective method and share common-use IT resources in an industry-standard setting with their strategic partners; this situation also prevails in the home-region oriented airlines in East Asia. However, empirical research on PSS adoption in IS academia has been rare. For better understanding of the phenomenon of PSS adoption, this explanatory study selected pre-determined adoption factors and business value dimensions from IS, IB and airline business literature based on a deductive approach; the present researcher as an airline IT practitioner then conducted multi-case research to explain ‘why’ and ‘how’ target airlines in Japan, Korea and Taiwan adopted their PSS at the firm level as well as to reveal PSS impacts on business value of the adopters. In demonstrating detailed real-world case examples, this empirical work was carried out in cooperation with Air Lynx [the pseudonym of a Japanese airline company], Air Libra [the pseudonym of a Korean airline company], Air Lepus [the pseudonym of a Taiwanese airline company], ComPozer [the pseudonym of a PSS vendor] that develops and provides OrcheStra [the pseudonym of a PSS suite], and Vision Alliance [the pseudonym of a global airline alliance]; this researcher conducted a series of on-site interviews with key directors and managers of

the three allied East Asian airlines responsible for PSS adoption in each business IT (primarily, Passenger Sales business units and IT services unit). By analysing the data within technological, organisational and environmental contexts, this thesis in IS from the interdisciplinary lens is designed to fill a theoretical gap in the airline-IT related area and offers findings on PSS adoption and the impact of PSS to the body of IS knowledge. The theoretical contribution comes not only from transforming a static model of IOS adoption factors to a dynamic model showing the PSS adoption mechanisms, but also from establishing a fuller understanding of an IS phenomenon being PSS adoption in airlines.

End of Chapter 1

CHAPTER 2: LITERATURE REVIEW

2.1 Outline of the Chapter

Chapter 2 provides the theoretical foundations of this study; a literature review reveals the background and characteristics of PSS from the perspective of IOS and HRO. In line with the contexts of technology, organisation and environment, this chapter seeks to establish a theoretical basis of PSS adoption from a western cultural perspective. Drawing on IS literature related to automated passenger sales and services, Section 2.2 and 2.3 note the role of reservation systems in the airline business and their evolution into PSS in the early 2000s, including key features of the PSS product. Section 2.4 approaches the adoption of PSS from an interdisciplinary viewpoint of internationalisation of IT systems, including the phenomenon of HRO to understand the propensity of international airlines to look for a transformation from a home-region airline to a global carrier. Section 2.5 deals with two focal theories; transaction cost theory and neo-institutional theory, known as grand economic and socio-technical theories; within this study, these two integral theories are used to select possible causal factors and discover relevant alternative views to the current body of knowledge in IOS adoption and HRO in airlines. A brief discussion on theoretical considerations then continues in the section. Lastly, Section 2.6 presents a summary of this chapter.

2.2 Automation of Passenger Sales and Services

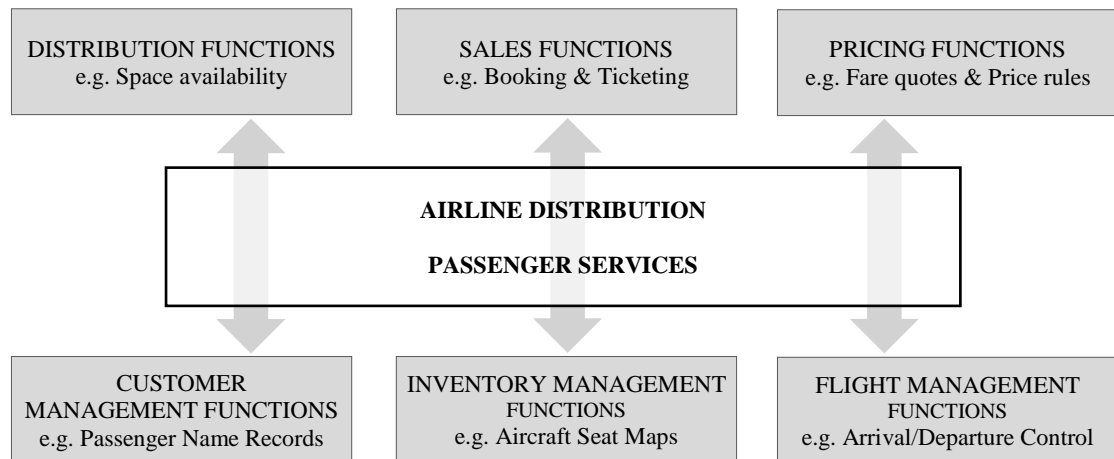
In the commercial aviation industry, IT systems have for some time played a vital role in the automation of passenger sales and services (Belobaba & Odoni, 2009). Commercial air carriers have undergone revolutionary innovations in their computerised systems—hereinafter referred to as airline reservation systems (ARS/RES) as they are well-known within the industry—for airline reservation services and airport passenger processing

(Merten, 2008). They operate in business environments that are sensitive to economic, institutional, regulatory and technological changes (Benckendorff et al., 2014). Thereby, the operation of an airline has been a challenge across passenger sales, customer services and ground handling, as each requires heavy reliance on diverse IT systems. On account of its role, RES has been traditionally at the centre of IT systems in airlines to ensure that passenger sales, distribution and departure control are processed in an efficient and effective way. Concerning significant technological change in airlines, recent IT services such as online reservations, wireless check-in, mobile boarding passes and self-service check-in kiosks have become more innovative and sophisticated in order to produce competitive advantage and reduce distribution costs (Belobaba & Odoni, 2009; Benckendorff et al., 2014). Furthermore, major airlines not only recognise the importance of a ‘seamless travel’ experience that enables passengers to minimise any inconvenience on an interline (or multi-carrier) trip, but also identify it as a challenging collaboration that should deliver such an end-to-end service by implementing technology standards together with their partners (Hoffman & Offutt, 2015). Consequently, one leading global airline alliance (GAA) and its founding carriers have cultivated an opportunity to build a common-use RES on a single platform that allows the members to maintain efficient day-to-day operation as well as to deliver a hassle-free travel experience to global travellers (Benckendorff et al., 2014; Briody, 2004).

2.2.1 Role of reservation systems in airlines

According to literature reporting airline-related IS studies, as shown in Figure 2, the major functionalities of RES are focused on two key airline businesses: (i) airline distribution that manages passenger seat sales functions incorporating flight distribution, schedule distribution, air ticket distribution, fares distribution and prices distribution; and (ii) passenger services that incorporate customer management functions, inventory

management functions and flight management functions (Belobaba & Odoni, 2009; Merten, 2008). These two integral business areas and their supporting functions traditionally relate to the business and service models of classic network carriers offering the full services on international routes (Tretheway, 2004).



Synthesised from Belobaba & Odoni (2009)

Figure 2. Airline Reservation Systems and Airline Business

The international airline business model is primarily designed to take anyone from anywhere to everywhere across borders (Hansson, Neilson & Belin, 2002). To do this, commercial carriers seek to sell travellers seats and space through their own distribution channels in different countries and to ensure support for their passengers, who journey internationally through multiple airports, from pre-seat assignment to post-arrival action (Benckendorff et al., 2014). Hence, the distribution functions and the passenger-handling processes between different airlines become critical in managing their real-time flight schedules, selling seats, filing fare rules, handling customer profiles and controlling seat inventory, as well as in providing global travellers with the departure services that are associated with pre-arrival, check-in, boarding, transit and post-arrival. By incorporating a series of uninterrupted, flawless passenger operations, all these requirements and

functions should be integrated in a single RES platform that not only covers each airline's distribution channels, but also forms a service network that shares useful knowledge and real-time information with partners to achieve common goals (Silva, 2012). As a result, PSS have become far more than 'reservation systems', creating a different paradigm for airline distribution and passenger services beyond the traditional RES.

2.2.2 Airline distribution

As the previous section discussed, the primary role of air travel distribution is to provide passenger airlines with the ability (i) to book flight seats, (ii) to issue electronic tickets for air segments and (iii) to keep track of critical information on reserved and/or flown passengers. Belobaba and Odoni (2009, p. 444) explain further: "the airline distribution function is responsible for selling the airline's transportation service to its customers, by allowing them to obtain information about flight schedules, availability of seats and fares, and then enabling them to make reservations and purchase tickets for their travel itineraries." In performing the fundamental roles of airline distribution and operating the necessary IT systems, some traditional air carriers have suffered from low efficiency and high expenditure, heavily depending upon a complex infrastructure of distribution channels that plug into travel intermediaries through external distributors (Merten, 2008).

As air travel distribution is central to the airline business, it has become more important than any other element in air retailing and customer marketing (Belobana & Odoni, 2009). Therefore, the function of airline distribution has been expanded in (i) gaining more competitive advantage in passenger sales, (ii) growing the power of 'direct' channels (e.g. airlines' own websites, contact centres) and (iii) reducing the cost of distribution by virtue of the direct exchange of purchase requests to/from customers (Buhalis & Laws, 2001). From the international airline's perspective, distribution and transaction costs in

conjunction with the use of ‘indirect’ channels through online intermediaries and conventional travel agencies, such as subscriber fees, booking/ticketing fees, surcharge for issuing tickets, monitoring expense and sales commission, had come to be regarded as significant operating expenses, reaching from 18% up to 30% of the total operating cost in passenger sales (Doganis, 2006; Prideaux, 2001). However, with the advent of the Internet, the rapid diffusion of airline online sales has led to a fundamental transformation of airline IT and resulted in changing distribution strategies. Such a remarkable change as a new business driver in passenger business was enabled and encouraged by bringing down various distribution costs by putting more weight on direct sales than indirect sales (see Figure 3); this is because the dot-com technologies allowed international airlines to bypass online intermediaries and walk-in travel agents.

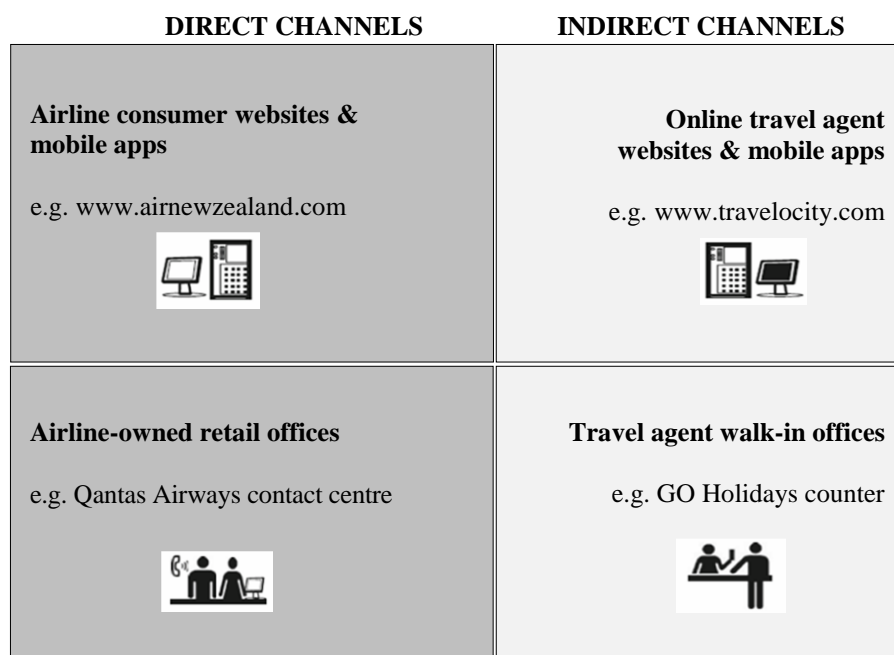


Figure 3. Airline Distribution: Direct Channels vs. Indirect Channels

Thus, the establishment of direct channels (via airline websites/apps) towards both leisure groups and business travellers marked a turning point in the relationship between full-scale carriers (FSC) and intermediary players in the air travel sector. However, a long-

standing issue for outdated legacy RES and a critical limitation of airlines' online channels are poor interoperability in data communication between airlines, where a different technical standard has been independently implemented by each airline over many years (Roberts, 2015). Interoperability—the state in which an enterprise operates “mechanism and structures that allow the interwork of enterprise IS according to the common business purpose” (Kumar, Esteves & Bendoly, 2011, p. 49)—in airlines can be readily implemented in a single platform environment to transmit structured booking and formatted ticketing data by firmly integrating internal peripheral business applications (see Appendix A). In dealing with global travellers who fly with international connection flights and request on-board special services (e.g. special in-flight meals, personalised service on arrival) on different air segments, the operation of high-quality standardised process at the distribution stage has become essential (Doganis, 2006). From a carrier's perspective, nonetheless, the independent development of interoperable application software that ensures full synchronous communication—a communication technique of exchanging data in a standard format between IS on a real-time basis (Kronenke, 2012)—entails large investment in human and financial resources. In the past, it was beyond an individual carrier's capability. However, the challenge rather acted as a spur for airlines to build towards an efficient distribution system through collaboration; the initiative was designed to enable airlines to ‘simultaneously talk’ to each other between their distribution outlets (Roberts, 2015).

2.2.3 Passenger services

Air carriers operate a complex passenger processing environment and offer diverse advanced IT services such as mobile check-in and self-service boarding kiosks. Airline innovation in passenger services has played an important role in gaining competitive advantage for airlines. Further passenger processing technology and more automated

departure-arrival services include an enhanced airline tracking of check-in baggage through smartphones, incorporating a radio frequency identification (RFID) tag and Near Field Communication (NFC) technology (Belobaba & Odoni, 2009). Benckendorff et al. (2014, p. 192) describe passenger services as “the passenger journey stage [which] can be viewed as a series of touch points consisting of pre-arrival, check-in, boarding, stopover and arrival” that might occur at the origin, transit and destination airports. In this respect, technological advances enable airlines to provide more modernised ground handling for travellers. Before arriving at the airport, passengers can check in for their flights in advance on the Internet. The pre-boarding process has also undergone a remarkable change by shifting away from check-in counters to self-service kiosks. Passengers with checked luggage may leave these at a self-service bag drop and pay excess baggage charges using mobile devices for themselves. During this process, bar-coded boarding passes may be stored on their mobiles. Furthermore, multiple air segments require a stopover to change flight at a transit airport, and transit passengers can run mobile apps that display the status of connecting flights in real time. Also, there is a need to consider the arrival experience prior to customs inspection, immigration control and baggage claim at the destination airport.

To support such advanced passenger processing, the functions of application software in RES used by airlines and IT systems in the airports should ideally be integrated into a single IT environment; then, airlines can send out an instant disruption notification message (in terms of a flight delay or an emergent security check) in a timely manner to connection flight passengers, track interline checked baggage and distribute the newest information about faster ground transport to ‘connected/wired’ travellers who may access the Internet in search for local travel information (Benckendorff et al., 2014). As international air travel has become a commodity, passenger processing for wired

travellers should operate in ‘a seamless interface’ reliant on a single, common-use resource that serves the needs of international airlines as well as their passengers, hub airports and their IT operation partners (Roberts, 2015). In response to this demand, IS providers have worked together with major airlines and other aviation stakeholders (e.g. airline alliances) to develop an ‘end-to-end’ passenger system designed to capture information on travellers ‘from the sales query through to the flight’ on the basis of a common-use infrastructure (Benckendorff et al., 2014, p. 204; Briody, 2004).

2.3 Development of Passenger Service Systems

An evolution of traditional RES into the next generation IT system known as PSS was primarily encouraged by re-engineering airline distribution and passenger services. The development of PSS as the airlines’ common platform in the commercial aviation sector was driven by several specific business backgrounds. In other words, RES and PSS share common grounds from the technology perspective, including key functions for reservation, inventory control and departure control in airline distribution and passenger services. In addition to those functions, PSS are designed to play more advanced roles than simply serving as traditional RES in the following three business needs.

2.3.1 Seamless passenger processing

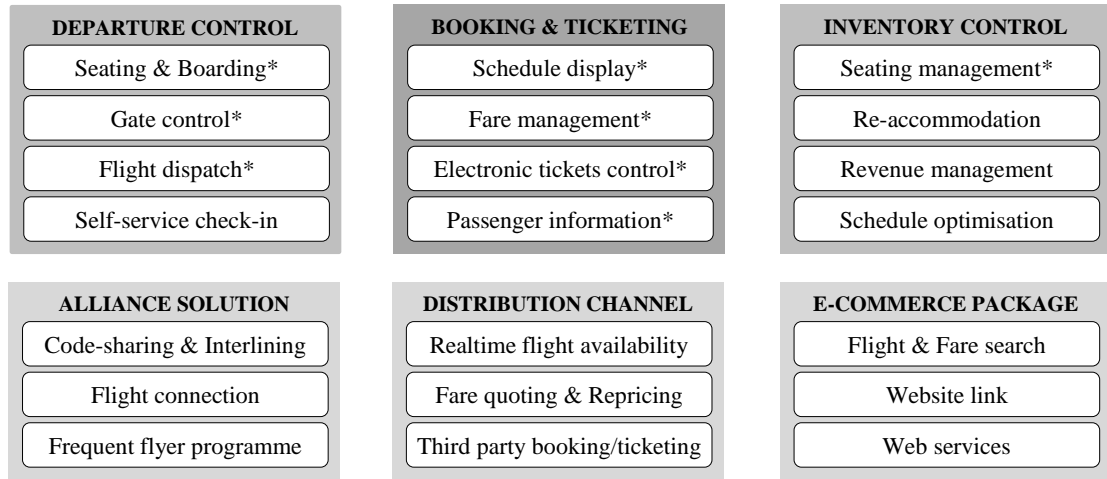
Commercial airlines have collaborated to adopt emerging technologies for competitive advantage and cost-effective operations. As such, they have gradually shifted from on premises, stand-alone systems to outsourced, commonly-used environments, because each airline in the past applied unique local requirements and different standards to its legacy RES, which were incompatible in nature (Benckendorff et al., 2014; Källström, 2005). In the late 1990s, a revolutionised open platform was initiated by one airline alliance and its leading member carriers (Belobaba & Odoni, 2009); in a bid to offer a

seamless travel experience, between IT services as well as airlines, for international travellers through the platform, the founding members pioneered a new idea that an industry-wide PSS as a common platform might be shared across not only the alliance airlines, but also non-allied carriers in any region (see Appendix C).

In general, a platform is designed to provide common services under shared subsystems, which are interconnected components with the main system (Oz, 2004); its subparts function as building blocks that can be configurable with users' requirements within a particular group in an industry (Meyer & DeTore, 2001). In the same way, PSS as a platform can function as a collection of *building blocks* that enables airlines to cater for specific common strategies and changing market demands, thereby providing strategic partners with shared services (e.g. inter-line selling and cross-selling for connection flights) and a suitable fit for exchanging data without the need for manual intervention (Iatrou & Oretti, 2007; Pandey, Karmakar, Shekhar & Gurunaryanan, 2013). As Figure 4 shows, the application software of PSS in structure contains six different subsystems for booking & ticketing; inventory control; departure control; alliance solution⁴; direct distribution channel and e-commerce services. Each of the subsystem blocks consists of multiple subparts in accordance with the function of the subsystem in the group (e.g. schedule display; fare management; e-ticket control and passenger information for booking & ticketing). In response to industry pressure towards flawless travel services, a PSS primarily differs from RES within legacy IT silos in that (see Appendix D): (i) its products form a platform that provides a set of standardised technologies and a shared repository; (ii) the PSS delivers interoperable functionality that enriches the industry mandates such as interline e-ticketing and (iii) each application can be tailored by

⁴ Alliances provide two values for travellers: a combined service is more attractive, and one-stop shopping is more convenient. Thus, the use of a common-use IT is essential for the alliance members (Oz, 2004).

authorised users at touch points who are able to configure the front-end functionality in a block-like structure on their own without remote support from each airline's IT experts (Benckendorff et al., 2014).



Synthesised from Benckendorff et al. (2014) *: Common grounds between RES and PSS

Figure 4. Basic Structure of Passenger Service Systems

2.3.2 Global service network

The second challenge in growing air travel is developing “a larger and denser global network” (Tugores-García, 2012, p. 49). Since the 1990s, the majority of international carriers have prospected for global reach due to the impact of deregulation and the emergence of budget airlines (Rieple & Helm, 2008). According to recent IB studies, most international airlines with regional head offices all over the world are multinational enterprises (Munkvold, 2005); a multinational enterprise (MNE) is “any business that has productive activities in two or more countries” (Hill, Cronk & Wickramasekera, 2011, p. 33). Also, one of the recent streams of IB research on MNE is home-region orientation (HRO), which refers to the propensity of an enterprise to expand within its home region (Rugman & Verbeke, 2004). This explains why classic/legacy network airlines have traditionally tended to focus on domestic markets or short-haul routes in a region and

operate primarily in only a few nearby countries (Rieple & Helm, 2008). Banalieva and Dhanaraj's (2013) study on HRO asserts that technological advantage and regional institutional diversity work as driving forces in an MNE's transformation from its home region to global markets. In this sense, a home-region oriented airline seeks global reach; its distribution network requires a streamlined passenger processing, and the hassle-free services required can be driven by its technological advances and institutional environments (Belobaba & Odoni, 2009).

2.3.3 Common-use information technology

In the travel market, RES had become central to airline distribution. Initially, they were considered an innovative technical achievement (Benbasat, Goldstein & Mead, 1987). As time went by, major legacy airlines long puzzled over the redevelopment of their outdated RES technologies (Källström, 2005; Lee et al., 2017). This is mainly because a move toward investing in modernisation of such colossal and costly enterprise systems came to a standstill with the airline industry's downturn in the new millennium (Feldman, 2002). Moreover, a series of considerable efforts required to reprogram applications in now-obsolete computer languages, known as machine-dependent 'assembly languages' developed in the early 1950s, inevitably entailed delaying delivery of the software due to a lack of human resources and programming skill set (Belobaba & Odoni, 2009). Although a single airline might be unwilling to cope with such a large-scale IT change, there was an alternative approach instead; the passenger airline industry has turned its attention to a strategic tie-up with partners to jointly build up a unified airline IT hub that is accessible through multiple channels and touch points; the centralised, common-use PSS also allows airlines to reduce, simultaneously, the total cost of IT ownership and distribution costs (Benckendorff et al., 2014; Doganis, 2006). To date, three major PSS products have been adopted by FSCs all over the world (see Appendix E). The industry-

wide IT platform offers more standardised mainstream functions used by major airlines. The expansion of airlines today has triggered a technological metamorphosis among strategic partners; within the airline-common platform, many of the newly developed components act as alliance solutions to aggregate customer profiles from multiple airlines, confirm seat availability with the selected flights, and reserve the chosen spaces before the passenger boarding service. Therefore, interoperability based on a set of new technology standards for the airline industry is a key application functionality.

2.4 Passenger Service Systems Adoption: An Interdisciplinary View

As discussed, this study looking at different business backgrounds in adopting PSS between international airlines requires an interdisciplinary approach, in contrast to that used in existing studies on RES, because the technical challenges encountered by airline businesses interacting across borders these days become more complex. However, the prior IS literature has only looked at this situation independently. Considering the widespread use of IT in airlines and the increasing focus of IT systems in a changing international business environment, this study suggests that the adoption of inter-organisational IT systems and global market access in internationalisation should be theoretically linked.

2.4.1 Definition of Inter-organisational Systems

Airlines have typically used various types of IOS, including their reservation platform; IOSs are automated IT systems used jointly by two or more autonomous organisations that draw upon common and shared IT capabilities (Lyytinen & Damsgaard, 2011). They enable partners in a network to (i) collaborate by transferring instantaneous computer-to-computer information based on a set of standards (Kurnia & Johnston, 2000) and (ii) link an organisation to its distributors or suppliers (Laudon & Laudon, 2005). In line with

enabling technological advances (e.g. Internet-based Electronic Data Interchange (EDI)⁵) and the resultant improvements (e.g. database sharing on open standards) in different IT operations and business environments (e.g. cross-industrial/multi-lateral), IS researchers have modified the definition of IOS over time (see Table 1). In the early stages, many IOSs were proprietary under singular ownership, but more recently they have become widely shared across organisational boundaries (Lyytinen & Damsgaard, 2011).

Table 1. Definition of Inter-organisational Systems in the Literature

Definition: Examples/Cases	Environment
The Interfirm electronic network that manages organisational interdependence to improve business outcomes for cost reduction, customer service and new product development (Chatfield & BjØrn-Andersen, 1997): Airlines' computer reservation systems	Value chain logistics coordination For the global distribution
Information systems that facilitates the exchange of products, services and structured/unstructured data between firms (Hong & Zhu, 2006): Business-to-Business e-commerce	Internet-based electronic market
The vehicle for driving the inter-organizational activities through the open communication and broad contact lines at organizational boundaries to share information and knowledge (Bunker et al., 2008): EDI-based IS for strategic alliance and collaboration, joint planning and process alignment	IT systems for strategic collaboration
A set of practices residing in separate organisations but connected through a special type of material boundary object (Reimers et al., 2010): Government-to-Government services in the middle East	Multi-lateral IT systems (e-government)
Information systems used jointly by multiple autonomous organisations that draw upon common and/or shared IT capabilities that facilitate the creation, storage, transformation and transmission of data, such as airline reservation systems, across organisational boundaries (Lyytinen & Damsgaard, 2011): Electronic supply chain management for administration, commerce and transport	Common and/or shared IT configuration
A network-based relational system on an open standards platform that extends beyond traditional enterprise boundaries permitting information access to other organisations (Vaidya, 2012): Web-based IT platform in the e-marketplace	Many-to-many electronic networks

Synthesised from Vaidya (2012)

Most IOSs have been implemented on open standards to facilitate collaboration via electronic integration and are designed to link business processes in ongoing use, thereby

⁵ EDI is the exchange of business information through computer network, replacing a paper-based or call-based communication. Especially, EDI over the Internet can create great cost savings (Oz, 2004).

providing organisations and their partners with pooled information resources, such as the common databases/applications used in airlines (Robey et al., 2008). The role of IOS is to potentially enable organisations to gain a competitive advantage, improve the efficiency of their transactional functions, facilitate joint knowledge creation and build up reciprocity in a partnership (Bunker, Kautz & Pyne, 2008; Cash & Konsynski, 1985), and therefore the adoption of IOS has been seen as important for trading organisations in the global arena (Ibbott & O’Keefe, 2004). In this regard, IOS studies have expanded to include distribution management and electronic commerce involving an integration of customer sales and services in the IB context (Lyytinen & Damsgaard, 2011; Reimers et al., 2010). IS researchers have followed suit by diversifying their theoretical approaches to address the complex challenges encountered in global IOS adoption (Robey et al., 2008; Vaidya, 2012).

2.4.2 Adoption of Inter-organisational Systems

In IS literature, the process of technology adoption has been divided into multiple models and stages. Rogers (2010) describes IS adoption as a three-stage process of initiation, adoption-decision and implementation, while Kwon and Zmud (1987) introduce a six-stage innovation process model incorporating: (i) initiation; (ii) adoption; (iii) adaptation; (iv) acceptance; (v) routinisation; and (vi) infusion. These models have been extensively applied in empirical research on the implementation of technology at the macro-, micro- or single person-level (Cooper & Zmud, 1990; Lyytinen & Damsgaard, 2011). Other researchers have also introduced different simplified models to the IS discipline. This is because different innovation characteristics entail particular research approaches within different contexts of IS (Hameed & Counsell, 2014). For instance, Van de Ven, Angle and Poole (2000) classify IS adoption into initiation, development, implementation and termination, explaining that the innovation process in organisations may not be

sequential. Darmawan (2001) presents a similar four-stage innovation model to investigate factors in a local government's IS adoption, including initiation, adoption, implementation and evaluation.

While researchers split the adoption process into various stages, all these phases can be simplified, fitting primarily into three groups: pre-adoption, adoption-decision and post-adoption stages, which are similar with Rogers' (2010) model combining initiation, adoption-decision and implementation (Hameed & Counsell, 2014). Zhu, Kraemer and Xu (2006) state that the adoption of complex enterprise IOS across different organisations and countries has different characteristics, and develop an integrated model by postulating a three-process—pre-adoption, adoption and post-adoption—and apply the model to the example of Internet-based global enterprise systems in different sets of approaches to adoption by different organisations. Adopting an IOS is not a simple decision but rather requires a long series of choices and accommodations. Their research therefore suggests that the possible outcomes as IOS adoption in phases can be linked into a chain of activities: (i) *decision making*, which is a critical activity in pre-adoption; (ii) *resource allocation*, the necessary financial/human resources are allocated after the decisions; and (iii) *full conversion* or *widespread use* that occurs at the post-adoption stage of adoption process (Hameed & Counsell, 2014), as shown in Figure 5.

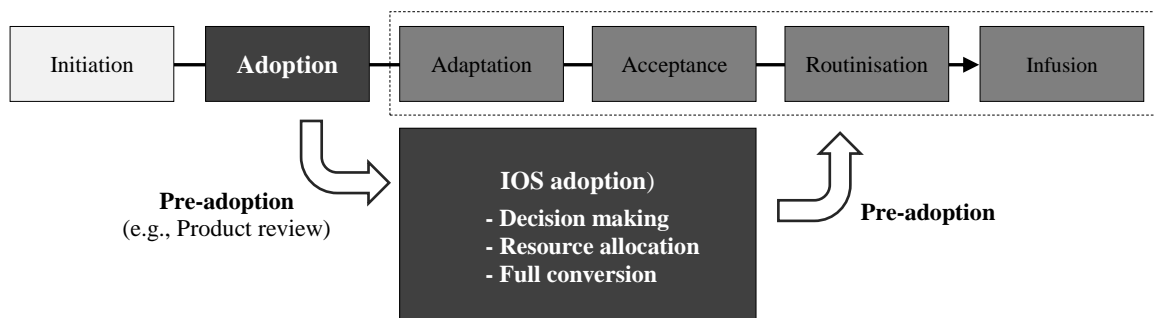


Figure 5. Definition of Inter-organisational Systems Adoption in this Study

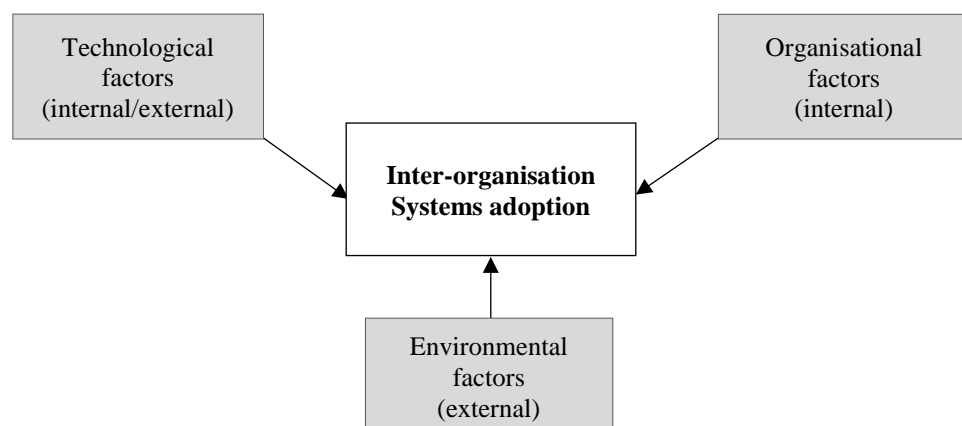
In the adoption of a large IT system, decision making typically means a strategic decision made at an organisational level by determining long-term objectives, resources and policies, and resource allocation determines how costs, time and personnel are assigned to different phases of a system adoption task (Laudon & Laudon, 2005). Full conversion (also defined as widespread use) of IS in an individual organisation, which is a highly difficult, most critical process, of switching operation from using an old IT system to a new one to be used, often entails multiple conversion strategies⁶, including phase/pilot conversion, and manage the transition. An international airline generally owns its regional headquarters and many points of sale in countries, and therefore RES/PSS are introduced by organisational units; a corporate head office, core sales/services divisions and major hub airports might be converted first, followed by mid-sized regional offices and outlying operating units later in due course. In other words, until full conversion is associated with phase/pilot conversion is eventually achieved (i.e. at the given point in time when the old applications are replaced), two different IT systems are maintained and then synchronised with each other (Martin & Cheung, 2000). This re-organised IOS adoption definition is applied to the present empirical study, to explain salient adoption factors as well as to address expected outcomes over time across three target airlines where the different PSS adoptions were undertaken in 2011–2016.

2.4.3 Contexts for Inter-organisational Systems adoption

Research on IOS can be undertaken at individual and enterprise levels. The individual-level frameworks, such as the Technology Acceptance Model, the Theory of Planned Behaviour and the Unified Theory of Acceptance, have been used to explore/predict the

⁶ An IS conversion may include four strategies: (i) parallel conversion—the old system is used along with the new IS for a predetermined period of time in parallel; (ii) phased conversion—a large IS may be broken into multiple modules and phased into operation at a time; (iii) direct conversion—an old system is discarded and a new one takes over the entire business operation in a big bang mode; and (iv) pilot conversion—a new IS is used in more than one business unit in stages (Laudon & Laudon, 2005; Oz, 2004).

individual user's behaviour over a generic set of technologies in quantitative research (Lyytinen & Damsgaard, 2011; Oliveira & Martins, 2010). These families of models/theories are rooted in psychology and sociology, focusing on the internal cognitive states of a single person or independent adopters (Venkatesh, Brown & Bala, 2013). At the enterprise level, the Technology-Organisation-Environment (TOE) framework developed by Tornatzky and Fleischer (1990) has been used as a powerful theoretical model, where IS practitioners and scholars aim to investigate variables or explain factors that influence IOS adoption. As shown in Figure 6, the conceptual framework comprises three contextual elements related to an enterprise's IS adoption phenomenon (Baker, 2012). The TOE framework identifies the triad of influences that compose the context in which an enterprise is operating when it considers IOS adoption: (i) *technological context* refers to both the characteristic technologies and emerging technologies, which can be internally appropriate and be available externally; (ii) *organisational context* is related to the characteristics and resources in a firm: for instance, they may be of managerial structure, internal communication process and cost issues; and (iii) *environmental context* describes industry or market structure, regulatory environment and stakeholder presence/absence (Baker, 2012).



Synthesised from Baker (2012)

Figure 6. Conceptual Framework: Technology-Organisation-Environment Model

TOE is considered to be one of the more widely-used IS research frameworks for the following reasons: (i) it is rooted in classical theories related to organisational innovation; (ii) the framework is designed to be consistent with generic theories adaptable to IS research whether using a quantitative and qualitative methodology; and (iii) its structure suits in empirical studies that address diverse facets of IOS adoption that may contain drivers and/or barriers in technology, inter-/organisation and environment (Oliveira & Martins, 2010). The freedom to vary the factors in different research angles without definite contextual borders makes the TOE framework highly adaptable (Baker, 2012). However, TOE *per se* is not a theory but “an interactionism framework” that is used to demonstrate how various theories can be applied in a systemic approach to explain the dynamics of IS interactions and/or the influences of TOE-oriented contextual factors on IOS adoption at the enterprise level (Kurnia, Karnali & Rahim, 2015, p. 10; Oliveira & Martins, 2010).

2.4.4 Understanding home-region orientation

In terms of internationalisation of IS for multinational corporations, the generic architectures and technological advantage in IT systems conform to four business styles (Bartlett & Ghoshal, 1991; Lehmann, 2010): global (i.e. a high degree of global control with limited local control), multinational (i.e. weak global guidance and high local autonomy), international (i.e. considerable variety between global and local) and transnational (i.e. a mix of tight global and local controls). According to these four MNE strategic stances, IS in a global business strategy are centralised and connected, and IT systems in the multinational environment are rather decentralised and independent. On the other hand, IS in the international context come to be mostly replicated—copied by a central system, while the enterprise IS with transnational elements become integrated through developments at local and central sites (Lehmann, 2010).

An increasing number of the world's enterprises have branched out into countries all over the globe, becoming true multinational firms. While a multinational may have its head office in a single country or its home region, it operates regional headquarters and sales divisions in different countries to take advantage of local benefits (Oz, 2004). Multinational organisations have adopted various types of IOS to serve their own multiple sites across borders (Oz, 2004). Multinationals thus become “a far-flung confederation of production and marketing facilities in different countries”, and the MNE strategy “concentrates management, operation and control out of a central home base” (Laudon & Laudon, 2005, p. 66). According to Oz (2004), MNEs rely more on their managerial ability to adopt an IS perspective that considers the organisations with which they interact. From an interactive perspective, enterprises can be roughly classified into two categories: vertical market and horizontal market. A vertical market is the place where one business sells to another business until the final product/services are sold to customers whereas firms in a horizontal market, such as the airline sector, exchange similar products and services, so they are competitors in nature within the market. Nonetheless, the horizontal market players share IOS to cooperate on specific elements of their activities and exchange information held by their competitors.

2.4.5 Contexts for home-region orientation in airlines

The standardised global element of an MNE's strategy is reflected in IT systems management, which shapes the style of their common systems and accumulates most of the local knowledge. Lehmann (2010) claims that IT applications used by multinational companies, such as airline reservation software, are accessed and connected globally. They are also used as domestic IT systems; while being essentially centralised and favoured for a single-site system with global access, their local content varies with the degree of home region rules and the scope of the access functionality. This means that

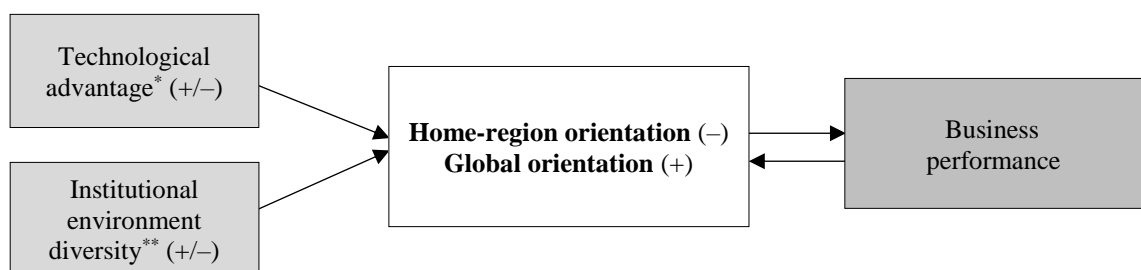
‘by thinking global, and acting local’ (Lehmann, 2010, p. 143), these days IS design, technological configuration and a mixture of central and local elements for a globally competing firm can be increasingly flexible. An MNE’s IT systems thus correspond to strategic organisational fit and complex local requirements, showing a balance between local operations in information/knowledge and global management in a standard setting from one IT centre.

International airlines own their foreign subsidiaries in multiple countries to overcome inherent differences in industry standards, languages, institutions and regulations; most airline companies thus operate multi-nationally and own regional subsidiaries, while having highly skilled personnel and largely automated equipment in the countries where their headquarters are located (Munkvold, 2005). Managing IT resources is important in multinationals such as large international airlines with regional headquarters in different national contexts (Oz, 2004). Major Asian air carriers operate on an intra-regional basis in particular, exhibiting a high-level regional nature in sales, assets, equipment and human within their home region—the Asia Pacific (Collinson & Rugman, 2007). To lower transaction costs—the cost of market participation (Laudon & Laudon, 2005)—across national borders and complex global operations, in the beginning, most carriers start their businesses as home-centric firms, rather than entering new foreign markets at a distance. However, in the face of intense competition and interference from both local/domestic and global markets, they have gradually adjusted their international expansion toward more distant global locations (Banalieva & Dhanaraj, 2013; Iatrou & Oretti, 2007).

One recent strand of IB research on MNE strategy is home-region orientation (HRO). Banalieva and Dhanaraj (2013, p. 90) suggest that, “HRO is the propensity of a firm to expand within the home region as opposed to outside the home region.” This means that

the majority of MNEs tend to concentrate their activities and assets both in the countries and within the region where their headquarters are located. Amongst MNEs in three major economic zones known as the broad Triad regions of North America, the European Union and Asia Pacific, East Asia-based multinationals, particularly, remain strongly home-region oriented (Cerrato & Alessandri, 2017; Mauri, Song & de Figueiredo, 2017; Rugman & Verbeke, 2008; UNCTAD, 2006). This tendency is more intensified and prevalent in the service industry than the manufacturing sector; this is mainly because the countries in the East Asia region are culturally related and have economic and institutional proximity. Therefore, service firms within the region tend to not only acquire relevant knowledge and information about home-region business practices, but also eliminate redundant transaction costs and the risk for the decision-making process by operating in familiar and proximate markets to their home country (Lee & Marvel, 2009).

Banalieva and Dhanaraj (2013, p. 94) claim that as technology and environment shape a firm's geographic scope, technological advantage and institutional environment “influence the firm's distance of international expansion, that is home-region orientation, HRO.” Here, technological advantage means a firm's unique capability, which is



* Intangible assets (i.e. new distribution system, technology standards for global markets)

** Foreign market information on government regulation, political economy

Synthesised from Banalieva & Dhanaraj (2013)

Figure 7. Conceptual Framework of Home-region Orientation

governed internally and embodied in its competitive products/services, and thereby technological sophistication enables the firm to penetrate farther into more distant global markets (Rugman & Verbeke, 2008). On the other hand, institutional environment refers to external factors in foreign entry, government regulations, and political economy, which determine a firm's international competitiveness, including distributional skills and service quality, and the structure of transaction costs across national borders (Banalieva & Dhanaraj, 2013). In other words, a firm's *global orientation* or *home-region bias* and business performance are hence influenced by the level of technological advantage and institutional diversity within the firm (Cerrato, 2009). Banalieva and Dhanaraj's HRO framework (2013) explains the influence of technology advantage and institutional diversity on HRO and the impact on the business performance of MNE (see Figure 7).

Technological advantage and institutional environment are the dominant constructs that determine HRO, influencing an MNE's entry to a new country, market expansion and its business performance. From the IS perspective, in the form of intangible assets and specialised industry knowledge that can be managed within IOS, both technological advantage in *the technology context* and institutional diversity in *the environment context* provide an MNE and its strategic partners with competitiveness to: (i) access global markets; (ii) overcome challenges when increasing distance from the home market; (iii) enlarge global distribution channels; and (iv) reduce the costs of new product development (Cerrato & Alessandri, 2017; Mauri et al., 2017; Wolf, Dunemann & Egelhoff, 2012; Zahra, Ireland & Hitt, 2000). This implies in the airline sector that PSS adoption could facilitate international carriers to: (i) develop more efficient distribution channels; (ii) achieve a wider network beyond their regional boundary by increasing code-share schedules through the shared database; and (iii) identify potential partners that operate a hub in a foreign market using the same PSS (Tugores-Gracia, 2012).

Airlines operate in diverse institutional environments (Kostova, Roth & Dacin, 2008). In response to the industry's regulatory liberalisation, institutional changes and severe market competition, many airlines expanded their global reach (Brueckner & 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 & Helm, 2008). However, due to the impact of deregulation known as *Open Skies*, the emergence of LCCs and the formation of airline alliances in the 1990s, the liberalisation of air travel markets became a global phenomenon, and airlines began operating far from their home regions, vying for more profitable and less competitive markets (Tugores-García, 2012). Such a globalisation impetus brought technological challenges for evolving distribution channels in the institutionally-regulated context of the air transport industry (Belobaba & Odoni, 2009; Merten, 2008). Through the distribution networks within PSS, airlines have the potential to secure a global competitive advantage and cooperate on cross-cultural elements of their services with partners by reducing home-region dependency and widening long-haul segments.

2.4.6 Studies on passenger service systems adoption

Selecting a PSS was a very complicated process and a complex framework.

Probably the largest airline [IT] migration in history (Iatrou & Oretti, 2007).

Most traditional airlines had implemented their reservation systems for sales and services automation by the 1980s (Buhalis, 2004). Accordingly, previous academic research on RES adoption was intensively carried out in that period (Lee, Wang & Leong, 2015). After this, the majority of the investigations on airline reservations addressed the issues of fare search, user interface and multimedia content to explain users' acceptance behaviour and individuals' intention to use them on airline websites (Bigné, Sanz, Ruiz

& Aldás, 2010; Cunningham, Gerlach, Harper & Young, 2005; Law & Leung, 2000). In addition, a small number of studies on reservation systems adoption were focused on examples of low-cost carriers (LCCs) in general (Bhatia, Oertzen & Wise, 2010; Buhalis, 2004; Chang & Hung, 2013; Escobar-Rodríguez & Carvajal-Trujillo, 2014; Law, Leung, Leung, Lo & Fong, 2015). This means that, possibly, there might be knowledge gaps in the literature. This is because empirical studies on the adoption of PSS need to be conducted at the firm level, not at an individual level, and the PSS solution is also fundamentally designed for home-region oriented airlines that provide full-scale services (Lee et al., 2017).

While there still exists a small collection of articles introducing the features of PSS, collectively, they are limited in adverting to PSS initiatives or exploring PSS-related issues. In the IS area, two of the few empirical contributions to unveiling the phenomena on PSS are the studies of Källström (2005) and Rieple and Helm (2008). Among the IS-related literature, the term PSS is firstly identified from Källström's (2005) qualitative case study on three airlines among leading PSS adopters. Källström (2005) introduces the idea that the PSS consists of modular applications originating from the conventional components of reservation systems and several peripheral subparts, including alliance applications, online selling packages and an external connectivity to third parties. The PSS suite, in the form of an open standard platform used for airlines, shares information with all possible airlines and connects airport workstations. It is developed to integrate database and open architecture to allow reservations, check-in and other value-added services as well as to maintain a consistent view of passenger information. It can be easily customised with add-on software and bundled products that offer value-added services to high-end customers. His study mentions that the PSS is also designed to support strategic

partnerships and harmonise customer data across the PSS user airlines as well as to increase potential business value of the airline business from PSS.

Relying on data from secondary sources from five legacy airline companies, Rieple and Helm (2008) released another empirical case study with a descriptive comparative analysis that discussed motivation for PSS adoption from the customer sales perspective; in the PSS-related part, on the basis of transaction cost theory, their research investigates five legacy airlines—three from Europe and two from Australasia. It explores the idea that the adoption of a ‘standard bought-in PSS’ enables the airlines to achieve significant cost savings and remove redundant distribution costs through more sophisticated distribution channels. Another motivation for the adoption is the recognition that PSS can not only share customer profiles through the highly compatible system with joint marketing partners, but also enables the adopters to improve their competitive advantage through PSS.

In summary, Källström’s (2005) exploratory case study of the first three European airlines in the world to implement PSS focuses on revealing the PSS business value, incorporating strategic drivers and operational implications from an organisational perspective; the major value would be long-term cost reduction and access to leading-edge technology. However, his research does not propose how the airlines adopted PSS and how technological and organisational factors influence their PSS adoption. Rieple and Helm (2008) claim two motivations of five airlines for the adoption of PSS⁷; (i) the use of a standard, compatible PSS in customer sales and (ii) ticketing and a competitive advantage to achieve significant cost savings as well as to access shared database about customers

⁷ Rieple and Helm’s (2008) article contains five separate topics on how seven airlines achieve competitive advantage: plane acquisition and ownership; engineering and aircraft maintenance; customer sales and ticketing—PSS adoption in five carriers; in-flight catering and corporate identity and brand management.

for marketing purpose between PSS adopters. In the form of a research report, their study enumerates information about the features of PSS and key functions of the airline IT solution without critical discussion on the phenomenon of PSS adoption. In this sense, an explanatory study conducted in a theoretically robust manner to examine the possible causal factors in PSS adoption at the firm level, and to explain the impacts of PSS adoption on home-region oriented airlines, is meaningful in the IS area.

2.5 Underlying Theories of the Study

Robey et al. (2008) claim that IOS is a topic area in which no single theory has dominated; they advise IS scholars to: (i) capture the variety of IOS research domains; (ii) attempt to apply overarching theories in other fields to the IOS research issues; (iii) enrich hypothesis development in the IOS area; and (iv) discover more distinct identities of IOS. Considering these suggestions, this study notes that Vaidya (2012) explains the different forms of inter-organisational arrangements, identifies the relevant dimensions of IOS and draws up over 30 theories that underpin IOS adoption, while the research of Wolf et al. (2012) derives eight underlying theories from their study into the phenomenon of MNE's HRO that explain how/why MNE concentrate activities in their home region. Based on a systematic review of these two articles, it is recognised that transaction cost theory (TCT) and neo-institutional theory (NIT) address the phenomenon of IOS adoption and HRO as underlying theories in common use (see Figure 8). The highlighted circle in the TOE context is therefore proposed as a suitable theoretical domain for this study.

2.5.1 Transaction cost theory

From a technological perspective, RES in airlines are integral in terms of facilitating data interchange and real-time information sharing with air travel stakeholders such as travel intermediaries, airport security agencies and Immigration Services (Oz, 2004).

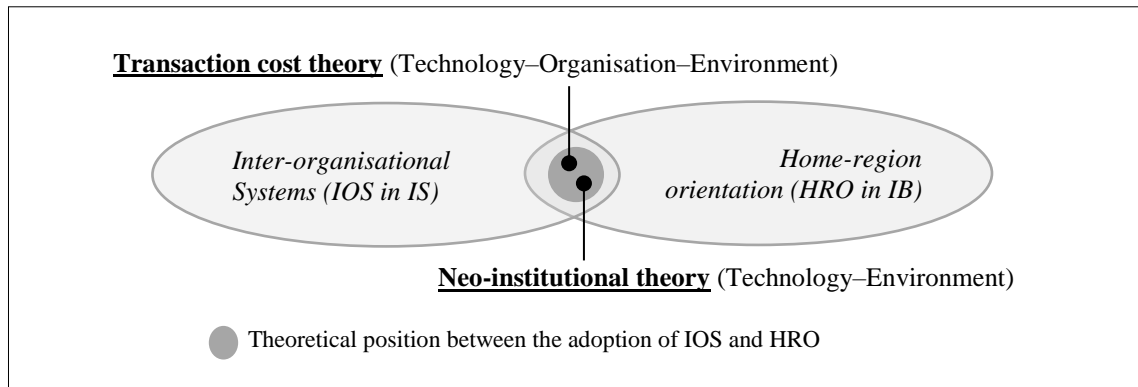


Figure 8. Theory of Interest and Theoretical Commonality

From a business point of view, however, rising transaction costs in airlines have been a constant pressure, and, thus, lowering transactional fees (for booking, ticketing and messaging between airlines and distributors) through distribution channels has been a longstanding critical managerial concern over airline distribution (Merten, 2008). TCT views IOS, including airline RES, as governance structures and human/site asset specificity that control three transaction costs: information, negotiation and monitoring costs (Vaidya, 2012). This theory is widely employed to analyse the impacts of IOS on transaction structure, as well as to scale, that IOS may: (i) decrease external and internal co-ordination costs; (ii) increase operational efficiency; and (iii) lower financial burdens associated with business events known as transactions (Oz, 2004; Vaidya, 2012).

On the global business side, an MNE's transaction costs grow when the country-level distance increases from its home (Rugman & Oh, 2013); the distance refers not only to geographic distance, but also to institutional distance. Wolf et al. (2012) explain that an MNE tends towards HRO because of the limited geographical reach of its firm-specific advantage, and HRO results from connecting their firm-specific internal preferences with country-specific external advantages (Rugman & Verbeke, 2008). This means that an MNE's success stems from its ability to adjust its firm-specific advantages to the

conditions that exist in the host market, and the MNE pursuing a new business opportunity in a foreign market engages in institutional activities and cooperation with overseas stakeholders. Therefore, the institutional environment within the home region affects transaction costs (Banalieva & Dhanaraj, 2013), and the use of the shared network (e.g. the same distribution channel for connection flights on a PSS where no additional booking/ticketing fees are generated) can help multinational firms lower transaction costs (Laudon & Laudon, 2005).

2.5.2 Neo-institutional theory

Airlines have experienced dramatic changes to the institutional commitment and regulatory mechanisms that govern airline markets and distribution structures (Button & McDougall, 2006). Institutional forces guide strategic changes as well as inter- and intra-organisational innovation among the enterprises (Vaidya, 2012). NIT represents organisations' adoption of rules and practices that may raise their legitimacy in external stakeholders' points of view (DiMaggio et al., 1991). Orlikowski and Barley (2001) encourage IS researchers to employ NIT to investigate/explain the influence of regulative, normative and institutional structures. In general, an increased number of innovation-adopted organisations, thus, creates isomorphic forces—mimetic, coercive and normative pressure—on the remaining organisations and trading partners, thereby influencing their IOS adoption (Dwivedi, Wade & Schneberger, 2011). Simply to say, organisations imitate one another, in case a leading organisation adopts a specific innovative IT system. A new type of IOS, such as PSS, can be viewed as an organisational innovation, and the level of IOS use is dependent on the organisation's needs and resulting isomorphic pressures (Dimaggio et al., 1991). Notably, in HRO-related studies, the postulation of NIT is that an MNE's executive cannot reliably judge the economic effectiveness of their strategies (Banalieva & Dhanaraj, 2013; Dimaggio et al., 1991). NIT argues that prior

decisions and actions of competitors and suppliers provide legitimisation and information to a decision marked by uncertainty. As a result, in cases where the competitors and suppliers are globally dependent such as in international air travel, an MNE may have a strong tendency towards the global markets due to institutional concerns and concomitant technical pressure (Rugman & Oh, 2013).

2.5.3 Theoretical consideration related to this research

Drawing on TCT and NIT, Kurnia and Johnston (2000) and Vaidya (2012) propose a theoretical framework of IOS adoption based on the following propositions: (i) industrial factors correspond to transaction risks, industry trends, strategic partners' readiness, customer needs, and market competition; (ii) technological factors encompass operational efficiency, switching costs, interoperable services; and (iii) organisational factors comprise coordination cost, process innovation, financial resource, firm size and top management commitment. Similarly, within the technological context and environmental context, Wolf et al. (2012) recapitulate two kinds of internal and external factors that potentially influence a global firm's business towards HRO according to TCT and NIT; for instance, they demonstrate that (i) technological internal factors are an enterprise's ability to connect its firm-specific advantages including technological advantage, knowledge, innovative processes and market-/sales-related skills; and (ii) environmental external factors are used as country-specific advantages provided by foreign locations such as institutional environment, customer demand, human capital and social infrastructure. Based on the two commonly underlying theories, Table 2 summarises key driving forces to the phenomenon of IOS adoption in the TOE contexts and HRO within the context of technology and institutional environments.

Table 2. Common theory: Inter-organisational Systems vs. Home-region Orientation

Inter-organisational Systems adoption	Commonly-applied theories	Home-region orientation
Transaction cost/risk control Inter-operational efficiency	Transaction cost	Firm-specific advantage Country-specific advantages
Organisational innovation Strategic impacts	Neo-institutional	Competitors' decisions Suppliers' actions

Source: Kurnia & Johnston (2000); Vaidya (2012); Wolf et al. (2012)

Within this research, these driving forces are used to explain the roles of PSS in terms of airline distribution and passenger services in international airlines and thereby to identify possible factors in PSS adoption and business value from PSS. With this theoretical consideration and logical structure, the next chapter presents the study's research model based on the TOE framework and discusses the possible influential factors in PSS adoption.

2.6 Summary of the Chapter

This chapter provided the theoretical foundation for the study. IS literature classifies a reservation platform used in airlines as a specific type of IOS, and recent internationalisation studies reveal most international airlines are home-region oriented multinational enterprises. In parallel, an understanding of the emergence of airline PSS is critical in comprehending the intricacies of the current airline industry and business environment, such as competitiveness in common IT services, global alliance evolution and multilateral liberalisation. This chapter presented a review of extant literature on the development of IT/IS for airline distribution and passenger services and the evolution of PSS, in terms of accelerating the provision of cross-border connection services by partnering and the strategic use of common IT platforms together with major international airlines. The IS and IB literature also highlight IOS adoption on an organisational level

and the MNEs home-region oriented tendency, including the characteristics and contexts of home-region oriented airlines. Lastly, Chapter 2 reviewed transaction cost theory and neo-institutional theory, the interactionism between the two underlying theories and a theoretical consideration in the aspect of IOS adoption and HRO, prior to building a conceptual model on the adoption of PSS in airlines.

End of Chapter 2

CHAPTER 3: RESEARCH MODEL

3.1 Outline of the Chapter

Chapter 3 proposes the research model used in the present research. This chapter starts with a set of research questions in Section 3.2, and Section 3.3 sets out the design of the study based on a deductive approach. Based on the previous literature review, Section 3.4 discusses identified potential factors in IOS adoption and HRO that can be applied to the present study, theoretical constructs within the three key contexts, and a set of expected factors in PSS adoption. Next, within the context of technology, organisation and environment, section 3.5 introduces two theoretical frameworks that are rooted in the IOS adoption model (Robey et al., 2008; Vaidya, 2012; Zhu et al., 2006) and the HRO model (Banalieva & Dhanaraj, 2013; Rugman & Verbeke, 2008), and then illustrates the conceptual research model that could address the phenomenon of PSS adoption from a qualitative explanatory perspective. After presenting the theoretical research propositions, Section 3.6 discusses how to represent influential relationships and organisational interactions among PSS adoption factors in graphical form based on a cognitive mapping approach that is widely used in a qualitative multiple case study. Finally, Section 3.7 reports a summary of this chapter.

3.2 Research Questions

A general principle for selecting an appropriate research design, protocol or instrument is to begin with clarifying the research questions (Nastasi & Hitchcock, 2015). As aforementioned, this study aims to provide a rich explanation of the dynamics of PSS adoption in airlines at the firm level, applying a multi-theory perspective in the concepts of IOS adoption and HRO. Through organisational interactions and inter-organisational relationships, PSS embody their value in the collaboration and competition of the

international airline business; a focus of this explanatory research, is thus, on testing causal factors for PSS adoption from the perspective of IOS adoption and HRO, and revealing cause-and-effect relationships within the context of TOE. Based on industry needs, this study proposes three key questions as follows:

Research questions:

- 1. Why do the target airlines need PSS?**
- 2. How influential are the identified factors to their PSS adoption?**
- 3. What are the predicted impacts of PSS on their business?**

Through the lens of IOS used by home-region oriented airlines, the first research question explains why each East Asian airlines needs PSS by looking into the business goals/values and the potential factors identified in the existing studies; the approach to the overarching research arguments is on the basis of a threefold challenge of innovating distribution channels and passenger service provision in the aviation sector, including: (i) transformation into an industry-wide common use system (Benckendorff et al., 2014; Merten, 2008); (ii) an efficient sales and service network used with strategic partners (Silva, 2012; Tugores-García, 2012); and (iii) a technology enabler for shared passenger services (Belobaba & Odoni, 2009; Iatrou & Oretti, 2007).

The second research question and its findings are discussed in the arrangement of causal factors within the TOE context that influence the three phases of PSS adoption—decision making, resource allocation and full conversion (Oz, 2004; Zhu et al., 2006)—to see which of the deducted potential factors seem to play a role in the cases. The findings on the second and third questions are revealed by addressing the mechanism by which PSS adoption occurs in the each of the cases (i.e. whether the factors seem to be positively/negatively connected) and by predicting the impacts of PSS on the airline business in terms of strategic and operational benefits (Robey et al., 2008). Examination

of multiple IOS research and IB studies led to recognition of potential knowledge gaps in relation to the mechanisms of PSS adoption, thereby inspiring this researcher to design the study to answer the given research questions. In accordance with the multi-directional (networked) cause-and-effect display (Miles, Huberman & Saldaña, 2014), the research then represents influential relationships between factors and discusses impacts and consequences of the adoption of PSS. Consequently, to explain the phenomenon of PSS adoption in the airline industry, the aforementioned inquiries are grounded in the theoretical underpinnings of the IOS adoption framework and the HRO model in the IB literature.

3.3 Design of the Study

This researcher approached the design of the study with deductive reasoning. A deductive approach is useful to test a previous model, an earlier theory and similar contextual factors in a different situation (Elo & Kyngäs, 2008). Through this deductive strategy, the present explanatory case study is rooted in an *a priori* construct specification to identify variables in PSS adoption, as well as to examine contextual factors in accordance with an event-state network; a causal network of event-state display is useful in describing interwoven qualitative textual data in a flow of causal factors and outcomes (Miles et al., 2014). To do this, by referring to the literature on IOS adoption and HRO in multinational service firms, the *a priori* orienting constructs that are practically related to PSS adoption are selected as antecedent variables and mediating variables, which are presented in the causal networks; as previously summarised in Table 1 and Table 2, much of the IS literature rooted in TCT and NIT specifies a multitude of characteristics addressing factors in IOS adoption within technological, organisational and environmental contexts, and multiple IB works on HRO also elucidate technological and environmental factors.

Such contextual adoption factors can be theoretically re-arranged in two perspective as follows:

- | | | | |
|-------|---------------------------------------|---|--------------------------|
| (i) | technological context factors | } | IOS adoption perspective |
| (ii) | inter-/organisational context factors | | |
| (iii) | environmental context factors | | |
| (iv) | technological context factors | } | HRO perspective |
| (v) | environmental context factors | | |

As shown in the top of the Figure 9, the factors on the basis of the IOS adoption model are incorporated with the contexts of technology, organisation and environment (Vaidya, 2012) in order to explain internal/external factors of PSS adoption.

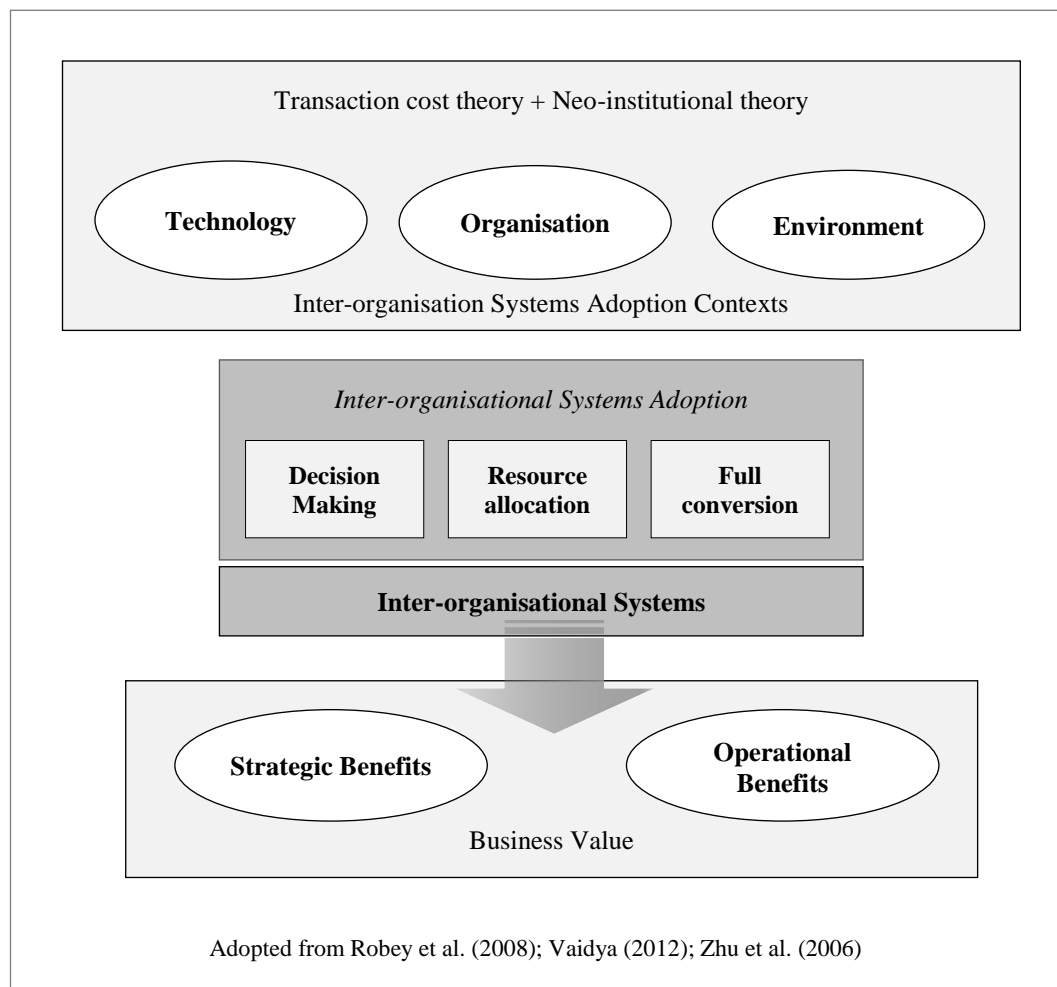


Figure 9. Theoretical Framework – Inter-organisational Systems Adoption

The expected outcomes of the PSS adoption phase that reside in the middle of the IOS framework, might be also addressed within decision making, resource allocation and full conversion of PSS (Oz, 2004; Zhu et al., 2006). As the consequence drawn from PSS adoption (or the impact of PSS adoption), the business value from PSS, which comprises strategic benefits and operational benefits at the bottom of Figure 9, can be then discussed (Robey et al., 2008). As such, a TOE-oriented framework can be thus suggested as one integral part of the conceptual research model of the study from the IOS perspective. In parallel, to explain the issues of global reach within the context of technology and environment, the factors from the HRO perspective are first placed in line with the HRO model (Banalieva & Dhanaraj, 2013; Rugman & Verbeke, 2008) (see Figure 10).

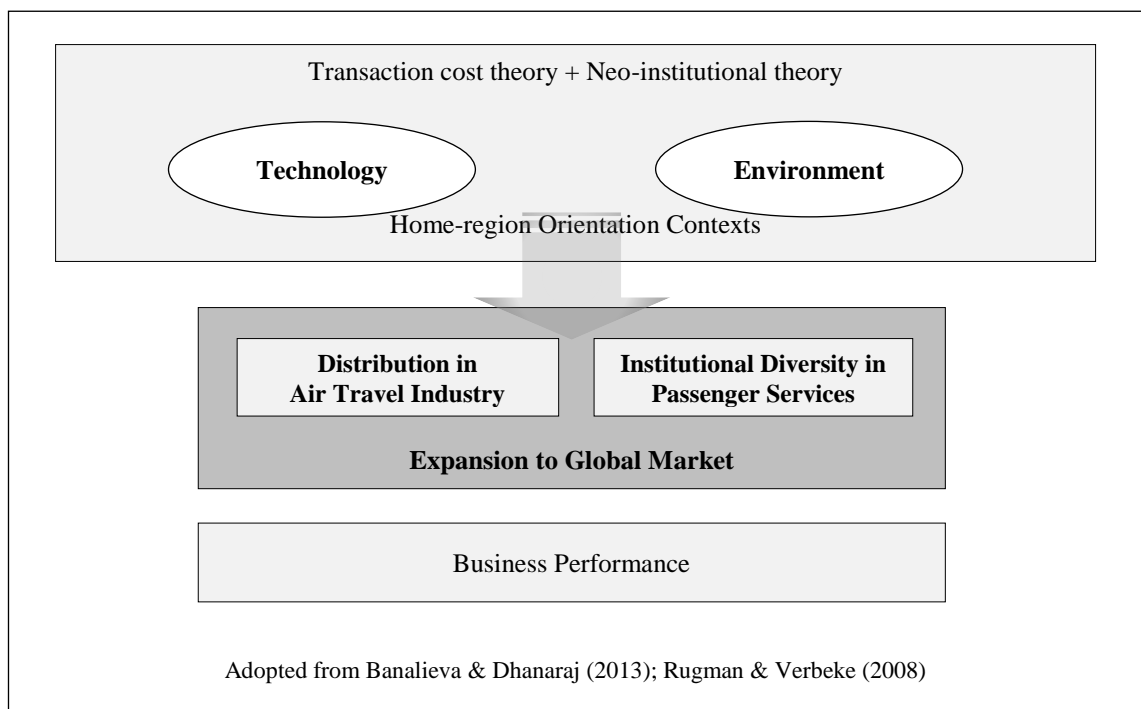


Figure 10. Theoretical Framework – Home-region Orientation in Airlines

In a bid to enable a discussion on globalisation in airline sales and services through PSS, one set of factors related to air travel distribution as well as another set of factors in institutional diversity in passenger services can be then arranged together. Lastly, the

effects from PSS adoption should be addressed within each airline's business performance. These three components included in Figure 10 conceptualise another core portion of the research model of this study to be discussed in the coming section. In sum, the two different frameworks originating from the related IS and IB literature will be merged (shown in Section 3.5) to test the factors of PSS adoption in airlines across technological, organisational and institutional properties, delivering business value and performance, combining strategic benefits and operational benefits.

3.4 Relevant Constructs for the Research Model

From the standpoint of the socio-technological context in IOS adoption and HRO, the unified theoretical framework for this study needs to be filled with the triad of firm-level factors (i.e. within TOE-based three contexts) that influence PSS adoption in airlines.

3.4.1 Contextual factors applicable to this research

Within the contexts of technology, organisation/inter-organisation, international regulation and institutional environment, the extant IS literature demonstrates that the TOE framework possesses theoretical and empirical powers to identify and/or explain factors in the adoption of IOS. For instance, Gibbs and Kraemer (2004) carried out a cross-national investigation of the determinants of e-commerce adoption within the TOE context, including technology resources, financial resources, a lack of compatibilities, external pressure and legislative barriers. Zhu et al. (2006) developed an extended TOE model that addresses the adoption of e-commerce with global connectivity in the context of multi-lateral organisations; they claimed that technology integration, global scope, data interchange and partner usage were significant adoption predictors.

While the above studies have been conducted in a quantitative manner, employing descriptive statistics, Munkvold (2005) discussed his research findings from a qualitative

cross-case analysis of the organisational adoption of electronic collaboration technologies of two European companies, describing challenges in communication costs, cultural diversity and technological heterogeneity. As another qualitative exploratory multiple case study employing the TOE framework and a multi-theory perspective, Kurnia et al. (2015) suggested that compatibility [positive] in the technological context; financial and human resources [mixed] as well as top management support [positive] in the organisational context; and coercion [positive], government regulations [negative], and foreign influence [positive] in the environmental context affect inter-organisational IS adoption for e-commerce business firms in an Asian region. An explanatory case study by Uwizeyemungu and Raymond (2011) claimed insignificant differences between different business size enterprises, pointing out the predisposition of various TOE factors in the organisational context; their research also revealed that the strategic orientation of senior managers generated the greatest effect on IOS adoption in the service industry. In other explanatory multi-case research from the IS and IB perspective, Zhang, Zhang, Zhao, Tan and Meng (2017) explained that top management support, organisational technology accomplishment, regional economic and social environments were determinants in adopting e-document exchange systems in the China-based organisations. In addition to the above studies that address TOE-based IOS adoption factors (Gibbs & Kraemer, 2004; Kurnia et al., 2015; Munkvold, 2005; Uwizeyemungu & Raymond, 2011; Zhang et al., 2017; Zhu et al., 2006), this research sets forth the following Table 3, Table 4 and Table 5 and enumerates 28 PSS adoption factors, which may be interdependent with others and the expected benefits, by referring to the relevant literature in the field of IS as well as IB and in the area of airline business/air travel IT services; the selected variables are to be examined in the later chapters of the thesis as to see the dynamics by which one or more of them exerts influence on PSS adoption, to represent organisational

interaction in adopting PSS and to discuss how/why each of these factors influences the adoption stage from the perspective of air travel distribution and passenger services.

3.4.1.1 Selected possible technology factors

Firstly, in terms of the potential technological factors (see Table 3), *interoperability* means the state in which an enterprise operates “mechanism and structures that allow the interwork of enterprise IS according to the common business purpose” (Kumar et al., 2011, p. 49). In the airline IT sector, it refers to the ability, through industry-wide standard and structured interfaces, of a system to work seamlessly with other systems (Roberts, 2015). Within the travel industry context, airline e-tickets that are the tickets issued and stored electronically are one of the recent typical examples of an interoperable service; furthermore, interoperable functionality enables airlines to save various distribution costs for selling seats and lower transaction costs incurred when international carriers find new overseas markets with partners (Källström, 2005; Roberts, 2015; Vaidya, 2012).

Compatibility with existing systems can be described as the degree to which an innovation fits with the present values, current needs and existing experience of potential adopters as being easy to use (Hassandoust, Techatassanasoontorn & Tan, 2016; Kishore & McLean, 2007, OZ, 2004; Rogers, 2010); within the same airline platform, complex reservation rules even across different airlines may be easily compatible, because the computing resources (e.g. seat map databases) in a single infrastructure are shared. An industry-specific *technology standard* capability can serve the needs of enterprises or organisations to save time and lower risk (Kroenke, 2012). In the air travel industry, IATA has defined new industry standards that are shared across airlines, and the majority of technology standards are initiated under the umbrella of IATA; a recent example is XML (Extensible Markup Language) based data transmission standards that replace the existing

electronic messaging scheme. The new standards have been widely used to share electronic data for connecting passengers between airlines (Benckendorff et al., 2014).

Table 3. Possible Technology Factors in Passenger Service Systems Adoption

Variables [11]	Definition	Literature
Interoperability	The ability, through industry-wide standards and a structured interface, of offering a necessary functionality and working seamlessly with other IT systems	Roberts (2015)
Compatibility	The degree to which an innovation fits with potential adopters' existing systems and values	Rogers (2010)
Technology standards	A set of technical guidelines, which can be used as common requirements in a specific industry	Kroenke (2012)
IATA mandate	IATA's regulatory rules that come into force by deadline to raise operational efficiency in the air transportation sector	Benckendorff et al. (2014)
High quality data	Data that are managed and optimised in a high standard of quality to ensure completeness, consistency, accuracy, validity and timeliness; balancing these five elements of quality data is a key to airline overall activities to reduce disruption events	Rapajic (2016)
Differentiation in IT services	An achievement by providing customers with unique IT-assisted experience based on differentiated technological components from those of competitors	Reimann et al. (2010)
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 & Laudon (2005, p. 217)
Common platform	A standard IT system (e.g. hardware, software or operating system) that is commonly used in a business group or an industry	Oz (2004)
New technology development	The development of non-existent products, processes and services that are created through technological innovation or using a technical skill	Meyers & Wilemon (1989)
Middleware	Special software that "connects two other separate applications, allowing them to communicate with each other and to pass data between them"	Laudon & Laudon (2005, p. 217)
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)

*: Also referred as an organisational factor, depending on the airline's context

IATA mandate for airlines means new IATA regulatory rules that come into force by a deadline to enhance passenger safety or raise operational efficiency in the air

transportation sector; for instance, a technical move to bar-coded boarding passes that contain information on flights and passengers in an industry standard two-dimensional code was one of the IATA mandates to replace magnetic strip passenger boarding passes by 2010 (Benckendorff et al., 2014; IATA, 2012).

High quality data are fit for use by large international airlines; to ensure usefulness and usability as well as to reduce disruption events, the characteristics of high quality data in airline IT services include five aspects: completeness, consistency, accuracy, validity and timeliness (Rapajic, 2016; Strong, Lee & Wang, 1997). These elements of the quality of data should be well balanced and compromised across skills, time and the cost associated with data processing. Otherwise, data discrepancies⁸ in transmitting interline passenger data between different airlines may take place due to a lack of compatibility in the incoming/outgoing message switching process; it eventually causes ‘no record’, such that booking data or boarding histories for an individual or a group of travellers are missing within RES for connection segments.

Differentiation in IT services can be achieved by providing customers with a unique IT-assisted experience based on differentiated technological components from those of competitors (Reimann, Schilke & Thomas, 2010); a trial application of a radio frequency identification (RFID) embedded tag onto passenger baggage to keep track of checked-in luggage is one of the more recent practices of IT services differentiation as a way of replacing traditional bar-code tags. A *legacy system* is an IT system that has been “in existence for a long time and that continues to be used to avoid the high cost of replacing or redesigning it” (Laudon & Laudon, 2005, p. 217); RES developed in a mainframe

⁸ Data discrepancies in IT systems take place in a certain situation where an unpredicted failure of integrity and consistency of data occurs between multiple IT systems (Armstrong & Hardgrave, 2007).

computer (i.e. a less powerful, old-fashion central processing unit) before the era of the internet-based open systems are known as underlying legacy systems used by airlines.

Common platform refers to a standard IS that is commonly used in a business group or an industry (Oz, 2004). The biggest GAA has led the development of PSS as common IT platforms, a suite of common-use passenger sales and service solutions that would be used for the member carriers and their strategic transportation partners. *New technology development* means the development of novel products, processes and services that are created through technological innovation or using a technical skill (Meyers & Wilemon, 1989). This practice can be done by an individual airline or a collaboration between airlines and IT service providers.

Concerning *middleware operation*, middleware is “special software that connects two other separate applications, allowing them to communicate with each other and to pass data between them” (Laudon & Laudon, 2005, p. 217); it can include in-house application software or an off-the-shelf software package. In operating middleware within an individual airline, integrating existing legacy applications with new applications in PSS, as well as creating a technological bridge between such disparate applications, is key to exchanging various sources of information through PSS across airlines.

IS personnel staffing has been one of the major research issues considered in IS studies since the 1990s, because executives tend to overlook the importance of “specifying, recruiting and developing IS human resources” (Niederman, Brancheau & Wetherbe, 1991, p. 480). As IS professionals need to possess new business skills and technical expertise in response to the advent of open systems that interface and interact with other systems (Oz, 2004), finding the right IS human resources is thus a key to IS-related tasks within the context of multinational firms.

3.4.1.2 Selected possible organisation factors

In the organisational context of IOS adoption and airline IT operation, Table 4 lists another ten potential variables that explain the influence of PSS adoption. *Partnerships with carriers* in a strategic relationship have become more important in airlines' global expansion; a strategic partnership is formed when a business entity allies itself with one or more other entities to enlarge potential benefits (Laudon & Laudon, 2005).

Table 4. Possible Organisation Factors in Passenger Service Systems Adoption

Variables [9]	Definition	Literature
Strategic partnerships	A strategic partnership is formulated when a business entity allies itself with one or more other entities to enlarge potential benefits	Laudon & Laudon (2005)
Joint marketing	A combined effort between two or more enterprises to promote business on both sides; passengers can accumulate mileage traveling in the host airline or any of its partner airlines and further use the mileage to fly with any of the airlines	Silva (2012)
Cost in IS operation	The degree to which the operation of IT systems is perceived as cost effective	Tan (2002) Tornatzy & Fleischer (1990)
Expert training	The provision of professional training programmes for individuals at a sufficient level by an organisation to use a specific IT system	Chang & 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-Gracia (2012)
Top management support	Top-level executive behavioural support of IS within the firm	de Guinea et al. (2007)
Organisational transformation	A strategic move within an organisation to transform business processes, work practices, internal culture and individual roles by the effective use of IOS to achieve organisational change	Morton (1991)
Organisational alignment	"The extent to which the various organisational components support the philosophy and technology of interest embedded within the focal IT innovation"	Kishore & McLean (2007, p. 258)

A typical form of strategic partnerships in airlines can be seen when a carrier enters into a cooperative agreement to code-share with a foreign carrier; code-sharing is a reciprocal

agreement where airlines share the same two-letter code to identify the carriers (e.g. Air New Zealand: NZ; Qantas Airways: QF) in the air transportation rule. Thereby, two code-share partners can mutually generate more revenue and greater profit beyond their own network coverage (Silva, 2012). *Joint marketing* is a combined effort between two or more enterprises to promote business on both sides. Within a joint marketing agreement between two specific airlines or within an airline alliance, as an example, passengers can accumulate mileage travelling on the host airline or any of its partner airlines and further use the mileage to fly with any of the airlines (Silva, 2012). *Cost in IS operation* means the degree to which the operation of IT systems is perceived as cost effective (Qirim, 2002; Tornatzy & Fleischer, 1990). *Expert training* refers to the provision of professional training at a sufficient level by organisations to use a particular IT system (Chang & Lung, 2002).

Global network is a key to international airline operations; 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). For a single carrier, providing a comprehensive global network to multiple countries and several regions through its own resources is challenging, as open skies become more multilateral, and aviation regulations have also changed; international airlines have thus extended their networks and services with alliance member carriers with a global reach to provide travellers with more convenient connections (Hwang, 2004; Park, 1997; Silva 2012). *Seamless service* refers to the provision of a series of cross-border connection services by partnering with foreign airlines (Tugores-Gracia, 2012). This service is particularly possible when the airline and its partner carrier (i.e. a member of the same alliance) make international travel seamless under ‘the umbrella of the alliance’ and offer consistent and

shared services to meet consumer demands for smoother connections to multiple destinations (Silva 2012; Tugores-Gracia, 2012).

In IS adoption, *top management support* means a top-level executive's behavioural support of IS within the firm (de Guinea, Kelley & Hunter, 2007); top managers encourage the use of technologies by approving the provision of necessary resources to facilitate IT/IS adoption (Hassandoust, 2016; Wang, Butler, Hsieh & Hsu, 2008). *Organisational transformation* addresses a strategic move within an organisation to transform business processes, work practices, internal culture and individual roles by the effective use of IOS to achieve organisational change (Morton, 1991) whereas *organisational alignment* is defined as "the extent to which the various organisational components support the philosophy and technology of interest embedded within the focal IT innovation" (Kishore & McLean, 2007, p. 258).

3.4.1.3 Selected possible environment factors

Table 5 presents the third group of potential qualitative variables related to PSS adoption within the environmental context. *Isomorphic forces* are institutional pressures at organisational or industry levels; this isomorphism includes *mimetic forces* (competitive pressure), *coercive forces* (regulatory pressure) and *normative forces* (market/industry pressure) in organisational fields (Dimaggio & Powell, 1983; Vaidya, 2012). In terms of complex IS adoption initiatives such as PSS adoption, this study also identifies *vendor support* as a potentially important variable reflecting a mix of timely support from vendors⁹ vis-à-vis technology, training and relationships (Guniea et al., 2007). *Foreign operations from home region* is defined as running an offshore business operation from the home base using cost-effective direct distribution channels on a global scale

⁹ A vendor (or a service provider) means an entity that supplies professional services or contributes high quality products (Oz, 2004).

(Banalieva & Dhanaraj, 2013; Tugores-Gracia, 2012). In the international airline business, knowledge acquisition between carriers also becomes more critical; knowledge acquisition on an inter-organisational level can be explained as a process of acquiring knowledge via internal and external IT systems and distribution of the knowledge over a network (Nambisan, Agarwal & Tanniru, 1999).

Table 5. Possible Environment Factors in Passenger Service Systems Adoption

Variables [8]	Definition	Literature
Isomorphic forces: mimetic, coercive and normative forces [3]	Institutional pressures at organisational, industry levels; this isomorphism includes mimetic forces (i.e. competitive force), coercive force (i.e. regulatory force) and normative force (i.e. pressure from the market) within the industry	Dimaggio & Powell (1983) Vaidya (2012)
Vendor support	A mix of timely supports from vendors vis-à-vis technology, training and relationships	de Guinea et al. (2007)
Foreign operations from home region	Business operation from the home base using the cost-effective direct distribution channel on a global scale	Banalieva & Dhanaraj (2013) Tugores-Gracia, 2012)
Industry knowledge acquisition	Knowledge acquisition on an inter-organisational 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 organisation	Nambisan et al. (1999)
Time-to-market	“The time between generating an idea for a product and completing a prototype”	OZ (2004, p. 721)
Mutual learning on a worldwide scale	The process of learning valuable skills created in a country within the home country to another country within the home region	Banalieva & Dhanaraj (2013)

Industry knowledge acquisition is an activity of sharing best practices, service experiences, market demand and specific information on travellers’ preferences (Silva, 2012). As much refined information is distributed to PSS adopters, the exchanged information through PSS can be used as industry knowledge sources. Thus, an individual airline can acquire potential organisational knowledge from other airlines. *Time-to-*

market means the time taken between the generation of an idea for services/products and the completion of a usable prototype that can be implemented or manufactured (Oz, 2004).

Mutual learning on a worldwide scale stands for the process of learning valuable skills created in a country within the home region to another country within the home region (Banalieva & Dhanaraj, 2013). Vaidya (2012, p. 282) claims that “organisations must have capacity to inter-organisational learning” by enhancing the use of IOS. Global learning—the notion that “valuable knowledge resides not only in a firm’s domestic operations but in its foreign subsidiaries” (Hill et al. 2011, p. 515)—from their close partners through the PSS is an explicit reason for airlines to enter a GAA where the member airlines use PSS together (Silva, 2012; Tugores-Gracia, 2012).

In summary, this sub-section provides a review of possible PSS adoption factors in the TOE context. It is worthwhile noticing that the freedom to vary the factors for new research topics makes the TOE framework more adaptable, and potential factors can be assigned to different contexts, depending on the task/organisation characteristics (Baker, 2012). For instance, vendor pressure can be allocated in the context of either technology or environment.

3.4.2 Business value considerations applicable to this research

The business value of IOS refers to the value added to the business by IOS impacts on business performance (Källström, 2005; Vaidya, 2012). In a generic definition in IS/IB, business performance has something to do with the financial performance of an international enterprise related to gross profit margin, market share and profitability. When it comes to business performance in the service industry, the meaning can be extended to how well a firm performs in terms of improving service quality, efficiency, productivity and competitiveness as well as of in achieving cost reduction and sales

growth (Robey et al., 2008). Therefore, business value from PSS, which can be applicable to this explanatory study in an airline business context, is conceptualised as the predicted impacts on product/service quality, efficiency of human resources, cost-effectiveness and sales-competitiveness. At the decision-making stage, these are estimates that can be financially/non-financially positive, or the predicted impacts relative to business value can be actually generated after the adoption. More specifically, in estimating the business value of the airline's PSS, Källström's case study (2005) suggests that business value of PSS can be seen in strategic level benefits as well as in operational level benefits. Such a perspective not only includes technological considerations, but organisational and environmental implications on the airline alliance community in a broader context.

Strategic benefits are the strategic impacts on organisations that refer to the effects of IOS on the mission and scope of organisations, including the opening of new markets, the development of new products or services and the increase of market-level performance (Robey et al., 2008; Vaidya, 2012). On the other hand, operational benefits refer to impacts facilitating more efficient operations or more effective coordination structures, such as the improvement of service delivery, the acquisition of channel information, change of business process, the enhancement of organisational productivity and the reduction of transaction cost as well as costs for IOS operation. In the domain of the airline business and considering its innovation characteristics, competitive enhancement, a business growth and globalisation imperative can be included in strategic benefits, while processing efficiency, cost reduction and price increases may be applicable to operational benefits. The anticipated strategic benefits and operational benefits that a PSS brings to the adopting airline can also be arranged as indirect benefits—opportunities for technological maturity with external RES/PSS and relationships with partner airlines—

and direct benefits—efficiencies in reducing distribution costs and inventory (i.e. passenger seats) levels (Källström, 2005; Robey et al., 2008), as follows:

- Strategic level benefits (indirect benefits)
 - 4. Impacts of PSS on passenger business growth
e.g. expanded global reach; improved customer services
 - Operational level benefits (direct benefits)
 - 5. Impacts of PSS on the airline's efficient operation
e.g. efficient disruption control; reduced overall IT costs
- } Business value from PSS

3.5 Conceptual Foundations

Based on the underlying models of IOS adoption and HRO that the previous sections discuss, a synthesised conceptual model encompassing context-specific factors potentially relevant to the adoption of PSS in airlines can be produced, as Figure 11 illustrates.

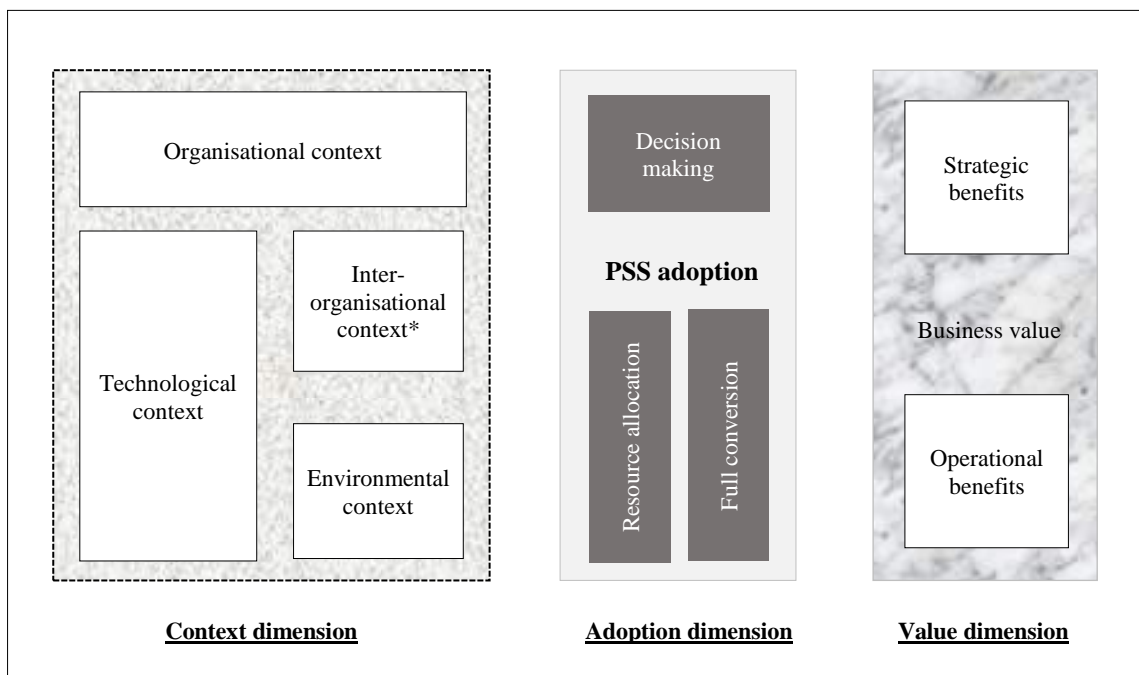


Figure 11. Proposed Research Model – PSS Adoption in Airlines

It is noteworthy that this original research model combining three dimensions (i.e. context dimension, adoption dimension and value dimension) differs from a traditional TOE-based IOS adoption model on two points. Firstly, the inter-organisational context is detached into an external PSS domain from the organisational context; this is because an IOS in a common-use environment enables adopters to engage in inter-organisational practices so that the adopters can absorb the environmental and technological impacts resulting from the forces of trading partners (Lee et al., 2015; 2018). Secondly, organisations could expect to generate business value from IOS in three aspects based on the IS effects on the organisation (Dwivedi et al., 2011; Melville, Kraemer & Gurbaxani, 2004; Oz, 2004): (i) strategic benefits (e.g. competitive advantage in the industry and a close relationship with trading partners); (ii) tactical benefits (e.g. higher quality in customer service); and (iii) operational benefits (e.g. greater productivity and more efficient operation). This study might focus on strategic and operational perspectives at an organisational level, not on an individual or employee level (Robey et al., 2008; Vaidya, 2012). Therefore, the expected business value after the adoption of PSS is thus condensed into strategic benefits, including tactical customer services elements, and operational benefits in terms of the value dimension.

3.6 Research Propositions

Deductive reasoning based on two theoretical propositions are developed. In addition to causal explanations, testable propositions are arranged based on the theory for explaining and predicting. In explaining, theory provides an explanation of how, why, and when things happened, relying on varying views of causality and methods for argumentation, promoting greater understanding or insights by others into the phenomena of interest. Whereas, in predicting, theory states what will happen in the future if certain preconditions hold. A testable proposition is a statement of relationship “between

constructs are stated in such a form that they can be tested empirically”, while a causal explanation means a statement of relationships “among phenomena that show causal reasoning, not covering law or probabilistic reasoning alone” (Gregor, 2006, p. 620). This research therefore proposes that:

Proposition 1: *Ceteris paribus*¹⁰, technological, organisational and environmental factors related to IOS adoption influence the PSS adoption stage of the East Asian airlines, and PSS adoption will improve business value on a strategic level and an operational level.

Proposition 2-A: *Ceteris paribus*, each East Asian airline’s technical issues and functional requirements in the technology context influence its PSS adoption stage.

Proposition 2-B: *Ceteris paribus*, each East Asian airline’s organisational strategy and characteristics in the organisation context influence its PSS adoption stage.

Proposition 2-C: *Ceteris paribus*, each East Asian airline’s institutional considerations in the environment context influence its PSS adoption stage.

Proposition 3-A: *Ceteris paribus*, PSS adoption enables each East Asian airline to increase strategic benefits in passenger sales and services.

Proposition 3-B: *Ceteris paribus*, PSS adoption enables each East Asian airline to increase operational benefits in passenger sales and services.

3.7 Visual Representation

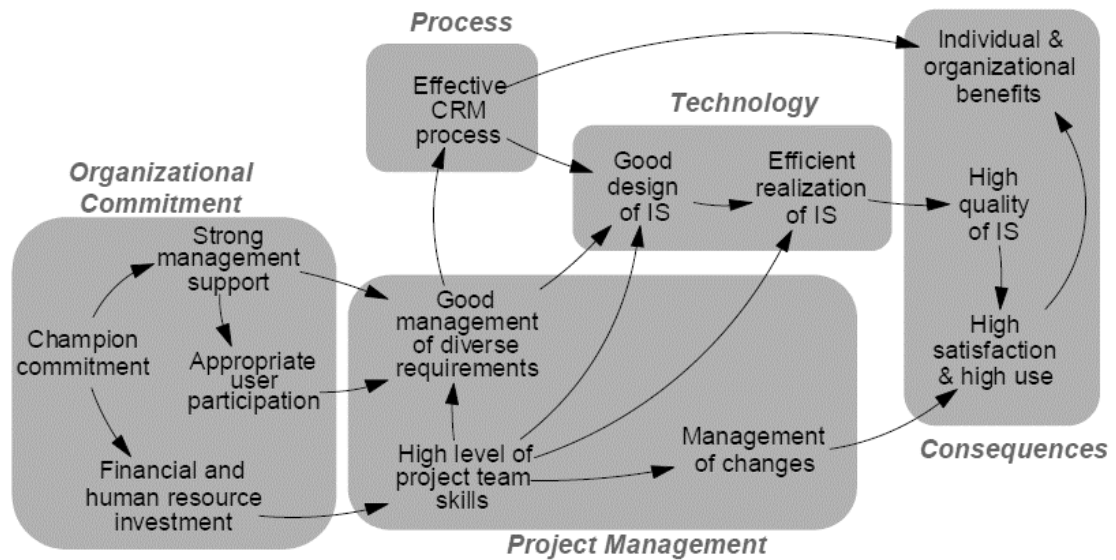
When seeking to provide explanations of complex, multi-factorial phenomena, descriptive texts may offer an accompanying visual representation such as a cognitive

¹⁰ All propositions are stated on a *ceteris paribus* basis. While we have stated it here, the phrase “*Ceteris paribus*” (other things being equal) could be considered as implicit at the beginning of each proposition.

map. “A visual and processual adaptation and representation” is more effective than a narrative paragraph alone at aiding visualisation and understanding of complex processes and multiple events at the organisational level (Miles et al., 2014, p. 209). For instance, a cognitive map can show *processes* in a logical structure in a particular domain, displaying the influential relationships among factors (i.e. events/actions and states). As a form of visual representation, from the process perspective of IS adoption, the cognitive mapping approach is used to represent efficiently “in non-hierarchical network form: a collection of nodes attached by links, and/or bins extended by arrows” (Miles et al., 2014, p. 189). Gregor (2006) advises that, based on a process model, many qualitative IS researchers conduct process-type case studies within specific contexts or settings to explain particular events that lead to various results, offering an explanation of the temporal order and historical narrative, using words such as ‘influences’, ‘determines’ or ‘then leads to’, which are explicitly causal. Markus (2014) also claims that IS scholars commonly understand IS adoption to be processes in an organisation by which outcomes are believed to come about. In explaining PSS adoption, this research thus utilises a process model based on cognitive mapping that can reveal a complicated phenomenon in IS adoption, as Figure 12 illustrates by example (the case of Customer Relationship Management).

This procedural view on the adoption of a specific IS identifies influential relationships among multiple contextual factors, and a process perspective is useful to explain why and how sets of related factors influence each other and lead to actual results in IS adoption (Kim & Pan, 2006). In line with the process model approach, procedural coding methods provide context- and site-specific research with prescriptive ways of analysing participant data; causation coding, as a major coding skill in a procedural method, recommends procedures for extracting causal beliefs from qualitative textual data about both how and why particular outcomes came about (Saldaña, 2013). An understanding of the adoption

process may be improved by delineating the network of causal relationships among key factors that are of positive or/and negative polarity in influential links (Kim & Pan, 2006).



Reformatted from Kim & Pan (2006)

Figure 12. Example of Influential Relationship in Cognitive Mapping Approach

3.8 Summary of the Chapter

This chapter outlined the research model for this study. The extant literature of IS adoption and IB strategies leads to the research questions: (i) why do the target airlines need PSS? (ii) how influential are the identified factors to their PSS adoption? and (iii) What are the predicted impacts of PSS on their business? These questions drive this research to examine potential causal factors identified in existing studies on IOS adoption and HRO as well as to explain the adoption of PSS by airlines, proposing a synthesised original research model and six research propositions. This explanatory research utilises deductive reasoning; in a deductive strategy, as Miles et al. (2014) advise, the selection of potential factors is based on the researcher's *a priori* orienting constructs to examine them as crucial factors in PSS adoption. In accordance with a cognitive map skill, many

IS studies have conducted process-type case research work to explain identified events and various outcomes in a causal network of event-state relation display. In that sense, this chapter also proposed the utilisation of a process model based on cognitive mapping to visualise complex processes and multiple events around PSS adoption.

End of Chapter 3

CHAPTER 4: METHODOLOGY

4.1 Outline of the Chapter

Chapter 4 describes the research methodology adopted in this thesis. The intent of this chapter is to present the overall strategy in terms of the research methods that best fit the research problem and questions. Subsequent to this outline, Section 4.2 sets forth the research approach and paradigm applied to this original study as per the philosophical lens of IS and the social sciences. Section 4.3 then discusses research methods in three sub-sections, involving justification of the qualitative approach, explanatory case research methodology and the mode of qualitative explanation. Section 4.4 addresses an explanatory case design in IS from the viewpoint of epistemological qualitative positivism, based on a threefold evaluation criterion in IS case research by Dubé and Paré (2003); in particular, this section intensively presents 21 attributes across three criteria—research design, data collection and data analysis—that add rigour to this explanatory case study. Section 4.5 illustrates a roadmap of the study at a glance by dealing with eight key agenda. Lastly, Section 4.6 reports a summary of this chapter. This outline of Chapter 4 closes with a schematic diagram of research methods and theoretical approach employed in this research (see Figure 13).

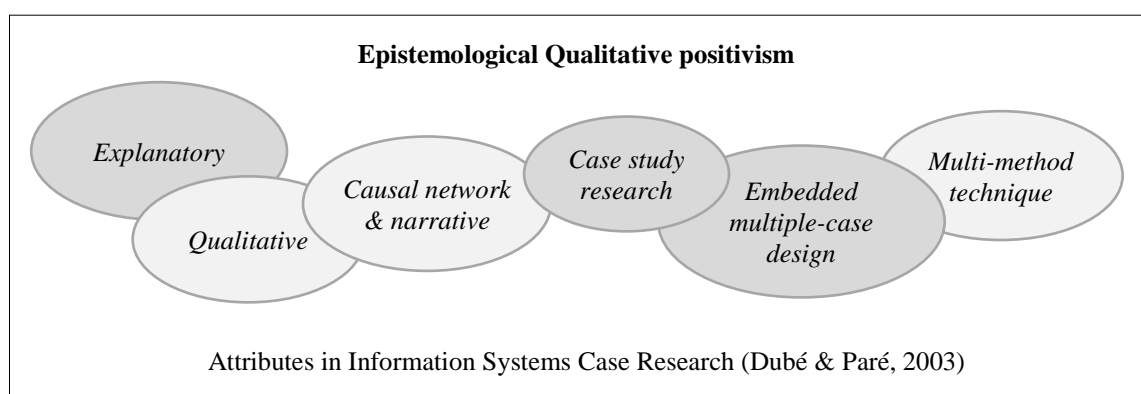


Figure 13. Research Methodology and Theoretical Approach

4.2 Research Approach

Academic research in the social sciences, whether it is qualitative or quantitative, is based on a philosophical assumption that it constitutes valid research. Bhattacharjee (2012) argues that social science research is shaped by two fundamental sets of philosophical assumptions: ontology and epistemology. Concerned with the nature of reality, some IS researchers with ontological stances consider one of the three positions—external realism, internal realism and subjective idealism—whereas, in search of the nature of knowledge claims, other IS researchers tend to seek one of four underlying epistemologies—the positivist, post-positivist, interpretive and critical philosophies—in selecting an appropriate paradigm (Chua, 1986; Kaur, 2015; Losekoot, 2015; Orlikowski & Baroudi, 1991). In IS studies, the two main philosophical streams (i.e. ontological stance and epistemological stance) reflect significant differences in research paradigm. Most ongoing social science research is based on the positivist, post-positivist or interpretive paradigms, while critical social science is less commonly seen in academic journals (Bhattacharjee, 2012). Similarly, empirical work in the IS discipline is cognizant of the positivist/post-positivist studies versus interpretivist paradigm debate (Leong, 2012; Losekoot, 2015; Mathrani, 2010).¹¹ The following sub-sections, therefore, discuss the researcher's underlying philosophical assumptions and the choice of research paradigm in line with the research questions presented in Section 3.2 and justification of the research methods discussed in Section 4.3.

4.2.1 Epistemological post-positivist qualitative assumption

Burrell and Morgan (1979), in their seminal book *Sociological Paradigms and Organizational Analysis*, claim that social science researchers can see two possible

¹¹ In reality, researchers can't make an explicit statement for their study to be found at face value. Their work may lead to insights that override being pure to a philosophical stance.

philosophical options: ontology and/or epistemology. Ontology refers to a researcher's assumption about social order and how to see the world. According to Archer (1988), a three-fold classification of ontological categories is summarised as: (i) social reality exists independently of our construction of it (external realism); (ii) reality-for-us is an inter-subjective construction of the shared human cognitive apparatus (internal realism); and (iii) each person constructs her/his own reality (subjective idealism). In using technologies and software, the two ontological stances for IS researchers are external realism and internal realism that address human interpretations and meanings (Sarker, Xiao & Beaulieu, 2013). In contrast, epistemology indicates the assumptions made by researchers about universal facts and how to obtain knowledge. Archer (1988) provides a brief discussion on epistemological stances that (i) facts and values are distinct: scientific knowledge consists only of facts (positivism); (ii) facts and values are intertwined: both are involved in scientific knowledge (non-positivism); and (iii) scientific knowledge is inevitably conducive to specific sets of social ends as it is ideological.

Much of the IS research concerned with the ongoing relationship between technologies and individuals tends to reflect a positivistic orientation based on the criteria for constructing and evaluating knowledge. Such a positivist perspective is accompanied by a broad, traditional commitment to the approach that IS studies in the social sciences should emulate the natural sciences, thereby considering large-scale sample surveys to be a common research strategy (Myers & Avison, 2002). Meanwhile, IS commentators in non-positivism have advised that the application of only these precepts to complex social phenomena might be problematic, because idiosyncratic or exceptional events in a changing organisation consist of diverse elements of social change and organisational order. A substantial body of qualitative research in business, organisation and management studies, therefore, suffers from diverse positivist anxieties in measuring up

to conventional positivism standards; such work is well described as constituting “a form of qualitative positivism”, namely “post-positivist qualitative research” (Prasad, 2005, p. 4; p. 10). For instance, the use of IT/IS in globalised organisations today is intrinsically embedded in the context of organisation, inter-organisation and regulatory institutions. Hence, a growing number of IS studies attempt to understand multi-faceted social phenomena by combining empirical evidence through interviews in a qualitative manner; this theoretical stance is called qualitative positivism. According to Prasad (2005):

Qualitative positivism employs non-quantitative methods of data collection such as interviews and observation within conventional positivist assumptions about the nature of social reality and the production of knowledge. For the most part, qualitative positivism adopts a relatively commonsensical and realist approach to ontological and “epistemological” issues. Reality is assumed to be concrete, separate from the researcher, and understandable through the accurate use of “objective” methods of data collection. Many conventional case study areas are rooted either explicitly or implicitly within the assumptions of qualitative positivism (p. 4).

In explaining complex IS practices, this meta-theoretical stance requires an application of a multi-paradigmatic approach by IS researchers, who view the world as a set of objective constructions or a combination of an objective and subjective reality (Bhattacharjee, 2012; Myers & Avison, 2002). On this account, by retaining the positivist notion of an objective truth, this qualitative positivist research in IS studies properly considers both internal issues and external concerns over selecting a common-use IT solution at the organisational level and aligning regulatory institutions.

4.2.2 Research paradigms in Information Systems

A paradigm means ‘a whole system of thinking’, and a research paradigm is translated as “a basic orientation to theory and research” (Neuman, 2003, p. 70). Social scientists

suggest four distinct research paradigms: positivist, post-positivist, interpretive and critical. The majority of IS research with an epistemological belief are also rooted in the similar paradigmatic assumptions (Sarker et al., 2013; Venkatesh et al., 2013). On the whole, the interpretivist, positivist and post-positivist paradigms are the dominant epistemological foundations used by IS researchers, whereas critical research is classified as a further alternative philosophical paradigm that focuses on a dialectical analysis, by assuming that social reality is historically constituted. Interpretive researchers start out with the basic assumption that access to reality occurs only through social constructions (Myers & Avison, 2002). Interpretive studies thus seek to understand social phenomena through the meanings, values and beliefs that people assign to them. In IS, similarly, interpretivism aims to produce an understanding of the context and/or the process of IS.

Positivism, in contrast to critical and interpretive science, generally assumes that reality is objectively given. Many applied researchers embrace positivism. They seek an objective reality that is believed to exist independently from the observers (Keutel, Michalik & Richter, 2014; Neuman, 2003). By controlling contexts or factors, positivists apply a nomothetic approach to their studies and aim to find universal facts that can be generalised beyond the investigated cases. However, many social researchers discover that human knowledge is based not on solid foundation, but rather on a set of tentative conjectures, and empirical evidence can be the basis for disproving the conjectures accordingly. Such an emergent meta-theoretical position amends positivism by the *qualitative positivist school*, also known as *post-positivism* and as *extra-positivism* (Prasad, 2005). This camp attempts to understand social reality better, in general relying on interviews in qualitative methods such as case study research.

4.2.2.1 Positivism versus Qualitative positivism

IS literature further demonstrates the underlying epistemological paradigms of positivism and qualitative positivism. While the positivist paradigm is widely considered to be a valid approach in IS, Orlikowski and Baroudi (1991) classify IS research as positivist in cases where there is evidence of theoretical propositions, testable variables and empirical data about a unique description of any chosen aspect of the phenomenon. On the other hand, diverse variables in a human or organisational context related to contemporary IT/IS issues in a changing business environment cannot be directly measured. In addition, the tenets of positivism are inadequate for the understanding of complex, nuanced and context-dependent social processes (Prasad, 2005). As a result, many researchers in IS adopt qualitative positivism to compensate for the intrinsic defect in a positivist position assuming social reality can be observed on the basis of objective truth. Qualitative positivists suggest that it is possible to reject false beliefs by retaining the positivism notion on scientific method (Bhattacharjee, 2012). Post-positivist qualitative researchers view social reality as “not certain but probabilistic” for discussions of social phenomena, and work substantially with “texts” and “language” as the sources of “truth” and “reality” (Bhattacharjee, 2012, p. 18; Prasad, 2005, p. 10; p. 221). In sum, qualitative positivism closely parallels the post-positivist who believes that the researcher’s observation of reality and belief systems, including values, knowledge and experience, can and should influence the research explanation.

4.2.2.2 Qualitative positivist stance

Given the context, domain and themes of this interdisciplinary study, conducted in an applied setting, it appears likely that this thesis envisions epistemological qualitative positivist beliefs. This is because, as regards philosophical assumptions and assessment, the present researcher has the following worldview:

- Facts in a changing environment become knowledge if they are not only objectively identified by actual events, but also subjectively explained in accordance with logical reasoning.
- Stable causal relationships in an organisational phenomenon can be readily understood by making reasonable inferences in a qualitative method.
- Between theory and practice, there is reality with a degree of certainty that is capable of being explained by researchers' values and practitioners' expertise.
- An integrated method in a study powerfully enhances the credibility of findings; multi-method research using different types of data (e.g. on-site interviews and secondary data sources) can give a deep understanding of multiple cases.

Judging from the researcher's ideological attitude, a qualitative positivist approach would, therefore, be appropriate to this study. In the conduct of empirical research in nature, the work requires the researcher to institutionalise a set of criteria of validity, rigour and replicability based on an objective view of reality as well as to provide positive knowledge about IS and IB based on the evidence of formal propositions. The following research methods are discussed on the basis of the researcher's qualitative positivist approach.

4.3 Research Methods

All researchers must decide what research method best suits the requirements of their study. Research methods are at the core of knowledge production in a given research practice (Dubé & Paré, 2003). "Research methods shape the language we use to describe the world, and language shapes how we think about the world" (Benbasat et al., 1987, p. 392). In order to shape people's daily lives and firms' reactions to technological innovations using data collected from people's use of language, researchers employ a plethora of diverse research methods that can be broadly categorised into quantitative and qualitative at the methodological level (Venkatesh et al., 2013). Positivist research in IS

has been relatively equated with quantitative research methods using statistical/numeric techniques or structural equation modelling. Since the early 2000s in the IS discipline, however, there has been a growing interest in the use of qualitative techniques, including a mixed methods approach (i.e. use of both quantitative and qualitative methods in a single research inquiry) to develop rich insights into various phenomena of interest that cannot be well understood by means of a quantitative worldview. This tendency to employ qualitative techniques is prominent in studies of the adoption and use of IT/IS in an *organisation*. As a result, IS positivist case studies at an organisation level figure among diverse qualitative methods in particular (Dubé & Paré, 2003).

4.3.1 Justification of the qualitative approach

Research methods can be classified in terms of quantitative and qualitative methods. Quantitative research relies mostly on numeric data (Bhattacharjee, 2012); in a bid to enable researchers to study natural phenomena, the quantitative methodology was originally developed in the natural sciences (Myers & Avison, 2002). However, quantitative methods are now also applied to the social sciences, including IS studies; survey methods, laboratory experiments and numerical methods are the classic examples of this research method. In contrast, qualitative research methods were designed to study social and cultural phenomena (Myers & Avison, 2002). Qualitative strategies are characterised by diversity; prime examples of qualitative methods are action research, focus group research, case study research and ethnography. Such methods assist social scientists who employ non-numeric data to understand people, collections of people (e.g. groups, task forces, business units, societies), individual or collective behaviours and social/cultural contexts (Bhattacharjee, 2012). A research method is a strategy of enquiry, which moves from a philosophical assumption to the state of research theme. IOS adoption has become a significant topic in the IS domain, and two approaches addressing

the individual and the firm level appear predominately in IS literature. Literally, the individual-level stream emphasises an individual user's behaviour in the workplace over a generic set of technologies, drawing on socio-technological theoretical models (Lee & Hwang, 2011; Oliveira & Martins, 2010), such as Davis' (1985) Technology Acceptance Model, Ajzen's (1991) Theory of Planned Behaviour and the Unified Theory of Acceptance and Use of Technology proposed by Venkatesh, Morris, Davis and Davis (2003). On the other hand, the enterprise-level stream aims at investigating the adoption of IS from the organisational viewpoint (Baker, 2012). Case studies on IS/IOS adoption traditionally select qualitative methods relying on small size samples, as being designed to explain leaders' decisions in workplaces within the specific contexts of the business entity (Myers & Avison, 2002; Lee et al., 2017). However, the topic of PSS is still in the relatively early stages in the IS discipline as air carriers have, in earnest, started to implement PSS as software used in common with their partners since the late 2000s (Lee et al., 2015). Furthermore, conceptually, PSS adoption has not been widely understood because there is little explanatory research available; in the IS area, only two empirical contributions, uncovering the adoption/use of PSS at the firm level, have been made (Källström, 2005; Rieple & Helm, 2008).

As a multi-case study of major European carriers, Källström's work (2005) concerned the first three European PSS adopters in an exploratory qualitative manner, offering a deeper understanding of the business value of PSS in term of strategic and operational drivers. Rieple and Helm (2008) also released findings of a case study on motivation for the adoption of proprietary components on the PSS, where a qualitative comparative analysis was used by examining five European and two Australasian legacy airlines' PSS

motivation from cost reduction and joint marketing perspectives.¹² IS researchers must also decide which research methods will be employed for data collection. This implies that the choice of research method influences the skills with which the researcher collects data (Myers & Avison, 2002). Post-positivist research in IS utilises qualitative data for theory-testing and then generalises research findings based on theoretical concepts of the observed interests. In particular, when the sources of data collection are key informants within large-scale enterprises, a qualitative approach has been widely chosen to look in depth into the issues concerning organisational IT/IS adoption (Kaur, 2015). In this case, the set of qualitative data sources ranges from informal conversation, in-depth interviews, participant observation (i.e. fieldwork) to documents and texts that the firms provide online. Likewise, qualitative data from different functional areas are fundamentally well suited for testing technology adoption at an organisational level. In a similar vein, through the lens of IOS and HRO, this study aims to explain PSS adoption at the firm level from the senior-manager and middle-executive perspectives. Therefore, qualitative methods should be well incorporated in this study with unique business entities within multiple contexts of PSS adoption practices.

4.3.2 Justification of the explanatory case research methods

This study is categorised as explanatory research in nature (as opposed to exploratory research conducted in new areas of enquiry, and descriptive research making careful observations/documents). To view the phenomenon of PSS adoption as an objective reality, an explanatory research technique under a qualitative positivist paradigm is applied. Research in an explanatory mode seeks explanations of observed phenomena or

¹² However, there is a difference in this study in that the two studies on PSS adoption that selected a mix of airlines in different regions within the western context using qualitative methods focused on analysing key strategic benefits within system-dependent and user-dependent dimensions, without investigating adoption factors that exert influence on the adoption stage.

behaviours and attempts to obtain reliable, valid answers to why-and-how types of research questions. Seeking explanations for identified events requires theoretical interpretation skills, along with insightful description and personal experience in the corresponding research area (Bhattacharjee, 2012).

Explanatory cases may suggest important clues to cause-effect relationships—explaining how and why some events occurred (Yin, 2003). Where explanatory case study research is undertaken, a single case may first provide the basis for developing explanations of why a phenomenon takes place, and it can then be further investigated by subsequent additional cases in similar or other settings (Darke, Shanks & Broadbent, 1998). The IS area is characterised by constant technological innovation, managerial questions, organisational questions and environmental change, and it has been constantly more interested in how context and innovations interact. Myers and Avison (2002) comment:

For example, airline reservation systems were very innovative technical achievements in the early 1960s. However, they became a key competitive factor in the changing airline industry ... In order to understand this phenomenon, one must examine the structure of the industry, the role of regulations and the federal laws governing the industry ... The case method allows the researcher to answer ‘how’ and ‘why’ questions, that is, to understand the nature and complexity of the processes taking place. A case approach is thus an appropriate way to research an area in which few previous studies have been carried out (pp. 80–81).

In the IS discipline, there have been a considerable number of case studies that pursued an explanatory strategy not only by describing the events that took place and then presenting multiple competing theories to explain the course of events, but also by testing propositions that organisation strategies such as those regarding IT/IS adoption will be influenced by contextual factors from chosen theories or *a priori* reasoning (Myers &

Avison, 2002). In this sense, it is understood that explanatory case research is best suited for this study, where causal reasoning will also be engaged in a multi-directional, data-bearing cause-and-effect relationship and presents multiple causal displays (Yin, 2012), and theoretical insights about inter-organisational practices across airlines and professional skills in airline distribution will be presented on the basis of the TOE framework.

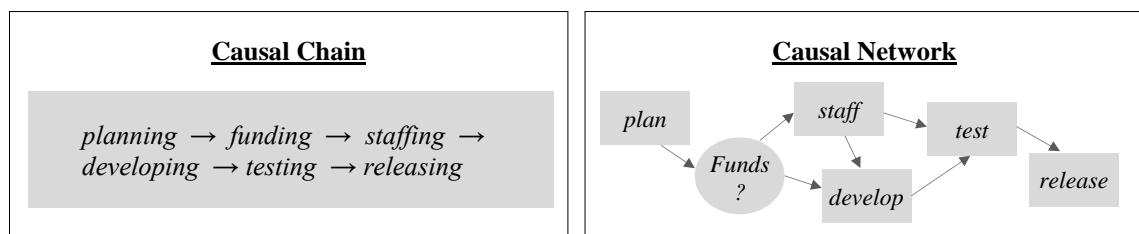
4.3.3 Mode of qualitative explanation

Good explanations in qualitative research methods require a combination of logical links that involve multiple causes and various outcomes. Causes are conjunctive, because they combine and affect each other and attempt to “connect the dots” in research (Bhattacharjee, 2012, p. 6). In that sense, identifying causal factors, outcomes and impacts through the observed phenomenon and then making an explanation for target events needs both theoretical background and interpretation skills, along with unique insights and personal experience.

4.3.3.1 Causal network display: event-state network

According to Miles et al., (2014), there are three methods in explaining causal relationships and illustrating causal links: (i) causal chains, (ii) causal networks for within-case explanation and (iii) causal networks for cross-case explanation in an embedded analysis. A causal chain is a research-oriented linear display of events and/or states that suggests a plausible sequence of causes and effects. Causal chains illustrate the path of an individual story line in the data and, thus, can be simply produced because they require little elaboration or textual explanation. However, most qualitative analytic processes are networked and interwoven rather than linear (Saldaña, 2013). In this respect, a causal chain that displays linearly may be of limited use in describing multiple events/actions or states. In contrast, a causal network is a stronger explanatory form; a

causal network gives “a more inferential level of analysis that pulls together that data into a single summarising form” (Miles et al., 2014, p. 247). A simple example in Figure 14 compares these two types of causal mechanisms. Causal networks use the qualitative positivist constructs of a multi-directional cause-and-effect¹³. Technically, a causal network starts to illustrate how one variable leads to another variable in linear yet interwoven patterns. However, a causal network can progressively build up an integrated map of case phenomena in a network and, for multiple cases, make an embedded map that contains generalisable causal explanations.



Source: Miles et al. (2014)

Figure 14. A Simple Diagram Describing Causal Chain vs. Causal Network

A causal network for a single analysis (in a form of within-case networks) integrates several causal chains into an interrelated system, while a causal network in a form of embedded cross-case analysis combines several within-case networks. In other words, within-case networks display and show how to make an inclusive, explanatory analysis of single-case data, whereas cross-case networks work powerfully to move from case-specific explanations to more generalisable constructs (Miles et al., 2014). In drawing a causal network, case-specific events and states can be turned into generic ‘variables’ in an event-state network that illustrates how events and states can be plotted as a flow diagram. More specifically, variables can be classified as three general temporal

¹³ In order to reconceptualise the qualitative positivist constructs of non-linear cause-and-effect, either influences-and-affects or a multi-directional cause-and-effect can be accurate in methodological meaning (Saldaña, 2003).

categories: (i) antecedent variables—the baseline conditions within the sites; (ii) mediating variables—events and states as factors that initiate changes or actions; and (iii) outcomes—the consequent results of the variables. An event-state network portrays both the actions as events *in boxes* and the existing issues over a longer time as states *in bubbles* that initiate next actions, as Figure 14 showed; it is a visual and processual representation that allows the researcher to make deductions from data about the possible motivations for why and how (Miles et al., 2014). In listing antecedent and mediating variables and their outcomes for causal display work, causation coding is an effective coding skill that helps researchers generate the variables. Rating the variables also gives more powerful explanations, but not necessarily all variables may accompany ratings (e.g. strong and weak) or scales (e.g. high, medium and low) to be eligible for inclusion in event-state network displays.

To provide analytic and powerful qualitative explanations, as such, this explanatory embedded multi-case study first produces three causal displays of event-state subnetworks in line with the three TOE-based contexts; a set of three subnetworks of variables leading to the outcomes in the PSS adoption phase then teases out the multi-directional (or interwoven) cause-and-effect relationships into one integrated causal network in a within-case design and a cross-case analysis. Lastly, this research requires the use of multiple case sites with a literal replication (i.e. case-oriented) logic across three target airline companies and refines the conceptual research model in the form of a qualitative causal network.

4.3.3.2 Causal network narrative

Explaining causal relationships also provides a method for narrating the ‘why’ and ‘how’ of a study’s outcomes or results (Miles et al., 2014). After developing causal networks,

qualitative researchers are recommended to tell stories, by writing out a chronological ‘narrative’ including each of the major streams from beginning to end. Narrative is defined as a tale or story of facts. In IS research, its focus has been on understanding language, communication and meaning among organisational members (Mayer & Avison, 2002). According to Miles et al. (2014), presenting a causal network and its narrative is meaningful in several aspects: (i) it enables researchers to be more coherent; (ii) writing the narrative provides an opportunity for expansion and enrichment in the experiential field; and (iii) both the network display and the narrative text are the basic material that can be improved by other researchers later. In the causal network narrative, Miles et al. (2014, p. 247) advise “Always writing accompanying text to clarify and summarise the streams and increasing the credibility of any given network and narrative by subjecting them to colleague and even participant critique.” In addition to the causal network display within the context of TOE, this explanatory study provides the narrative text in a different format of the same material; thereby, findings on PSS adoption over time can be explicit about causes and effects. The narrative paragraphs are thus prepared to offer evidence that explains why different contextual factors in PSS adoption are related, why some of them precede others, why they are rated differently, and which ones matter more as salient factors.

4.4 Case Research Design

In the field of IS, post-positivism is the predominant philosophical paradigm used in recent case studies, enabled by the availability of qualitative data and evidence (Creswell & Poth, 2017; Kaur, 2015). In a bid to find general patterns and increase predictive understanding of phenomena from the selected cases, post-positivist case studies in IS focus on testing theory and articulating researchers’ observations related to IOS adoption, implementation and use. Within three different contexts (i.e. technology, organisation and

environment), this research project employs multiple units of analysis in an embedded multi-case design. Darke et al. (1998, p. 281) state, “single cases provide for in-depth investigation and rich description, while multiple case-designs allow a literal or theoretical replication and cross-case comparison.” As such, case studies across different global business organisations can explain similar and contrasting results in line with different inter-organisational contexts and present embedded subcases in a complex industry community. Rigour is considered in this case study by following the guidelines of Dubé and Paré (2003), Miles et al. (2014) and Yin (2009; 2012).

4.4.1 Qualitative positivist case research in Information Systems

In epistemological case studies using qualitative data, causal relationships, which are the basis for generalised knowledge and *a priori* orienting constructs, can explain patterns of behaviour across situations (Dubé & Paré, 2003). Explanatory cases are suitable for causal studies to test out theories, including rival theories, and to explain why and how an event or events occurred; they “engage in causal reasoning” and “enrich the understanding of a cause-effect relationship” (Yin, 2012, p. 89). An explanatory case study should be crosschecked with its research questions, research methods and the design of the study. To conduct this research rigorously, a set of methodological guidelines and systematic procedures developed by Dubé and Paré (2003) is applied; the two scholars, in their research “Rigor in IS Positivist Case Research”, suggested a list of attributes for evaluating rigour in positivist case studies. The list highlights valuable methodological insights in three goals of research: exploratory, descriptive and explanatory (Neuman, 2003), and the evaluation attributes address three sets of criteria applied to these stages of the research: research design, data collection and data analysis (Dubé & Paré, 2003). The following sub-sections discuss key operational attributes that specifically enable IS positivist authors to enhance the methodological rigour of explanatory case research.

4.4.2 Three criteria of qualitative positivist explanatory case study

While the various specificities of the case study methodology are identified by IS literature, the fundamental criteria pertaining to the explanatory nature of case research are integrated by Dubé and Paré (2003) as listed in Table 6; the list of evaluation attributes is grouped in three main criteria:

- (i) *research design*, which refers to the core attributes associated with the design of the case study research;
- (ii) *data collection*, which is related to the data collection process and the overall quality of multiple data sources to enhance reliability and validity;
- (iii) *data analysis*, which is the criterion concerned with elucidation of the data analysis process, as well as the use of analysis techniques.

The application to each attribute specified in Table 6 asserts the rigour achieved in the conduct of this study.

Table 6. Key Attributes to Assess Explanatory Case Study

Attributes	Use in this research	
	Application to each of 21 attributions	Sub-section
<i>Criteria of Research Design (10 attributes)</i>		
Clear research questions	Three research questions based on the research needs from the industry are stated to explain PSS adoption and impacts.	4.4.3.1
<i>A priori</i> reasoning	<i>A priori</i> fixed relationships with PSS adoption capable of being identified and tested via hypothetico-deductive logic.	4.4.3.2
Theory of interest Clean theoretical slate	Two underlying theories that commonly relate to the research theme—IOS adoption and HRO—are addressed explicitly. Theoretical proposition from the extant studies are also arranged in line with the research framework.	4.4.3.3
Predictions from the theory Rival theories	Theoretical predictions deducted from the dominant theories and predicted answers are specified. Rival/alternative explanations are also made to raise predictive power.	4.4.3.4
Multiple-case design Replication logic in a multi-case design	To improve generalisability, an embedded multiple-case design across three East Asian carriers that belong to the same airline alliance is used for a literal replication (i.e. similar results) logic in line with the TOE contexts.	4.4.3.5

Unit of analysis	Three airline companies are selected to analyse causal factors in their PSS adoption and impacts from PSS.	4.4.3.6
Preliminary study	Prior to data collection from key informants, pre-work using secondary data is helpful in identifying baseline issues around PSS in airlines.	4.4.3.7
Context of the case study	Technological innovation, organisational partnership and institutional environment changes in airlines are provided.	4.4.3.8
<i>Criteria of Data Collection (6 attributes)</i>		
Data collection process	Publicly available secondary data are first gathered, and primary data are collected later through face-to-face interviews.	4.4.4.1
Multiple data collection methods	In a multi-method approach, multiple data from secondary data sources combining business websites, newspaper accounts and industry publications as well as from two primary data sources including semi-structured/open interviews with key informants and field notes written during the interview are arranged.	4.4.4.2
Data triangulation	Multiple data collection from three different sources (i.e. different sites, different participants and different types) is used to enhance reliability and validity. Data are also collected and analysed until information in the study are replicated; the focus is to think of rich as quality rather than thick as quantity.	4.4.4.3
Data saturation		
Case study protocol	Interview instruments are developed, and potential ethical issues are also considered.	4.4.4.4
Case study database	By creating a case study database, the elements of raw material (e.g. secondary data; audio/video files; interview transcripts; field notes and consent forms), coded and analytic material as well as data displays are well managed.	4.4.4.5
<i>Criteria of Data Analysis (5 attributes)</i>		
Data analysis process	A three-phase process fitting for deductive content analysis with a structured matrix (predetermined codes) are mapped down, followed by a first and second cycle of coding/patterning methods. Using a 24-hour rule, critical field notes are created after interviews.	4.4.5.1
Field notes		
Data displays	To discover connections between coded segments, visual displays are presented by diagrams, tables, extended texts.	4.4.5.2
Logical chain of evidence	A back-and-forth maintenance through all research processes between research questions and conclusion is checked, and peer reviews (e.g. feedback from the interviewees, reviews within the faculty and journal editors) to trace the steps of handling data is arranged.	4.4.5.3
Empirical testing for embedded patterns	A pattern-matching logic is secured, by looking for similar concepts and repetitive patterns, in order to make predicted answers to research questions and explain causal relationships.	4.4.5.4

Adapted from Dubé & Paré (2003); Fusch & Ness (2015); Mathrani (2010)

4.4.3 First criterion: Research design

In designing an IS explanatory case study, rigour can be achieved by the first criterion of research design as reflected by 10 attributes: clear research questions, *a priori* reasoning, theory of interest, predictions from the theory, rival theories, multiple-case design and replication logic, unit of analysis, preliminary study, and context of the case study.

4.4.3.1 Clear research questions

One of the key attributes for the reasonable use of the case study method is the type of research questions posed. For qualitative researchers in particular, it is desirable to start with a researchable question in the general domain (Miles et al., 2014). This is because clear research questions form a useful starting point for a study and represent the facet of enquiry in an empirical qualitative study. Unlike exploratory or descriptive studies, explanatory research predominantly states its research questions prior to the methodology design in order to flexibly identify a presumed set of causal paths (Yin, 2009). As such, the following research questions were previously suggested in Section 4.3: (i) Why do airlines adopt PSS? (the main question); (ii) How do different factors influence PSS adoption? And (iii) How will PSS have an impact on the airline business? (revisiting the sub questions). Explanatory case study research is likely to be appropriate for how and why questions because these question types deal with operational causal links that need to be traced over time, rather than mere frequencies of incidence (Darke et al., 1998; Yin, 2012). Therefore, these questions in a lucid style should be relevant to this explanatory research.

4.4.3.2 *A priori* reasoning

A priori reasoning is useful for shaping the initial design because case study researchers may not have a strong prior notion of what the critical variables of interest will be, and how they should be conceptualised (Benbasat et al., 1987; Dubé & Paré, 2003). With an

in-depth review of the literature on IOS and HRO and the researcher's field experience, a temporary list of the *a priori* orienting constructs in PSS adoption in the airline business are suggested first; the theoretical evidence as provisional variables is selected through deductive content analysis relying on secondary data, followed by an empirical confirmation with interview data. The analytic units that fit deductive explanatory orientation are properly operationalised and then matched with a body of field data.

4.4.3.3 Theory of interest

Prior theorising constitutes an essential input in explanatory case design, and the use of explanatory case design to test theories as well as to define constructs requires the specification of theoretical propositions/answers derived from existing theories (Yin, 2009). According to Dubé and Paré (2003), almost all explanatory case studies in IS state explicitly the theory of interest. The conceptual model of this study is interdisciplinary, since IOS has become a multi-contextual area where no single theory has dominated (Robey et al., 2008). In particular, as organisations linked by IOS are highly globalised, it is advisable 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 electronic distribution to the themes of IOS (Elgarah, Falaleeva, Saunders, Ilie, Shim & Courtney, 2005). With a review of Vaidya's (2012) research on 32 theories about the socio-technical phenomenon of IOS adoption, and Wolf et al.'s (2012) work on multinational firms' HRO deriving eight underlying theories, this study therefore suggests applying two key theories (i.e. transaction cost theory as well as neo-institutional theory), which are commonly supported between IOS adoption and HRO, to the formation of its original conceptual model from an interdisciplinary viewpoint of IS and IB (see Figure 1 in Chapter 1 and Figure 8 in Chapter 2). Based on a pair of the underlying theories in IOS and HRO, the conceptual framework on conjunctional patterns across

variables in PSS adoption and business value from PSS is addressed in the earlier Section 3.5, and predicted answers to three research questions are also provided in Section 3.6 prior to this chapter.

4.4.3.4 Predictions from the theory and rival theories

Another valuable outcome of explanatory case study research is the predictions from the theory (i.e. the deductions), the consideration of rival propositions and the analysis of the evidence on original/rival explanations (Yin, 2009). An explanatory case study reported by Markus (1983) is a good example in the field of IS. By presenting three rival theories of resistance (people-determined, system-determined and interaction theory) and robustly deriving several propositions from the rival theories, the research laid out its orienting frame, clearly specified what factors it would/would not investigate, and then compared the predictions of each against empirical observations. Explanatory case studies within IS research have been proposed as a valid means of testing theory, whether the theory is either validated or else found to be inadequate and may then be further refined based on the findings (Darke et al., 1998). The propositions or clear research answers can also tell researchers where to look for relevant evidence. Rigorous explanatory case study research presumes that the theory of interest is hence stated explicitly in the first place, and the predictions following from the theory are also stated clearly (Dubé & Paré, 2003). Therefore, in this empirical research, the results of data collection and analysis are utilised to compare the case study findings with the expected outcomes predicted by three answers to the given research question. Yin (2012) claims that “searching for and testing rival explanations” is one other essential technique. A series of intricate responses from causal narratives thus give this study alternative views and meaningful rival explanations; alternative explanations on the adoption of PSS are addressed mainly in the sessions of

discussions/findings on the impacts of PSS and limitations of the existing knowledge in IOS adoption and HRO in airlines.

4.4.3.5 Multiple-case design and replication logic

One of the critical considerations in designing a case study is deciding the number of cases to be investigated (Mathrani, 2010). Case study research may adopt single-case or multiple-case designs. A single case study is appropriate where it represents a unique case (Yin, 2003). A common and frequent criticism of case study research is that its dependence on one case renders it incapable of providing a generalisable conclusion (Myers & Avison, 2002). A single case can be insufficient to confirm an existing theory, and explanatory cases have thus made greater use of multiple-case design than

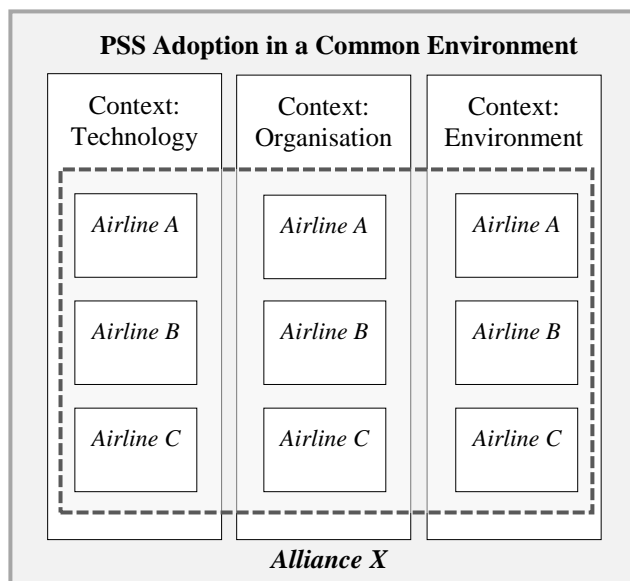


Figure 15. Embedded Multi-case Design Approach

exploratory or descriptive cases (Dubé & Paré, 2003). Multiple-case designs require using a replication, serving in a manner of explicitly predicting similar results (i.e. a literal replication) or contrasting results (i.e. a theoretical replication) at the outset of the investigation (Dubé & Paré, 2003). However, a design

calling for multi-case studies does not eliminate the variation of undertaking single cases; "Each individual case may still be holistic or embedded, and a multiple-case study may consist of multiple holistic cases" (Yin, 2009, p. 59). While multiple-case research generally requires three or more different cases to facilitate analytical generalisability of inferences (Keutel et al., 2014; Yin, 2009), an embedded multiple-case design in positivist

case studies has frequently selected two or three sites within an organisation or the same community (Yin, 2012). As illustrated in Figure 15, the embedded design is, therefore, appropriate for this study, where the multiple contexts reside on three units of analysis within an airline alliance in a geographic area (i.e. the same industry class and segment). As such, this research design entails embedded subcases within an overall case. The ensuing data after an embedded multi-case analysis can, therefore, predict similar results in a literal replication across the rest of the airlines and provide a greater certainty in the case-oriented findings (Yin, 2009).

4.4.3.6 Unit of analysis

The next fundamental attribute to be considered in designing cases is the unit of analysis. In explanatory case research, a clear definition that corroborates the unit of analysis is consistent with the boundaries of the theory being tested, and the sites being selected (Dubé & Paré, 2003). Darke et al. (1998, p. 280) state that “the unit of analysis identifies what constitutes a case; it may be an individual, a group, an organisation, or it may be an event or some other phenomenon”. In the IS research literature, an organisation can be specified as the unit of analysis, in a case where a decision over IOS adoption is made by top management and supported by key members of a decision-making team, and each individual in an organisation is expected to represent organisational decision making. Considering the nature of this study that revolves around large-scale enterprise issues, the type of unit being analysed is ‘organisation’; a qualitative case study at the firm level usually works with a limited number of organisations to focus on unique contexts and outcomes (Miles et al., 2014).

4.4.3.7 Preliminary study

Despite a growing interest in PSS, literature on the theme of PSS adoption is in its infancy. Empirical research on airline distribution and passenger services in the IS discipline has

also been limited in assisting to explain such an unfamiliar phenomenon (Lee et al., 2014). In explanatory multiple-case designs, pilot work is done to (i) familiarise case researchers with the issues themselves, (ii) determine the unit of analysis, (iii) gain insight into the basic issues being studied, and (iv) refine the plans of data collection, data analysis and pre-coding (e.g. provisional coding) (Yin, 2009). Based on the collected secondary data, in this sense, this study conducts a pilot study to prepare for the main cases with three objectives. The first objective is to establish why airlines replace their existing technologies by PSS; the pilot phase is thus to review the industry background of the innovation of air travel distribution and passenger processing. The second is to understand the overall practices of PSS adopters in the context of TOE, including how PSS is adopted by home-region oriented airlines, and how the PSS provides the adopters with greater business value. The third is to confirm the data collection instruments and the data analysis skills before the conduct of the main research.

4.4.3.8 Context of the case study

Understanding the context of a case study is important (Darke et al., 1998); it is thus meaningful for readers to understand the research contexts in a threefold challenge for the innovation of airline distribution and passenger services: (i) transformation into open systems (Benckendorff et al., 2014; Merten, 2008); (ii) the formation of global networks with strategic partners (Silva, 2012; Tugores-García, 2012); and (iii) seamless services through a common platform (Belobaba & Odoni, 2009; Iatrou & Oretti, 2007).

Transformation into open systems. Before the development of PSS, one of the major limitations to traditional ARS was that various technologies and independent software created by different organisations might be incompatible. The automated IS in airlines could not fully communicate with each other as they used different computer languages

in a heterogeneous network (Merten, 2008). Airline reservation systems were programmed in the 1960/70s in incompatible legacy technologies and now-obsolete languages, and a major IT challenge in airline distribution is, therefore, a full synchronisation of travel information in a cost-effective way among the different reservation systems (Benckendorff et al., 2014). In the meantime, 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 to be shared with strategic partners was initiated by civil aviation authorities and airline alliances in the early 2000s. These technical changes have also compressed airlines' legacy applications into their reservation systems, which are due for replacement to meet requirements for technological advances.

Global network with partners. International airlines have developed “a larger and denser global network” since the 1990s (Tugores-García, 2012, p. 49), prospecting for a global reach due to the impact of deregulation and the emergence of low-fare carriers. According to Silva (2012), ‘network’ refers to a collection of actors who have joined together to share useful information, knowledge and resources with other members to achieve organisational goals. As such, international carriers operate a comprehensive distribution network, by forming a global network with partners (Belobaba and Odoni, 2009). For instance, code-sharing—a strategic agreement to jointly coordinate the flow of passengers 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). On this account, the development of a global network via a collaboration requires substantial up-front investment and considerable time for adopting a new infrastructure.

Seamless services through a common platform. Air carriers have been collaborating to adopt emerging technologies and cost-effective IT operations across stakeholders. As a result, in the early 2000s, technology leaders in the passenger airline industry launched a joint project to integrate passenger services under a common 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 technology standards of the airline; the platform provides all participating airlines and travellers with improved passenger flow and seamless air travel in an efficient way (Barnhart & Smith, 2012). In line with these contexts and initiatives, building a strategic IT platform such as PSS “in a single, common-use resource with IT” (Briody, 2004, p. 1) was designed to enable collaboration in distribution and passenger processing, enhance technical interoperability and lower development costs through common information management. As such, airlines are required to migrate independent software and databases to a shared platform and a single data repository for enhanced services (Iatrou & Oretti, 2007).

4.4.4 Second criterion: Data collection

Data are the empirical evidence or information that researchers gather according to rules and procedures (Neuman, 2003). Qualitative case studies typically combine data collection techniques such as interviews, observation, documents and text analyses (Yin, 2009). The second aspect of the evaluation criteria in an IS positivist case study, to be discussed herein, focuses on five attributes related to gathering data, involving the data collection process, multiple data collection methods, data triangulation, data saturation, case study protocol and case study database.

4.4.4.1 Data collection process

A case study must elucidate how data is collected, because a clear description of the data sources is linked directly with the reliability and validity of the findings within the case research. In the IS discipline, the data for case research are collected by multiple means, including interviews, field notes and documents (Creswell & Poth, 2017; Myers & Avison, 2002). This explanatory case study is not limited to a single source of data, relying on both interviews and secondary data sources. To enhance the rigor of and insights into the study (Yin, 2012), this multi-method approach for data collection is adopted. Specifically, prior to gathering primary data through on-site interviews, secondary data are collected from publicly available industry publications, including industry reports, business websites and newspaper accounts. These secondary data are used for the pre-coding stage in identifying themes and the case description, including a snapshot of each company.

In May 2016, a series of on-site interviews with Air Lynx in Tokyo, Air Libra in Seoul and Air Lepus in Taiwan was conducted, and then the in-depth analysis of the combination of the primary and secondary data was carried in 2016–2017. This case study with three carriers utilised a mix of publicly available secondary data and retrospective primary data from the interviews with two staff who were key members of the PSS programme in each airline. Table 7 summarises the type of actual evidence used in the embedded case study, which was gathered during the data collection phase. The interview data were obtained through cooperation of the airlines that voluntarily participated in the academic research. Together with the interview invitation and participation agreement, each English written question sheet presenting eight open-ended questions and seven semi-structured questions was sent to both participants at each airline three weeks before the interview.

Table 7. Primary and Secondary Sources of Evidence

Type of evidence	Collection	Description (Purpose)	References
<i>Secondary sources</i>			
Business website	Q1-2 2016	Online documents/reports for investors available on each airline's homepage	
Newspapers accounts	Q1-2 2016	Public newsletters, press release and news reports	
<i>Primary sources</i>			
Interviews	Q2 2016	Conversations with personnel in Sales and IT unit of the three participating airlines; the informants are responsible for PSS adoption within their units as directors/managers	
Field notes	Q2 2016	Instant hand-written documents instantly made in the researcher's direct observation during the on-site interviews and partially created within 24 hours after the conversation	Dubé & Paré (2003) Myers (2013)
Interview answer sheets	Q3 2016	Written replies to the interview questions distributed to respondents by email prior to the interviews; these were optionally received by informant	Yin (2009; 2011)
<i>Secondary sources</i>			
Industry publications	Q3-4 2016	Industry profile in airlines and formal executive summary for consultants and professionals	
Video clips	Q4 2016	Voice content from announcements/interviews in airline events, which are available on YouTube®	
Printed materials	Q1-2 2017	Handouts and printouts distributed for attendants in PSS-related conferences and presentations	

* Interview period: May 2016

This preliminary distribution was intended to aid the informants to vividly recall the complex inter-organisational activities and crucial experience in the process of adopting the PSS. The open questions were related to the company's recent business overall, the affiliation of the participants, and their role and main duty during the PSS adoption stage. The semi-structured questions were then arranged to check the airline's home-region orientation and identify influential factors in line with the TOE contexts and PSS impacts

at the strategic level and operational level. After an initial contact by the researcher, the airlines provided access to one or two officer(s) of the business division (supporting IT planning related to distribution and passenger services) and another one or two high-level manager(s) with the IT unit. The volunteers were professional in offering relevant information and insights from the different units' perspectives; they were highly suitable because each of them played a vital role ranging from decision making to full implementation in adopting the PSS. The meeting place chosen was a quiet conference room or a business lounge in each of the companies' premises to enhance comfort and concentration at the same time. Dialogue was smoothly conducted in English, which is an official common language of the airline industry. The interviews were conducted for 45~60 minutes a person. The dialogue was recorded with the consent of the other party. The perceived actions and facial expressions were also written down by the researcher as separate field notes (Darke et al., 1998).

In producing the interview transcripts, this research sought to balance a robust procedure, budgetary constraints and transcription accuracy. Each of the voice files was copied from the researcher's audio recorder to his desktop computer. Using an up-to-date audio player, for each case, transcription was then carefully carried out by pausing at each phrase or sentence and listening repeatedly. The voice recordings were transcribed by the researcher, as an expert in airline-related technical terms, with minimal addition of words for the purpose of correcting grammatical errors and understanding; this choice was also helpful to save the research project cost (Corden & Sainsbury, 2006). This researcher was familiar with regional/local accents and industry jargon. Thus, he was able to increase efficiency in transcribing technical terminology and reduce errors in understanding the conversation. Based on general transcription conventions, transcript materials from the respondents were produced with minor editing work because of a few grammatical issues.

Only a few words were corrected by them due to misunderstanding of the Taiwanese and Japanese accents. Otherwise, the transcripts were reaffirmed through e-mail with the information providers.

For sampling through the in-depth interviews, this study uses reputational case selection—one of the strategies of a mix of expert sampling and purposive sampling in achieving in-depth investigation and representativeness, considering the unit and level of analysis and the research problem and topics (Patton, 2002). Expert sampling is a technique where interviewees in a specific expert group, such as the PSS Project Management Office, are non-randomly chosen on the basis of their expertise (Bhattacharjee, 2012). Also, purposive (reputational) sampling is used to select similar information-rich case sites where the qualitative researcher should use text analysis for in-depth investigation, and the cases exhibit minimal variations in a homogeneous market (Mathrani, 2010). The data collection process in case research is subject to the influence of the researcher's characteristics and background, relying heavily on the researcher's interpretation of events and documents/interview material (Darke et al., 1998). The present researcher has more than 18 years of industry experience in air travel distribution and automated passenger services in the East Asian region. Highlights of his career in the industry include his significant role as Co-programme Director responsible for the adoption of Passenger Service Systems (PSS), known as 'the next generation' of airline reservation software, at an international carrier headquartered in Seoul, and as a member airline representative in charge of 'the technology innovation' task force at a Frankfurt-based global alliance. By being involved in such challenging initiatives in 2006–2013, he was able to observe closely a thread of connections in PSS adoption exercises across three East Asian airlines. A key to selecting a case site is the researcher's interest mainly in

explaining similar patterns in PSS adoption across the different airlines in Japan, South Korea and Taiwan (see Figure 16).

Against this background, Air Lynx, Air Libra and Air Lepus—the pseudonyms for a Japanese, a Korean and a Taiwanese carrier respectively—are arranged as the ideal units of analysis¹⁴. It is because the target firms selected for this case study have many common conditions in the same industrial segment and business contexts. They have been/were:



Airline Ja: Air Lynx (Japan), Airline Ka: Air Libra (Korea), Airline Ta: Air Lepus (Taiwan)

Figure 16. Site Selection for Embedded Design – Three Allied Airlines

- (i) home-region oriented¹⁵, as holding the majority of their assets and sales in their home country (Wolf et al., 2012);

¹⁴ No airlines in China have so far adopted PSS in a global standard setting; a government-owned Chinese vendor has a monopoly in the supply of IT systems for airline distribution and passenger services.

¹⁵ This was confirmed during the interviews and the data analysis using secondary data in 2016–2017.

- (ii) incumbent members embedded within the same GAA;
- (iii) full-service carriers in East Asia¹⁶ where English is the second language;
- (iv) the leading operators based on market presence (e.g. network size), in fierce competition with the biggest industry rival in each country;
- (v) in a mutual cooperation since the late 2000s, reviewing the same PSS product and similar optional services;
- (vi) optimum comparable firms with similarities in terms of the degree of IT innovation and the point of transition into PSS; and
- (vii) keen on this study, and thereby willing to share their PSS experience.

In an embedded design, this study purposively gathers analytic data from the target airline companies that commonly adopted the OrcheStra suite. In comparison to using different PSS products, the advantage of collecting data and materials relating to the adoption and use of the same PSS is two-fold. Theoretically, such a data collection scheme enables the multiple case study research to present a nested unit (i.e. embedded subcases) within the same technological assumptions and conduct a consistent case analysis associated with a literal replication and cross-case comparison (Yin, 2009). In practice, more importantly as case study research, this collection scheme helps the case participants, technical/business advisers and their stakeholders not only discover the opportunities of strategic benefits by using the common PSS (e.g. an enhanced code-share programme using a real-time schedule change function, and a fast contact with particular passengers on connecting flights by sending out instant disruption notification texts), but also increase mutual operational benefits. For instance, the higher level of data consistency

¹⁶ According to Aminian, Fung and Ng et al. (2008) based on the World Bank data, the term East Asia typically refers to the four major economies; China, including Hong Kong and Macao, Japan, Korea and Taiwan.

and passenger data exchange between the same PSS as well as additional cost reductions in interline booking/ticketing.¹⁷ On an individual level, voluntary interviewees are chosen by means of reputational case sampling—a variant of purposive sampling that involves the selection of instances based on the recommendation of a key informant (Miles et al., 2014; Patton, 2002). Upon consideration of the dimension of interest and professional expertise in this research theme, a small number of participants is therefore recommended by each airline as well as the airline alliance and then chosen from among Airline IT/Passenger Sales professionals, in charge of the PSS Project Management Office¹⁸, who belonged to decision-making teams from different business units/divisions. Likewise, the use of well-selected control group is organised to eliminate potential threats to the internal validity. In the post-positivist qualitative research, the sample size within a specific research problem and limited business context is generally less relevant (Bhattacharjee, 2012; Price & Murnan, 2004). Nonetheless, internal validity should be considered in case participants do not respond truthfully, in a socially desirable way, during the interview. Hence, in association with some open-format and semi-structured interview questions, multiple data collection and data triangulation/saturation from evidence are also made as the following sections address.

4.4.4.2 Multiple data collection methods

Explanatory case studies in IS positivist research tend to rely on multiple data collection methods (Dubé & Paré, 2003). Such an approach not only improves the construct validity and reliability, but also secures accuracy and consistency in testing multiple source of

¹⁷ These operational benefits can clearly be made when airlines in a PSS community using the identical PSS package (such as ALX, ALP and ALB in this study) are able to access the single source and holistic data and also utilise the shared functions across all sales/services channels while other airlines using the separate in-house PSS manage their reservation data, electronic ticket coupons and seat maps in isolation.

¹⁸ 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.

case data by: (i) strengthening the evidence for the cases; (ii) constructing an evidence chain; and (iii) ensuring questions are appropriate for discovering relevant constructs (Yin, 2009). Likewise, this research utilises multiple sources of evidence and a multi-site case study strategy in a two-stage data collection process; in a multi-method approach, multiple data from secondary data sources combining business websites, newspaper accounts and industry publications, as well as from two primary data sources including open-ended and semi-structured interviews with key informants and field notes written during the interview, are arranged. Specifically, in addition to interview data (i.e. transcripts and field notes), evidence for this exemplary study is gathered through secondary data sources, and the volume of secondary information is used for pre-understanding of the complex case issues during the pilot study in particular (Gummesson, 2000). The strengths of secondary data analysis are that it is (i) stable—may be analysed repeatedly; (ii) unobtrusive—can be independent from analysing other types of data; and (iii) broad—might be covered by different events (Yin, 2009). However, face-to-face interviews are essential material and sources of information for this explanatory case research; a combination of open-ended and semi-structured questions is designed to probe for more clarification and information related to the research questions. The unstructured enquiries are used to collect general information about the function of PSS organisation and the interviewee's role in the project whereas the semi-structured questions are made in association with context-specific theoretical variables based on the literature regarding IOS and HRO.

4.4.4.3 Data triangulation and data saturation

Biases in collecting and analysing case data can be counteracted by using multiple sources of evidence to provide multiple instances from different data sources (Miles et al., 2014); bias refers to “any property of a question that encourages subjects to answer in a certain

way” (Bhattacharjee, 2012, p. 76). One of the most important advantages of using multiple sources of evidence is the development of converging lines of inquiry (Yin, 2009). The process of putting together multiple data sources is called triangulation (Dubé & Paré, 2003). The use of this multi-method research strategy for post-positivist case study in the qualitative form is identified from the extant IS literature that describes IOS adoption in organisations. This tactic aims to encourage convergent lines of evidence (i.e. a process of triangulation), for instance, by enabling investigators to address a broad range of managerial issues (Yin, 2009). As such, triangulation is further achieved in this study through a theoretical comparison between insights about different phenomena of PSS adoption within three airlines. To reduce intentional and unintentional bias in collecting data and mitigate the researcher’s personal lens in analysing them, this study employs multiple internal and external data collections; more specifically, a combination of secondary data from business websites, newspaper accounts, meeting minutes, industry publication and field notes as well as on-site interviews from semi-structured and open-ended questions with manager-/director-level informants in different business units is applied to collect ‘rich’ data and ‘enough’ information.

This research also demonstrates the richness of the information gleaned from the multiple sources of data to increase the ‘depth’ of the data. “Data triangulation is a method to get data saturation” (Fusch & Ness, 2015, p. 1411). Marshall, Cardon, Poddar and Fontenot (2013, p.11) claim that data saturation was “developed originally for grounded theory studies but applicable to all qualitative research that employs interviews as the primary data source” regardless of sample size in qualitative inquiry, and it is an elusive concept in IS qualitative studies since few concrete published guidelines exist. In this qualitative research, the interview data for the multiple case study are analysed and viewed

repeatedly through replicating the case study method until no more significant patterns and themes are emerging.

4.4.4.4 Case study protocol

A case study protocol is an essential requirement in multiple-case designs. Subsequent to secondary data analysis, the primary mode of data collection for this research is a series of on-site in-depth interviews at each case study site combining open-ended and semi-structured questions. This method intends to probe for more clarification and information about answers (Yin, 2012). Producing a protocol requires the setting up of the instrument, rules and procedures that are required to interview informants. An interview protocol should be prepared for the interview process, including a list of questions to be asked. On this account, a series of appropriate methods is applied to this study (see Figure 17).

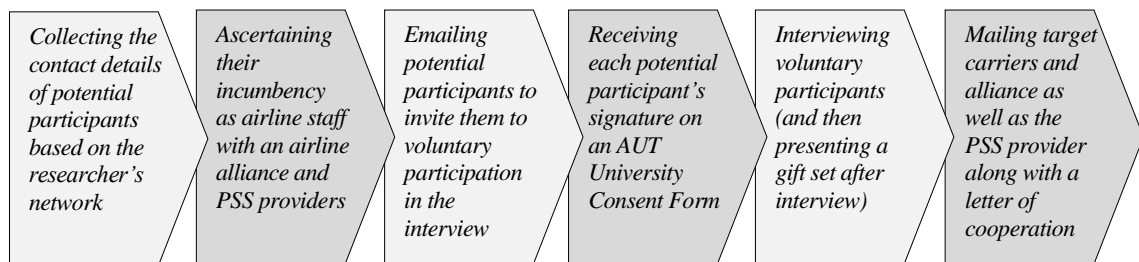


Figure 17. Case Study Protocol of this Study

A semi-structured interview method is considered to be useful when researchers intend to collect qualitative data that may generate expected insights from a given set of choices (Neuman, 2003). In addition, a semi-structured interview with open-ended questions is designed to leave some room to collect unexpected and meaningful comments from high-ranking officials and management (Bhattacharjee, 2012). For this study, along with the formal invitation letters, written interview questions combining eight open-ended questions on each firm's strategy (see Appendix F), structure and adoption status and seven semi-formatted questions related to specific conversations within three TOE

contexts were distributed on two separate occasions to all informants by electronic mail, including a reminder e-mail, prior to the on-site interviews in April 2016—a month before the visits. This action was designed to reduce unintentional bias/errors by the respondents (e.g. forgetting or misunderstanding questions), the interviewer's sloppiness (e.g. misreading or omitting questions) and unexpected reactions to answers during the conversation.

All interview scripts were produced in English, because the participants working in the international airline industry had a good command of English. In May 2016, the on-site interviews with two participants from each of three airlines were held in the head offices in Tokyo, Seoul and Taipei respectively. A small-sized conference/interview room in a natural setting was arranged. As shown in Appendix G and Appendix H, with the agreement of the interviewees in writing on the participant information sheet and consent form from Auckland University of Technology, each conversation was digitally recorded. Non-verbal actions—the undigested complexity of reality—were also documented in writing to be used as field notes (Bazeley, 2009). Each in-depth interview with senior-manager-level and middle-executive-level participants as members of the PSS Project Management Office took about 50 minutes (up to an hour) respectively. To guarantee privacy and confidentiality of both the company and the individual, no names and contact information were disclosed; thus, only pseudonyms were used in this study according to the formal agreement between the informants and the researcher. Based on the general transcription conventions, transcript materials were produced with as little editing as possible, and they were then reviewed by the respondents. More details on the interviews are described in the Chapter of Case Study Results (see Chapter 6).

4.4.4.5 Case study database

Case study data must be documented as they are collected throughout the process (Yin, 2009). They need to be organised in a way that will ensure ready access to the case data at any point during and, for the time being, after the study, because a well-organised set of case data can facilitate the task of analysing the case study evidence (Darke et al., 1998). A case study database usually contains the case data or evidence, including: raw material; coded data; coding scheme; other analytic material; and data displays (Dubé & Paré, 2003). A well-developed database is the key to reliability in case research; it enables researchers to maintain the logical traceability of the documentation (Mathrani, 2010). In this research, both a real-time based case study database and a back-up storage were systematically managed accordingly. More specifically, all the data collected from the target sources, including verbatim interview transcripts, field notes, transcribed audio records and all interview-related documents, are stored in electronic form, while a few of the on-site field notes in a hand-written form remain in hard copy.

Organisational reports, email messages, industry publications, press releases and other secondary data are also filed in the electronic database; they are indexed for instant retrieval. Most of the analytic codes are produced by QSR NVivo 10™, a qualitative data analysis software (QDAS) tool (Bazeley & Jackson, 2013), together with manipulating a spreadsheet tool and a word-processing application for an effective manual analysis. During the early stage of data coding, the manual analysis as an initial examination of text data was undertaken first, prior to the use of automated methods to code data, on the screen of the word processor (graphically underlined/highlighted), coupled with the printed papers using colour highlight pens. Key texts were copied and pasted into the spreadsheet according to the context dimension (i.e. three contexts), adoption dimension (i.e. adoption phases) and value dimension (i.e. business value) to review them by

comparing the pre-determined codes from the literature. Case study narratives, tabular materials in the form of tables and citations to specific evidentiary sources in the case study database, are also made.

4.4.5 Third criterion: Data analysis

A feature of positivist case research is the frequent overlap between data collection and data analysis (Dubé & Paré, 2003). Yin (2003) points out that data analysis is a process of “examining, categorising, tabulating, testing, or otherwise recombining evidence to address the initial proposition of a study (p. 109)” and “bringing its results and findings to closure (p. 114)”. In order to provide a brief description of the data analysis process and a clear and detailed (pre-/post-) description of the selected analytic procedures, this study also focuses on five attributes of the criteria of data analysis, including the data analysis process, field notes, data displays, logical chain of evidence and empirical testing for embedded patterns (Dubé & Paré, 2003). Collected data are coded and analysed in order for the data to be saturated. Saturation is reached when no additional insights are being found whereby qualitative researchers can develop properties of a category and look through collected interview data until they can empirically establish that the category is saturated (Glaser & Strauss, 1967; Fusch & Ness, 2015; Leong, 2012; Wanchai, 2014).

4.4.5.1 Data analysis process and field notes

Data analysis is “both the most difficult and the least codified part of the process” (Eisenhardt, 1989, p. 539). To test out theories within the aforementioned research methods, this study analyses two different datasets (i.e. for primary data and secondary data) in deductive content analysis. Content analysis as a deductive method is employed when research aims not only to test a previous theory in a different situation, but also to develop a temporary start list of codes based on theoretical evidence from secondary data (Elo and Kyngäs, 2008). With the provisional code list, interview data are then closely

reviewed for content and coded for exemplification of the identified categories. Figure 18 illustrates the process of content analysis used in this study. Qualitative coding refers to the process of converting data into a code—to a label as well as a construct—using analytic techniques (Saldaña, 2003).

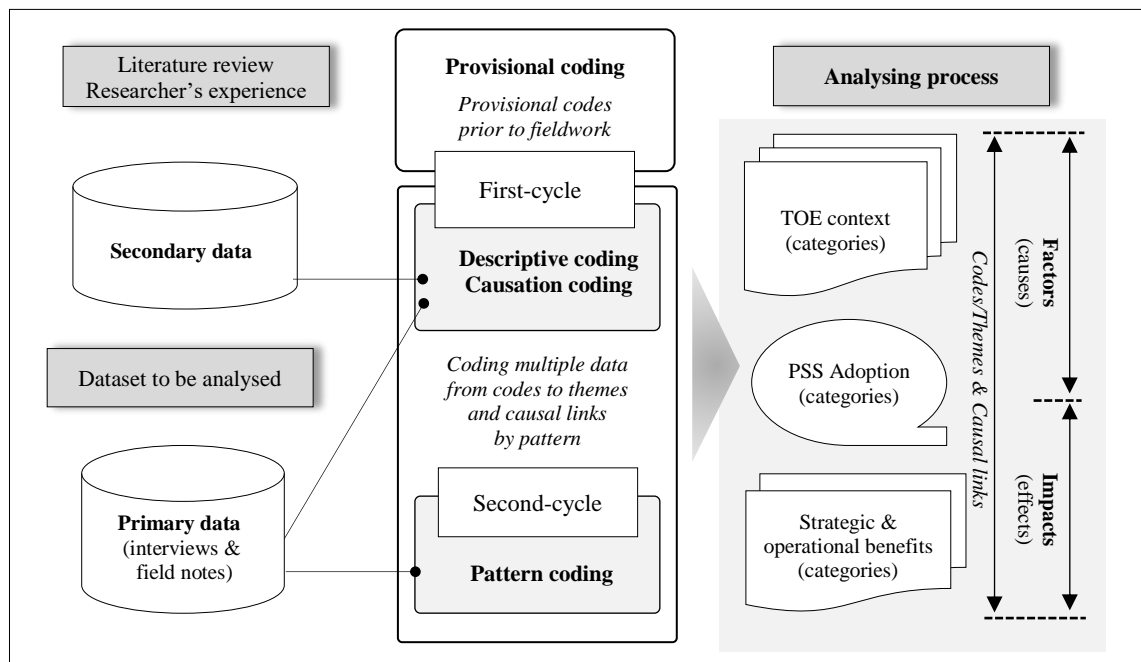


Figure 18. Multiple Data Coding and Deductive Content Analysis

Coding is a cyclical act; accordingly, rarely is a single cycle of coding data perfectly attempted (Saldaña, 2013). Coding is a method that enables researchers to organise chunks of data (i.e. similar data) into categories in two stages: the first-cycle and the second-cycle. By grouping them together, categories appear as “families” that share common characteristics in a repetitive pattern (Miles et al., 2014, p. 71). Richards and Morse (2007, p. 157) explain that categorising 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; themes are a set of extended phrases that identify what they mean and what a unit of analysis is about, and a theme can be used as an outcome of analytic reflection (Miles et al., 2014).

In this research, data coding is undertaken by an eclectic coding skill that combines provisional coding, descriptive coding and causation coding in a first-cycle, and pattern coding in a second-cycle coding process. Eclectic coding is applied when one coding method alone will not suffice; it is useful in case two or more codings of qualitative data are desirable to capture the complex phenomena or processes until saturation is reached using a repeatability approach (Miles et al., 2014). Provisional coding establishes “a predetermined start list of set of codes” that is generated from preparatory investigations based on literature reviews related to the study, and the researcher’s professional experiences (Saldaña, 2013, p. 144). Descriptive coding “summarises in a word or short phrase” and produces “codes that are identifications of the basic topic, not abbreviation of the content” (Saldaña, 2013, p. 88). These two techniques are essential groundwork for the coding approach to analysing interview transcripts and field notes.

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 (2013) asserts that causation in today’s interconnected world can range from individual (i.e. micro-level) issues to inter-group (i.e. meso-level) events to organisational (i.e. macro-level) phenomena, to other factors in various combinations. In that sense, 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 programmes through visual means such as causal network displays (Maxwell, 2012). Causation coding skills extract three elements of an attribution as: the cause, the outcome and the link between the causes and the outcomes. Therefore, this method is useful to hypothesise about potential outcomes from particular causes where causal relationships among variables are unclear. Pattern coding is involved at the final point to pattern the codes and explain the flow of events/actions and states during

the second cycle coding phase; for instance, in what way are factors influential in PSS adoption, and how such outcomes and business value as impacts from PSS came about. Likewise, descriptive coding, causation coding and pattern coding skills are used in a two-cycle coding stage of the data analysis process. Based on verbatim transcripts and non-verbal motions/signals recorded in field notes, each meaningful variable is supplementally rated (i.e. +/-) during the coding process (Bazeley, 2009).

In this study, data coding is systematised by QSR NVivo 10™; this QDAS programme helps researchers to efficiently (i) offer rapid access to conceptual knowledge, (ii) theorise unstructured/non-numerical data during the data analysis process and (iii) report from the data using contents of the qualitative database (Bazeley & Jackson, 2013). Table 8 shows some examples of the codes, themes and constructs/variables used in this study that were deducted from the existing body of knowledge and practices. In qualitative coding, MS-Word and a spreadsheet table from MS-Excel are also used to develop the pre-established codes and the analysis matrix during the two-cycle coding stage as well as to assist in visualising the data. Much information in case research is often revealed in a casual conversation and needs to be recorded in the form of field notes. Field notes should be as complete as possible, recorded within the 24 hours after interviews, and include not only verbal information but also non-verbal communication (e.g. tone/accent of voice, hand movements) and descriptions of the context from conversations (Yin, 2009).

4.4.5.2 Data displays

In qualitative case research, visual displays are important parts of the data analysis phase. According to Darke et al., (1998, p. 285), data display refers to “the organised assembly of information to enable the drawing of conclusion”. Displaying data is a powerful means for discovering meaningful connections between coded segments, because data displays

transmit synthesised information about the chain of evidence and the findings to other readers (Dubé & Paré, 2003).

Table 8. Examples of the Coding Results used in the Study

Coding Phase	Literature/Passage	Codes/Themes	Context/Categories	Constructs/Variables
[First-cycle] Provisional coding (codes predetermined by the researcher and related literature) Descriptive coding (codes in a word or short phrase)	<i>IOS adoption HRO in airlines RES/PSS development TOE framework</i>	INTERNAL RESOURCES INNOVATIVE SERVICES EXTERNAL FORCES	Organisation Inter-organisation Technology Environment	Top management support Interoperability Isomorphic forces
	<i>moving to open platforms support the common and industry standards ...</i>	PLATFORM; TECHNOLOGY STANDARDS; OPEN SYSTEMS;	Technological context	Technology standards
	<i>the decision to move to PSS was made ... totally by CEO</i>	DECISION MAKING; TOP MANAGER	Organisational context	Top management support
	<i>Regarding the vendor support, I think our vendors also has it ...</i>	PRESSURE; VENDORS	Environmental context	Coercive forces
	<i>taking actions to set up new processes as soon as possible ...</i>	FAST IMPLEMENTATION; NEW PROCESSES	Adoption	Full conversion
	<i>technological supports to continue with our plans for global market operation ...</i>	TECHNOLOGICAL SUPPORTS; PLANS FOR GLOBAL; MARKET EXPANSION	Strategic benefits	Global network
	<i>Now, it is time to make more distribution saving...</i>	COST REDUCTION	Operational benefits	Distribution cost saving
	<i>very positive ... important/relevant ... not really ... negatively affects ... not specific influence ...</i>	{++} critically or strongly positive {+} positive/favourable/advantageous {-} negative/disadvantageous/adverse {-} negative		
	<i>These worked a bit on our top manager before a <u>decision was made</u> due to many on-going <u>standard restrictions</u> from our old reservation systems ...</i>	LEGACY SYSTEMS > OLD TECHNOLOGY EXPERTS > DECISION MAKING {-}	Organisation	Legacy systems Decision making
	<i>One of our partners has a higher landmark, and the others are better than us ... We have felt <u>some</u> <u>pressures</u> from them ... their <u>decisions on the</u> <u>adoption</u> affected us</i>	NORMATIVE PRESSURE + MIMETIC > DECISION MAKING {+}	Inter-organisation	Normative forces & Mimetic forces Decision making
[Second-cycle] Pattern coding (codes, including action with effects from causes, to examine pattern of relationships)	<i>Industry standards ... are key drivers behind ... <u>Because</u> it was impossible of us to develop all ... Our adoption is for improving the usability of ... <u>That's why</u> we wanted PSS ... <u>So</u>, we reported to our top manager ... <u>Yes</u>, our PSS is the industry-oriented common systems</i>		TECHNOLOGY STANDARDS → COMMON PLATFORM	

Within the IS positivist case research approach, visual maps, narrative paragraphs, figures, matrices and various charts are the most widely used techniques for powerfully and concisely displaying qualitative data in line with data condensation (i.e. data reduction). In addition to some extended texts, for this explanatory case research, the major skills shown in displaying data are causal networks in a form of event-state display, causal network narratives and a range of graphical diagrams (Miles et al., 2014).

4.4.5.3 Logical chain of evidence

To increase the reliability of the information extracted or inferred, consistency in answering research questions using empirical data and construct validity presented in a case study, a key attribute to be checked is the maintenance of a logical chain of evidence (Yin, 2003). Building a logical chain of evidence can be achieved when the case report is assuredly the same evidence between rationale of the study and discussions. This might be demonstrated in linking case study questions, protocol, database and findings, as well as in tracing the steps in either direction—from conclusions back to initial research questions or from questions to conclusions (Dubé & Paré, 2003). Such a logical chain of evidence is made in the current study based on the logical linkage from research questions, case study protocol and citations to specific sources to case study reports.

4.4.5.4 Empirical testing for embedded patterns

To discover general principles, positivist studies are concerned with the empirical testability of theories (Darke et al., 1998). Empirical testing is critical in the context of explanatory case research where the goal of the investigation is to test theories from empirical case data. Yin's (2009) pattern-matching is a form of empirical testing for qualitative data; a pattern-matching logic compares an empirical pattern with a predicted one and internal validity (i.e. causality) is enhanced when the patterns coincide. This study combines an embedded multi-site case approach in order to (i) look for similar

concepts and repetitive patterns across different case sites, (ii) validate theoretical propositions and (iii) explain the flow of events-states within a given context and the causal relationship across outcomes—in what way the contextual factors influence PSS adoption in a similar non-linear causal diagram. Coupled with a holistic analysis (i.e. single-unit of analysis) is embedded search (i.e. multiple units of analysis) for patterns (Dubé & Paré, 2003). An example of such a tactic is to select categories or dimensions, and then to seek within-group similarities together with intergroup differences. To enhance generalisability and transferability between contexts as well as to deepen understanding/explanation of similarities and differences across the cases, this embedded multiple-case study adopts a strategy of cross-case analysis. Therefore, focusing on causal factors (antecedent and mediating variables), results (outcomes and impacts) and various constructs, PSS adoption by three different airlines in common conditions is to be compared for analysis on similar cause-and-effect and general explanations, as shown in Table 9.

Table 9. Causal Relationships between Influences and Results (Case-oriented)

Relationship	Classification	Types of Influences/Results in this Study
Causes	Antecedent variables	Events (drivers/challenges) in each context
	Mediating variables	Events (drivers/challenges) and states (issues/barriers) in each context
Effects	Outcomes	PSS adoption
	Impacts	Business value

According to Miles et al. (2014), Ragin (2014) and Yin (2009), cross-case analysis methods have two different approaches: case-oriented approach and variable-oriented approach. A case-oriented approach is used for one of the few cases to consider the case as a whole entity, by looking at causes-effects, associations and configurations within the

case, and turn to comparative analysis (Ragin, 2014). The method for a small number of cases (usually two or three) is thus good at arranging causal factors (antecedent and mediating variables) and predicting similar results by a literal replication, including underlying similarities, constant associations and limited different outcomes/impacts (Miles et al., 2014). In contrast, a variable-oriented approach is selected to predict contrasting results but for anticipatable reasons through a theoretical replication. Conceptually, it casts a wide net over a large number of cases (four or five, even up to six to ten) to find probabilistic causal relationships (i.e. causes-effects) among variables and constructs (Miles et al., 2014; Yin, 2009). Consequently, case-oriented analysis is appropriate for this study for finding specific, concrete and contextual patterns.

4.4.6 Addressing bias and ethical considerations

In order to provide reliable and unbiased research results, this qualitative study pays attention to the issues of potential bias. In particular, the key foci on research errors are socially-desirable bias (i.e. a respondent bias that takes place when respondents distort answers to present their reports in the best possible light or conform to social norms), confirmation bias (i.e. a researcher bias occurring as researchers overuse collected information to confirm their beliefs) and the halo effect (i.e. a tendency for a researcher to make assumptions about responses/outcomes in a highly positive manner) during the interviews and data analysis (Neuman, 2003). Giving attention to these issues enables the researcher to protect internal validity as well as to control the sources of bias by phrasing questions in more subjective and indirect ways that let norm violation appear less during the interviews. In analysing interview and public data, it also enables the researcher to reduce possibly distorted interpretations biased by his prior industry background and knowledge of the phenomenon being studied (Bhattacharjee, 2012; Neuman, 2003).

This explanatory multiple-case study involves voluntary human participation in the second phase of data collection. On-site face-to-face interviews on organisational issues and practices with key informants from target organisations are necessary. Specifically, a series of verbal conversations in English with senior manager-level and middle executive-level participants with international airlines is required in a natural setting. Therefore, ethical issues and principles should be properly considered. Prior to the conduct of on-site data collection from the participants, a formal approval was thus sought from the Auckland University of Technology Ethics Committee (the AUTECH) in late 2015, because ethics consideration is a community review of the ethical aspects of the research proposal. Using the AUTECH's printed template, the researcher re-emphasised in writing that not only would an individual's interview participation be voluntary and risk-free, but also confidential, and truthful principles would definitely be preserved. Consequently, no concerns were raised by the AUTECH, and the ethics application and its appendices were then formally approved (see Appendix I).

4.5 Summary of the Chapter

To this point, Chapter 4 has reviewed the methodology applied to the study, dealing with an explanation of the research approach, the research methods and the case research design, followed by the key criteria in an explanatory research style. As a result, a simplified roadmap in Figure 19 can be presented to provide an illustration of the discussed research methods. Rigour is largely considered by the criteria of Dubé and Paré (2003), Miles et al. (2014) and Yin (2009; 2012). Based on what has been addressed in the chapter, a systematic snapshot mapping research design and methods is presented in the form of a logical research process. The diagram briefs on industry background, research justification/rationale, research objectives and the expected contributions,

research questions, theoretical lenses, data collection and analysis, and reporting of the case study.

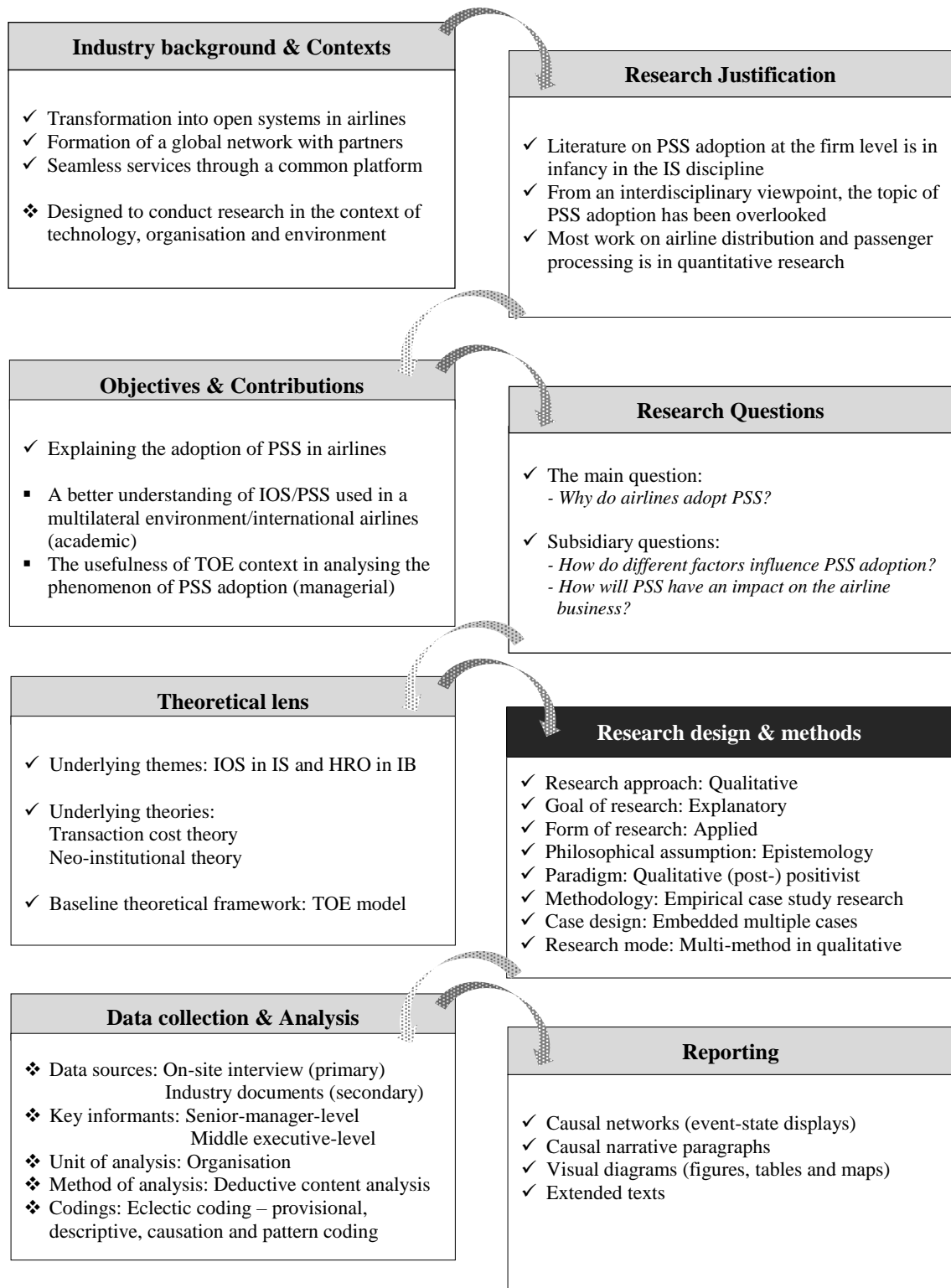


Figure 19. Research Roadmap of the Study

The research methods are discussed in-depth, including justification of the qualitative approach and explanatory case study as well as the mode of qualitative explanation (i.e. causal network displays and narratives) that Miles et al. (2014) advise. Case research design is also described from a positivist case research perspective. While an embedded multiple-case design strategy is justified, 21 key attributes are reviewed in line with research design, data collection and data analysis phase using qualitative textual data that Dubé and Paré (2003) as well as Yin (2009; 2012) propose. The attributes are used as the criteria of an IS positivist case study to establish the rigour achieved in the conduct of this research. The ways of reporting various types of data are also discussed. Lastly, as this work requires voluntary human participations in collecting data by interviews, potential ethical issues are considered and then duly approved. Prior to discussing the case study results, the next chapter presents the detailed coding skills in qualitative data analysis.

End of Chapter 4

CHAPTER 5: DATA ANALYSIS STRATEGY

5.1 Outline of the Chapter

Chapter 5 clarifies the strategy pursued in the analysis of case data, which is an integral part of the case study. Based on the five attributes of data analysis previously discussed in Section 4.4.5, it presents further details on qualitative content analysis and specifically focuses on coding schemes in a deductive method, a multiple coding procedure using a qualitative coding tool and applications to this research in analysing data. After this outline, Section 5.2 describes in depth the techniques of qualitative content analysis that are suitable for this explanatory case study; deductive coding skills and multiple coding methods are briefly reviewed in its two sub-sections. Its sub-sections expatiate on an eclectic coding approach in a two-cycle structure within the study. Section 5.3 then reports the applications to this research by presenting key skills in data analysis and explains how to use three coding techniques that combine descriptive coding as well as causation coding used in the First Cycle process, and pattern coding as an element of the Second Cycle. The section also clarifies the use of coding tools and the procedures of coding—a process of classifying and categorising text data segments into a set of themes, categories and relationships. Section 5.4 sketches skills in data display and outlines how to summarise factors (causes), outcomes (effects) and impacts (consequences) in an influence diagram in line with cognitive mapping. With a summary of the chapter in Section 5.5, this chapter finalises the analysis of data undertaken.

5.2 Qualitative Content Analysis

Considering the nature of research that deals with an organisation-level phenomenon, the qualitative data analysis strategy is well suited, because this case study focuses on explaining social processes and inter-firm dynamics within the specific context of the

coded data, explanatory conclusions and displays are built and verified. In line with the reports formatted in the data-building process, an initial report is written, and the final reports are produced on the basis of a single-unit conclusion and alternative explanation. Then, theory is being tested. This process iterates over the coded and analysed data. In a similar vein, each of the two cycles is also repeated to draw multiple-unit conclusions, including implications for theory.

In analysing data, qualitative strategies are diverse (Gibbs, 2002). Miles et al. (2014) and Saldaña (2013) describe more than 20 well-established qualitative analysis traditions, including content analysis. Content analysis pays meticulous attention to the embedded meanings of words in a data corpus, while each tradition employs a particular form of data analysis. It is a technique for examining content in written, verbal or visual messages that can be communicated (Neuman, 2003). Content analysis is also known as a method of analysing text-based documents, thereby enabling researchers (i) to distil words into fewer content-related categories, words and phrases, (ii) to test theoretical issues, and (iii) to enhance understanding of the extensive data (Elo & Kyngäs, 2008). With content analysis, research can be exploratory, descriptive or explanatory. In explanatory research, the qualitative content analysis method assists in initially revealing messages in text that contain causal relations across multiple variables, and eventually in building causal networks between given contexts (Miles et al., 2014).

5.2.1 Measurement in content analysis

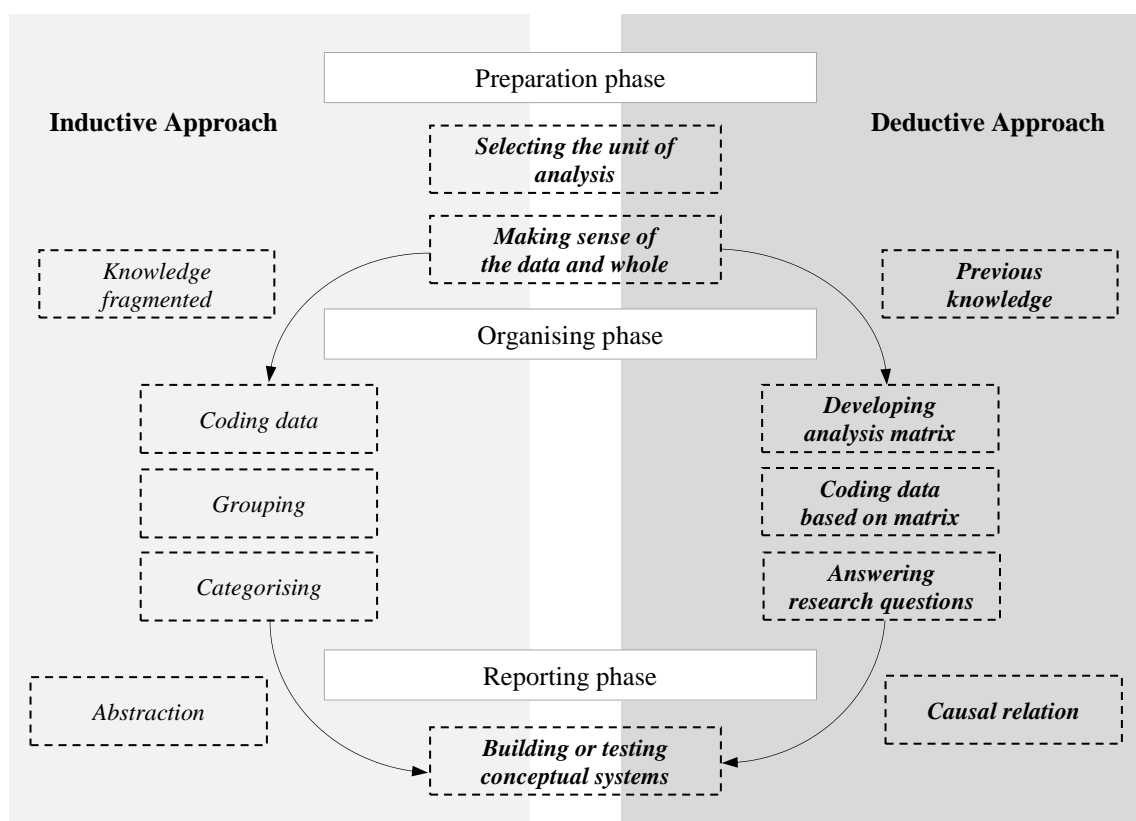
Measurement in content analysis uses structured instructions. Researchers examine the documents directly and develop a measure of constructs, operationalising the constructs with a coding system, which is a set of rules on how to observe and record content from text (Neuman, 2003). Coding systems within content analysis identify four characteristics

of text content: frequency (i.e. how often something occurs), direction (i.e. positive or negative), intensity (i.e. the strength of a message) and space (i.e. the amount of space allocated to a text message); in order to note the direction of a message in the text-based content and the power of a message in a direction, this qualitative research selectively measures three observations in analysing content: *frequency*, *direction* and *intensity* (Neuman, 2003). During the coding process, this research, therefore, tailors both the characteristics to industry documents, verbatim interview scripts and field notes to identify direction-based text and adequately to rate the strength of observed evidence (e.g. positive {+}, strongly positive {++}) and to recognise which factors are salient from multiple units of analysis.

5.2.2 Deductive content analysis

Content analysis can be used in an inductive or a deductive mode. As illustrated in Figure 21, both the modes are simplified in processing data analysis as three main phases: preparation, organising and reporting (Elo & Kyngäs, 2008). In the preparation phase, the inductive mode is appropriate when there is insufficient knowledge about the phenomenon, or the existing knowledge is fragmented. In contrast, the mode of deduction is used when the structure of analysis is operationalised because of previous knowledge about similar cases and contexts. In pursuance of organising raw data and reporting the data after the preparation phases, an inductive approach formulates a general description of the research topics to provide abstraction and generate new ideas about a phenomenon whereas a deductive method explains a phenomenon in a causal relationship or examines theoretical propositions. In this study, a deductive method is chosen; it is because this explanatory research on PSS adoption in airlines is theoretically rooted in IOS adoption as well as HRO, and then these two theoretical foundations in a specific business situation (i.e. PSS adopters in a particular region) are addressed for the case of PSS adoption within

the context of TOE. Miles et al. (2014, p. 238) claim that “in substantiating a cause-and-effect network, the deductive conceptualist has a top-down model”; in deductive strategy, researchers begin with a preliminary matrix (or predetermined codes), arrange *a priori* orienting experiences and seek logical relationships among constructs or concepts, thereby moving from the general to the specific using particular and empirical evidence (Neuman, 2003).



Adapted from Elo & Kyngäs (2008)

Figure 21. Qualitative Content Analysis Process: Inductive vs. Deductive

5.2.3 Multiple coding methods

In a qualitative manner, coding refers to an analytic process that converts data into a code (Saldaña, 2003); the process of coding is regarded as the critical link between the collection of data and the explanation of data meaning. First, coding is a method that

organises similar data into categories. Categories appear in a group such as families that share common characteristics in a repetitive pattern (Miles et al., 2014); categorising entails developing themes from categories (Richards & Morse, 2007). A theme is used as an outcome of analytic reflection; themes are a set of extended phrases that can identify what they mean and what a unit of analysis is about (Miles et al., 2014). In qualitative coding, there is also a proper hierarchy. Therefore, in this research, data coding is multiply undertaken in two cycles, because multiple coding skills should help to ensure capture of the complex phenomena of PSS adoption in analysing data.

5.2.4 Eclectic coding techniques

The qualitative analytic process is not linear but cyclical, as the nature of data coding is to compare “data to data, data to code, code to code, code to category, category back to data” (Saldaña, 2013, p. 58). Data coding can be undertaken with an array of coding methods; such a qualitative coding technique is called eclectic coding, because it employs a purposeful combination of two or more coding skills. Saldaña (2013) describes:

A code in qualitative inquiry is most often a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data. The portion of data to be coded during First Cycle coding processes can range in magnitude from a single word to a full paragraph to an entire page of text to a stream of moving images. In Second Cycle coding processes, the portions coded can be the exact same units, longer passages of text, analytic memos about the data, and even a reconfiguration of the codes themselves developed thus far (p. 3).

Likewise, eclectic coding can be linked by a multiple coding approach and divided into two cycles in general: First Cycle and Second Cycle coding (Saldaña, 2013). It enables qualitative data analysts to carry out a first draft of coding corresponding to research

questions and/or research scope and then to move on to a strategic draft of revised coding, transforming codes first into organised categories and then into higher-level concepts.

5.3 Technique used in Coding Data

In analysing data, this study uses a series of provisional–descriptive–causation coding as the First Cycle coding, followed by pattern coding for the Second Cycle (see Figure 22). More specifically, provisional coding—as an initial technique within the First Cycle—is undertaken on the basis of existing literature, *a priori* experience on IOS adoption and newspaper accounts in PSS projects to produce predetermined codes first.

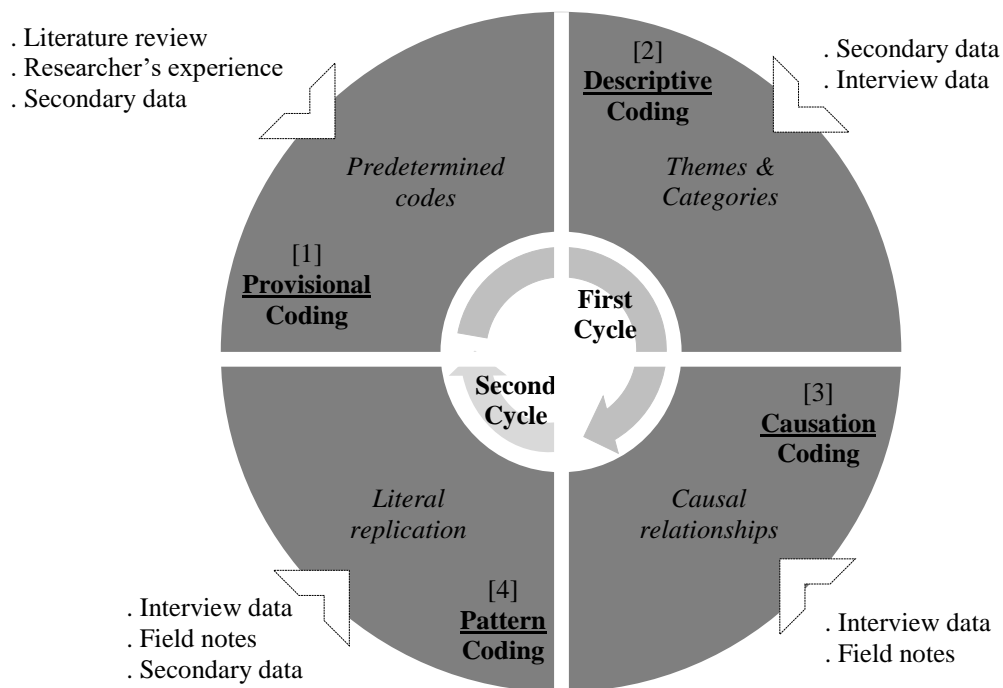


Figure 22. Eclectic Coding Process in 2-Cycle of Data Analysis for the Study

Descriptive coding is used primarily to analyse multiple secondary data documents, verbatim interview transcripts and field notes according to identified themes and categories. Causation coding then is applied to extract causal beliefs/relationships

showing why and how PSS adoption occurs as three conclusions as outcomes (i.e. decision making, resource allocation and full conversion), mainly relying on the interview and field note data that were collected from the face-to-face conversations. Subsequently, pattern coding is involved to pattern the codes and explain the flow of events/actions and states by finding a literal replication: in what way the factors influenced PSS adoption, and how such outcomes and business value from PSS came about across the target firms.

5.3.1 Use of coding tools

In this study, a systematic coding tool is used to help to ensure reliable coding procedure and maintain methodological rigour as well as epistemological traditions. Data coding is systematised by a qualitative data analysis software (QDAS) programme, QSR NVivo Version 10 for Windows (NVivo 10TM, hereinafter simplified as NVivo). In the beginning, as an intermediate level of Dedoose user, this researcher once made an attempt to code data using Dedoose Version 7.5.9, a web-based QDAS application on www.dedoose.com. But he realised that the Dodoose application would be more suited to analysing qualitative data along with various demographic data in effective ways, because it is designed to support mixed methods research that seeks to bring qualitative and quantitative approaches together (Dedoose, 2016).

Besides NVivo and Dedoose, there are multiple cross-platform QDAS packages, including a desktop edition of HyperRESEARCH and a web-based C.A.T. known as open source software. Among the wide selection and distinctive qualities of QDAS tools, only NVivo supports in-depth text queries (e.g. word tree), import from word processor, spreadsheet and portable document files and robust auto-coding that also enables novice qualitative researchers to reduce coding work (Boston University, 2018). As one of the widely-used QDAS programmes, NVivo also helps this purely qualitative study

efficiently (i) manage all collected data, (ii) provide rapid access to conceptual knowledge, (iii) theorise unstructured/non-numerical data during the data analysis process, and (iv) report from the data using contents of the qualitative database (Bazeley, 2009). On this account, NVivo was selected in this study as a single QDAS tool that would support the use of an eclectic coding skill, including provisional, descriptive, causation and pattern codings (see Figure 23).

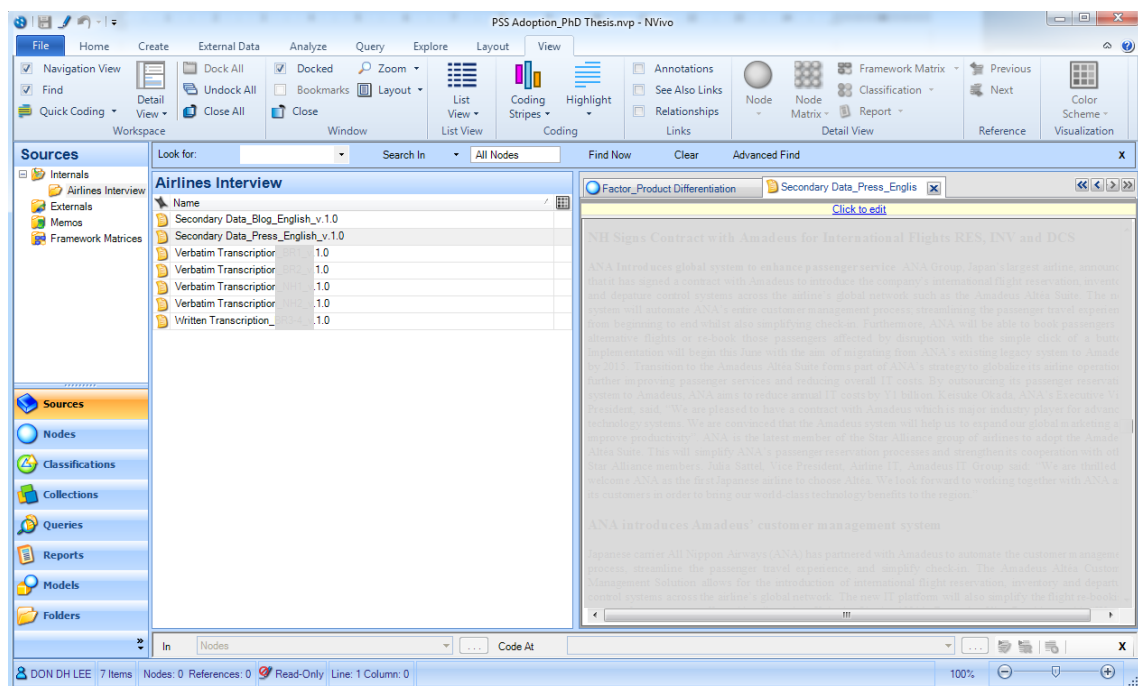


Figure 23. Screenshot of NVivo Used for Data Analysis in this Study

In parallel, MS-Word is utilised as a word processor for editing text data and a spreadsheet table from MS-Excel is adjunctively in place for the creation of a temporary code list during the two-cycle coding stage. In NVivo, using the 'auto code' tool is the primary way to concentrate on more interpretive, less mechanical work. Despite this, NVivo's automated routine coding was unused for this study. Instead, its search tool and automatic word trees were used. This is mainly because the coding skill is not appropriated for the unformatted industry reports, open-ended responses and semi-structured interview transcripts that were collected from different informants with multiple sites (Park, 2016),

and the automated tool is more appropriate for coding standardised questions, structured interviews and documents in tabular form where consistency in the level of heading across all documents is required (Bazeley & Jackson, 2013). In this study, the majority of the data to be analysed are set out in open-formatted and semi-structured conversations in line with a deductive analysis approach by comparing the present original factors with the words/phrases produced by the NVivo search tool (i.e. a text search query).

5.3.2 Coding skills in data analysis for the First Cycle

In coding data within this study, as aforementioned, the First Cycle coding includes three coding methods: provisional coding, descriptive coding and causation coding. The objective of the coding process in First Cycle methods is (i) to make sure the identified themes are representative of the original data; (ii) to understand the nature of the research questions; and (iii) to eventually develop a set of logical and valid themes (Miles et al., 2014). All of the identified themes are coded using the ‘nodes’ functionality in NVivo; a node is a virtual space in NVivo containing content/references about constructs, concepts,

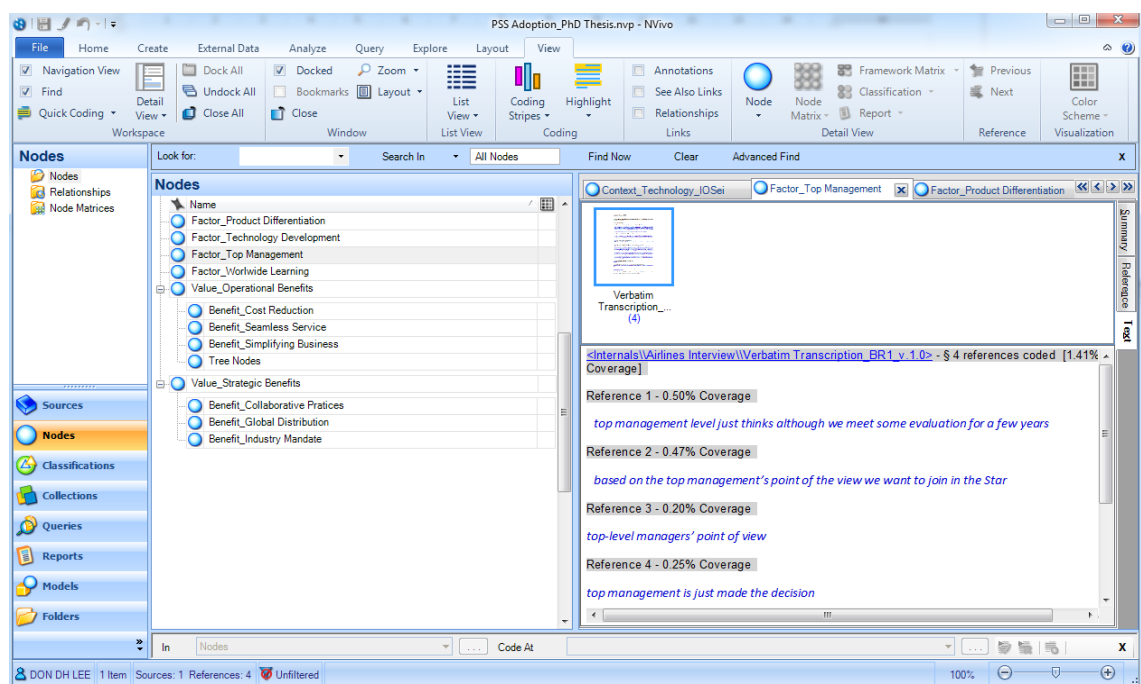


Figure 24. Screenshot of NVivo Displaying Nodes used within the Study

themes and cases. Figure 24 shows that the actual nodes by each construct were being created during the coding phase (e.g. a construct: top management support).

To store the coding, free nodes are used in NVivo. In general, the term ‘node’ stands for either a terminal point of a connection in a branch network or a point where a particular concept (e.g. a labelled phenomenon or an abstract representation of an event) branches out into a network, and nodes store coding about themes (Bazeley, 2009). In this study, themes produced from provisional and descriptive coding are dropped off at free nodes. Later, the nodes are moved together under tree nodes during the next step of coding.

5.3.2.1 Provisional coding

Provisional coding is frequently used in deductive content analysis. This coding skill utilises the pre-set codes that have emerged from preliminary investigations to establish a predetermined start list set of codes prior to fieldwork (Miles et al., 2014). The provisional list is produced from preparatory investigative sources such as the researcher’s experiences, literature reviews and former research findings that are related to the study. For instance, the researcher extracted all passages coded ‘top management’, ‘top manager’ or ‘CEO’ from a key informant of the Taiwanese airline to compose a more detailed inventory of the case and to construct a narrative describing the PSS adoption climate within the airline. Of course, such predetermined codes can be altered, deleted or expanded as the context-specific nature of coding the project works out, as provisional codes need “a reality check” as to whether each item from the start list is relevant (Saldaña, 2016, p. 146). In this study, a start list of codes is primarily generated from previous research findings on the adoption of IOS, the tendency of HRO in airlines and the development of reservation platform. The work begins with an underlying literature review in line with the context of TOE, because the TOE framework stretches from IT

software development by professionals and entrepreneurs to IS adoption by managers and executives within the context of a firm (Baker, 2012). This research as an explanatory case study selects the literature published by major IS journals in the 2000s and 2010s to identify referential codes before carrying out the provisional coding (see Table 10).

Table 10. Examples of Provisional Codes used for this Study

Field/Area	Construct (Literature)	Background/Trends	Factors
IB/HRO	New technology development (Meyers & Wilemon, 1989)	Airline services based on technological innovation	Technology (internal)
IB/HRO	Differentiation in IT services (Reimann et al., 2010)	Differentiated technical skills against local competitors	Technology (internal)
IS/IOS	IS personnel staffing (Niederman et al., 1991)	Development human resources handling PSS products	Organisation (internal)
IS/IOS	Top management support (de Guinea et al., 2007)	Top manager's encouragement to facilitate a critical IS adoption	Organisation (internal)
IS/IOS	Technology standards (Kroenke, 2012)	Common requirements in the industry-wide standards	Technology (external)
IS/IOS	Interoperability (Roberts, 2015)	Seamless passenger processing across the increased connections	Technology (external)
IB/HRO	Global network (Silva, 2012)	A larger and denser global air travel network	Organisation (external)
IB/HRO	Foreign operations from home region (Banalieva & Dhanaraj, 2013)	Cost-effective global distribution from the headquarters	Environment (external)

During the pilot study, more than 80 provisional codes were temporarily listed and the pre-established codes were formatted by MS-Word. They were maintained in a provisional list into the case study database, as an example of 'costs' shown in Figure 25. They are deleted, modified, revised or expanded to include new codes during the next step of descriptive coding. The provisional codes are reviewed later, based on *a priori* specification of constructs suggested in the IOS adoption and HRO literature in the above Table 10.

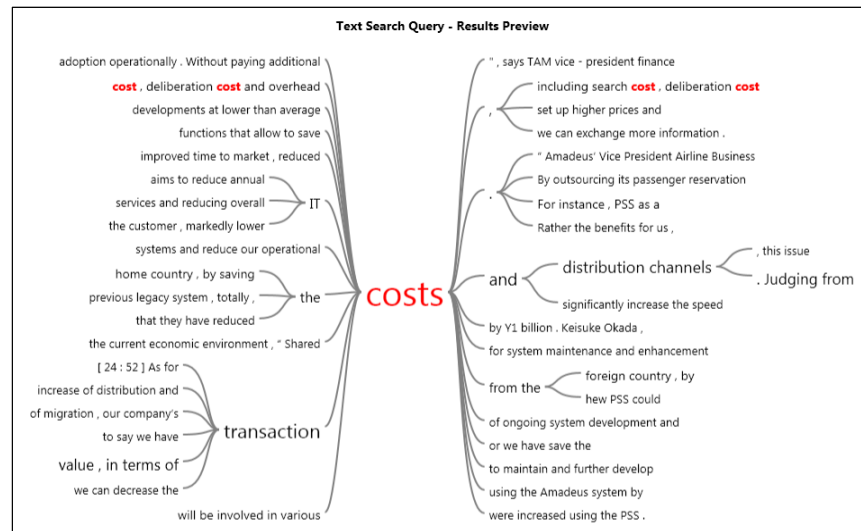


Figure 25. Screenshot of NVivo used as Provisional List of Case Study Database

5.3.2.2 Descriptive coding

Descriptive codes provide an inventory of the basic topics of all passages within qualitative data in text form—interview transcripts, field notes, online materials, printed documents and transcribed audio records—for categorising, and they are more appropriate for social environments than social action accordingly (Miles et al., 2014). In descriptive coding, a query tool is extensively used; queries in NVivo search through data to locate all the text references that meet the criteria set by researchers (Bazeley & Jackson, 2013). The query tool provides an automatic ‘word tree’ map (see Figure 26).

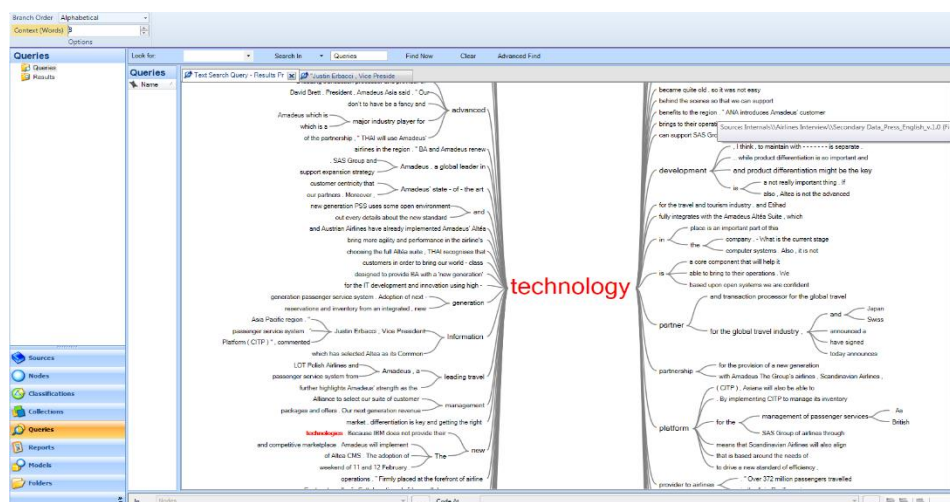


Figure 26. Screenshot of NVivo in Descriptive Coding – Technology Context

The word tree assists in identifying key themes, and the tree map shows the linkage of a central word in a cluster. One of the screen snapshots displays the word tree generated by the “technology” query. The figure shows the results as a tree with branches representing outcomes from the interview data within the context of technology in which the word/phrase occurs. In another example of applying the descriptive coding skill, Figure 27 shows another association by running a text search query of “top”; it is to identify the relationship between “top management” and words/phrases in the organisational context.

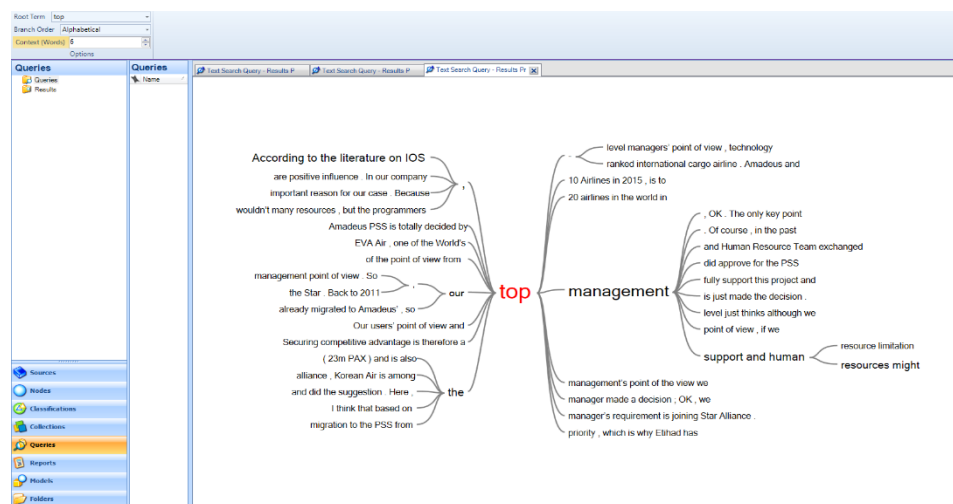


Figure 27. Screenshot of NVivo in Descriptive Coding – Top Management Factor

As the third example of descriptive coding, Figure 28 helps us see a specific relationship between “global” (related to HRO) and numerous words and/or phrases within secondary data in terms of PSS adoption in the context of environment. For instance, this research initially extracted the first passage of Air Lynx coded ‘revenue optimisation’ and ‘yield maximisation’ from the newspaper accounts concerning the value of revenue management package within the Air Lepus PSS to compose a detailed inventory of the case and then to attempt to construct causal narratives explaining the background of PSS adoption in the next coding phase (see Table 11).

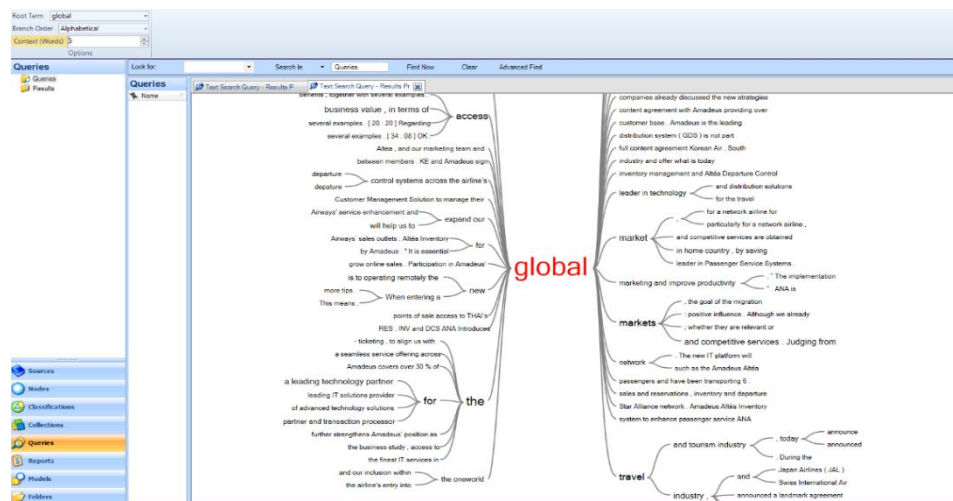


Figure 28. Screenshot of NVivo in Descriptive Coding – HRO-related Factor

Subsequent to the identification of themes through the initial coding process, causation coding is carried out to stipulate a chain of cause-effect patterns before moving on to pattern matching to test rival explanations by pattern coding in the Second Cycle of coding. Prior to the next cycle coding, many descriptive codes were ruled out in case they were out of the research scope.

Table 11. Examples of Descriptive Codes in the Newspapers Accounts Excerpt

Entity	Factors/Results	Codes
Air Lynx	<i>Air Lynx signed a contract with ComPozzer to introduce its international flight reservation, inventory and departure control systems across the airline's global network. The OrcheStra suite will automate Air Lynx entire customer management process; streamlining the passenger travel experience from beginning to end whilst also simplifying check-in. Transition to the system forms part of Lynx's strategy to globalize its operations, further improving passenger services and reducing overall IT costs.</i>	<ul style="list-style-type: none"> > international route > global network > customer-focused > seamless services > streamlined processing > service improvement > IT cost reduction
Air Libra	<i>ComPozzer's OrcheStra will support Air Libra's growth strategy by enhancing customer service and driving more efficient business operations. As an alliance carrier, Air Libra will use the OrcheStra suite to enhance interconnectivity and information-sharing between partner airlines, enabling the airline to deliver a smooth and seamless travel experience to its customers.</i>	<ul style="list-style-type: none"> > services enhancement > efficient operations > alliance airlines > interoperability > information-sharing > seamless travel experience

Air Lepus	<p>Greater automation and optimised revenues through proven state-of-the-art algorithms will enable Air Lepus to maximise route yield and overall profitability to the more than 50 cities the carrier services. The new system, which is aimed at supporting the airline's international expansion, will also provide Air Lepus with real-time data from multiple sources, enabling it to more accurately price its packages, offers and ancillary sales.</p>	> revenue optimisation
		> overall profitability
		> global expansion
		> accurate pricing
		> ancillary sales

5.3.2.3 Causation coding

In this study, causation coding is applied during the First Cycle coding process to extract causal beliefs from data and show why and how particular outcomes occurred; the coding skill is considered to be effective when qualitative researchers produce lists of antecedent and mediating variables and their outcomes to display their work together with a causal map/network. In response to verbal expressions during the interview and non-verbal motions/signals, rating or scaling the variables (e.g. positive {+}, negative {−} and intensive {++}/{−−}) that may be eligible for inclusion in event-state network displays also makes explanations more powerful. The process extracts three elements of an attribution as: the cause, the outcome and the link between the cause and the outcome/effect, thereby attempting to map a three-part process in sequence as: CODE 1 (antecedent variables) > CODE 2 (mediating variables) > CODE 3 (impacts/consequences). The method should not necessarily be considered a foolproof algorithm for deducing ‘correct’ answers but for hypothesising about plausible reasons or potential outcomes from particular causes (Miles et al., 2014).

5.3.3 Coding skills in data analysis for the Second Cycle

Pattern coding, as a Second Cycle method, follows to collate codes based on similarity in the Second Cycle and make connections and relationships across tree nodes (see Figure 29 as an example regarding ‘top management’). Pattern coding is also a way of grouping summaries into categories, themes and contexts (Miles et al., 2014), constructing a sort

of meta code to identify similar coded datum. As discussed in Chapter 4, this coding skill is involved at the final point to pattern the codes and explain the flow of events and states over cross-case observations to see, for instance, in what way the factors influenced PSS adoption and how such outcomes and business value from PSS came about across the three different airlines. In this study, pattern codes containing actions, situations and processes with effects from causes are produced by chasing keywords, connecting words (e.g. because, that's why, the reason, and so on) or meaning in multi-directional cause-and-effect¹⁹, and then examining patterns of relationships (for instance, the industry standards are key drivers behind ...; because it was impossible to develop all requirements at a single airline ...; So, we reported to our top manager ...). This coding is particularly useful for multi-case studies, in helping qualitative researchers elaborate a cognitive map and surface common contexts and directional processes (Miles et al., 2014).

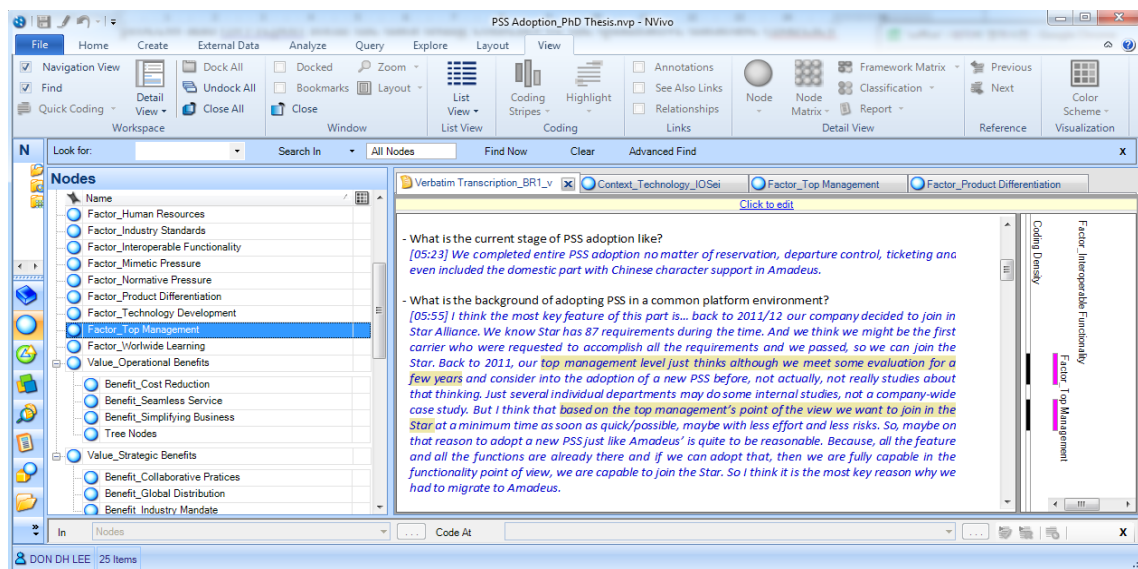


Figure 29. Screenshot of NVivo Presenting Tree Nodes used in this Study

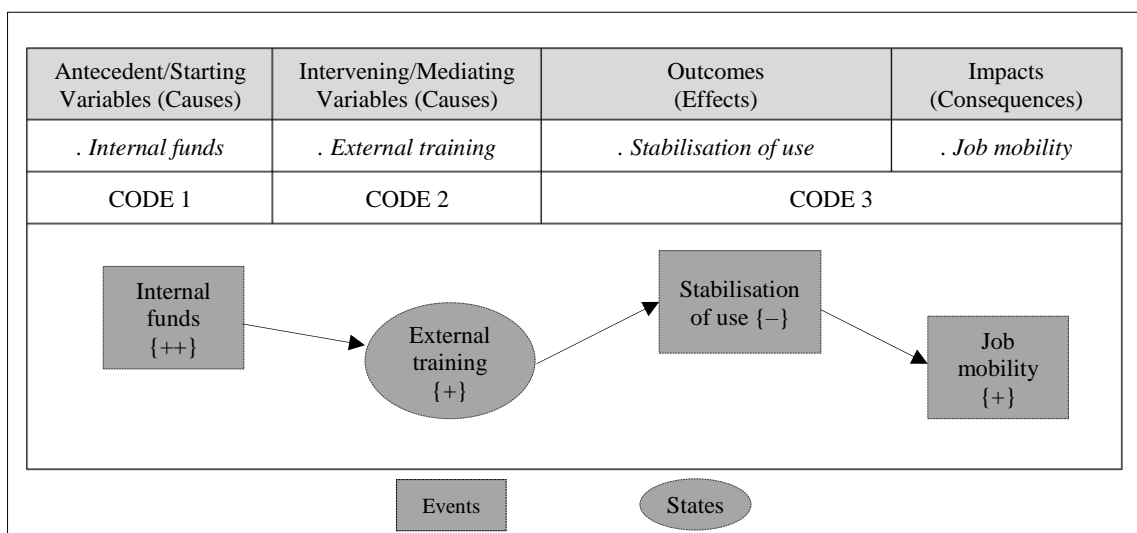
¹⁹ In explaining causation, 'cause-and-effect' is widely used in qualitative case study research when a causal link is linear whereas networked or interwoven causal displays illustrate qualitative 'influences-and-affects'. (Miles et al., 2014; Saldaña, 2003).

5.4 Methods of Explaining and Displaying Data

As discussed briefly in Section 3.6 and Section 4.3.3.1, this research uses visual representations and the causal network display in seeking to provide a more effective and detailed explanation. The adoption of IOS has been characterised by IS researchers and practitioners as an ongoing process performed in a specific period of time. As such, IS scholars commonly understand IOS adoption to be ‘a process’ by which an IT solution is implemented to the users in an organisation, whereas IT scientists and software engineers generally understand IS adoption to mean the introduction of software; many qualitative IS studies, therefore, utilise ‘the process’ of IOS adoption to explain how and/or why specific factors in the adoption of IOS have an influence, how such factors within particular contexts interact between them, and how IOS impacts adopters on business or services (Kim & Pan, 2006; Markus, 2014). IOS adoption can be understood as a social action as well as a dynamic phenomenon to use a specific cross-organisational IS through the social interactions of multiple actors, stakeholders and partners within many related social environments (Kim & Pan, 2006). Against this background, the aforementioned three-phases of PSS adoption in the study—decision making, resource allocation and full conversion—is based on the IS adoption process in organisations. To ensure the rigour of a qualitative case study in IS, a process perspective provides this study with a framework for various explanations of PSS adoption at a deeper level within three key contexts.

Bourgeois (2014, p. 8) argues that, as a core component of IS, “a process is a series of steps undertaken to achieve a desired outcome.” IT systems have become more and more integrated with organisational processes. Hence, processes should be visualised on a graphical map display, because they are more practical and interrelated in a phenomenon. To do this, process theory has been used to explain why and how expected outcomes are reached, in terms of IS adoption in particular (Kim & Pan, 2006). Drawing on the process

model, three meanings of the term ‘process’ under process theory are articulated as shown in Figure 30: (i) a sequence of events; (ii) a category of conceptual variables; and (iii) a logic of a causal relationship across variables (Miles et al., 2014; Van de Ven, 1992). The first approach is useful in tracking a particular event or state over time—an instance of social actions—while the second model understands a process as a structural feature that is considered an analytical convenience. In the third group, processes are identified as influential relationships among factors (e.g. events/states) in line with cognitive understanding of researchers. Cognitive mapping enables qualitative IS research to visualise narratives into processes. It enables the researcher to explain a set of influential processes among multiple factors and each influential link between any two factors, whether it is of positive or negative polarity. On this account, the present study adopts the cognitive mapping approach as a process model skill, developing influential relationships and interrelated factors within each of three TOE contexts, that lead to one of the outcomes in the PSS adoption phase.



Adopted from Miles et al. (2014)

Figure 30. Example of Process Model (Event-State Causal Display)

5.5 Summary of the Chapter

This chapter explained the data analysis strategy of this study, starting with a discussion on which a coding scheme is being conjugated within the study to analyse unstructured qualitative textual data in structured skills. It includes the deductive approach of content analysis, which is one of a cluster of methods that produce predetermined codes (preliminary matrix) based on previous knowledge prior to the interviews and pre-understanding of the cases using the volume of secondary data. In this sense, the chapter also clarifies the use of a qualitative data analysis software (QDAS) programme and focuses on a series of descriptions of a qualitative analytic process using multiple coding skills, known as eclectic coding, in the two cycles according to Miles et al. (2014): provisional coding (as a First Cycle method) for generating predetermined codes on the basis of literature review and the researcher's experience; descriptive coding (a First Cycle method) for producing themes and categories mainly from secondary data; causation coding (a First Cycle method) for testing cause-and-effect between factors; and pattern coding (a Second Cycle method) for undertaking a literal replication. Some coded examples and the related QDAS application screen captures are arranged for further understanding of the applied multiple analytic process. Chapter 5 also describes the skills in observing direction (i.e. positive or negative) as well as in intensifying data from the field note evidence and interviews. The final section briefly outlines the methods of explaining and displaying data in association with a cognitive mapping skill.

End of Chapter 5

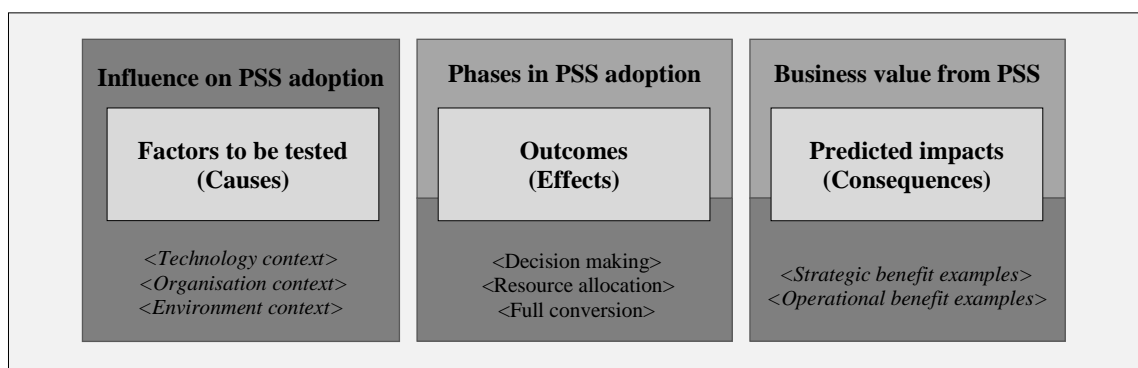
CHAPTER 6: CASE STUDY RESULTS

6.1 Outline of the Chapter

Chapter 6 presents and corroborates the results of three case studies based on the collected qualitative data. After the overview of case sites in Section 6.2, three subsequent sections in Section 6.3–6.6 present the findings analysed from multiple secondary data sources and eight respondents (six by interview and two by letter) with three East Asian air carriers that belong to the same airline alliance. Through such an embedded cross-case study with the allied airlines that adopted the same suite of PSS products, this chapter provides an in-depth explanation of the airlines' PSS adoption in response to the aforementioned research questions. A series of empirical findings are then reported. Firstly, each case is addressed in detail by writing case reports in textual and tabular format and quoting appropriate, meaningful statements of interview participants to add theoretical richness to the analysis. Secondly, the influential relationships among seminal factors in PSS adoption within the TOE context by focusing on why and how the airlines adopted PSS are discussed, followed by consideration of the impact of PSS after adoption. Thirdly, a group of cognitive visual maps and fishbone diagrams are presented for each case in a within-case form. As summarised in Tables 3–5 of Section 3.4, the selected variables are used to examine the phenomenon of PSS adoption and draw empirical evidence. Each non-linear causal mechanism is articulated through the refinement of analysed themes and causal relations, and then described events and states in the adoption of PSS in the TOE contexts of IOS adoption and HRO. After that, this chapter teases out the multi-directional causal links into a single event-state causal network within each TOE context (see Figure 37–39/43–45/49–51). Across the following sections, assumed names are used for the interviewees as well as the organisations across the cases to maintain confidentiality as agreed with the informants and their organisations.

6.2 Logical Process of Embedded Case Study

A dearth of existing empirical evidence on PSS adoption in the airline industry prompts this IT practitioner/researcher to conduct a multiple case study in a qualitative embedded method to potentially derive a generalisable explanation. In this embedded case study, this researcher presents the causal mechanisms by which PSS adoption took place within these cases and so answers why, how- and what-based research questions in line with the presentation format shown in Figure 31.

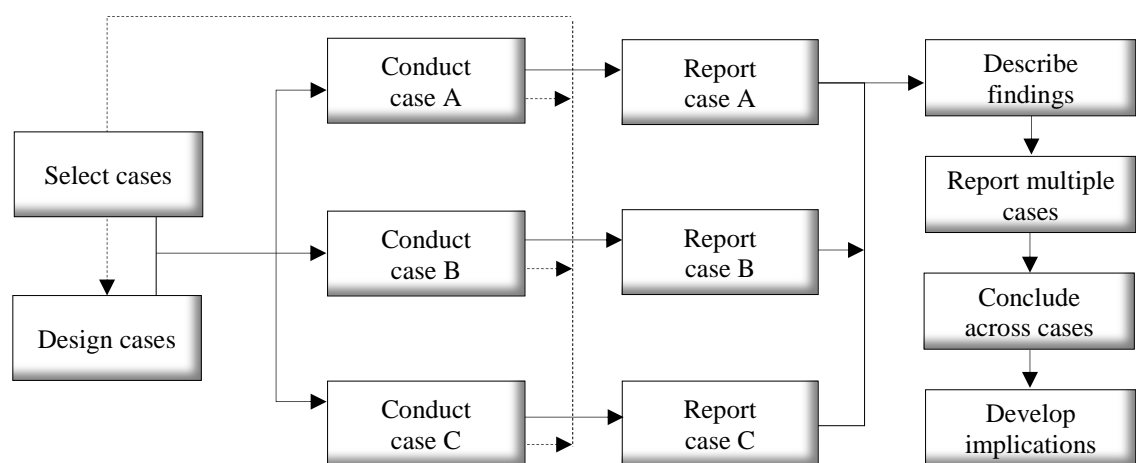


Adopted from Banalieva & Dhanaraj (2013); Miles et al. (2014); Robey (2007); Vaidya (2012)

Figure 31. Presentation Format of the PSS Adoption Case Findings

This research (i) analyses adoption factors (causes) based on IOS adoption and HRO in airlines within the TOE context, (ii) identifies outcomes (effects), which are pre-defined in a chain of adoption event (i.e. decision making; resource allocation; and full conversion), (iii) unfolds impacts (consequences) as business value resulting from PSS both on the strategic and operational levels, and (iv) outlines the causal influences (multi-directional cause-and-effect) in a narrative and causal network, and factual results—outcomes (i.e. adoption in phases) and impacts (i.e. business value)—from the influential factors. As deductive explanatory research, it provides a discussion of each case by adding related knowledge derived from the literature. Within each case, this study continues to present the following subsections, then, it discusses what is similar and what is different

across the cases. PSS adoption within the three target companies is addressed in 6.4–6.6, drawing on the evidence from retrospective empirical data; the identity and information about key informants and their organisations are treated with confidentiality under the agreement reached between the participating firms and the researcher. IS case study research on organisation-level phenomena and IT systems requires a within-case explanation on the story of each site to reveal the unique characteristics of organisations (Myers & Avison, 2002). Each individual case study within an embedded multi-case study consists of “a whole story” and its conclusions alongside facts are illustrated to be the information-rich replication by other individual cases (Yin, 2009, p. 56). Therefore, each of three subcases in 6.4–6.6 provides in-depth analysis within an individual case, and then multiple cases offer generalised findings, inferences and implications with replication logic in the next chapter. This study follows the general procedure suggested by Yin (2009) in Figure 32; after selecting and designing cases, it conducts each case and then reports each of the cases, followed by four key tasks, including a description of the findings, a report of the multiple cases, a conclusion across the cases and a summary of implications.



(Not in calendar sequence)

Source: Yin (2009, p. 57)

Figure 32. An Embedded Case Study Logic

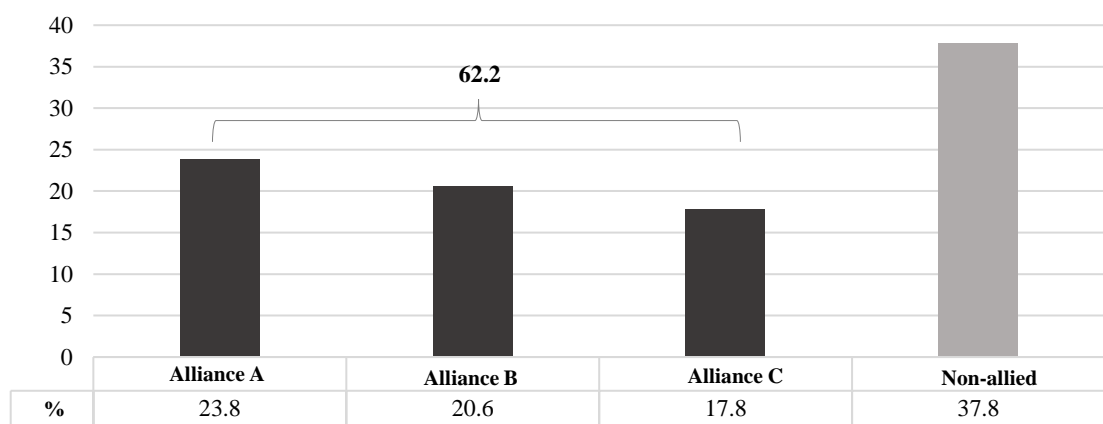
6.3 The Case Study Background

The following two sub-sections introduce an airline alliance (i.e. Vision Alliance, a disguised name) to which three East Asian airlines commonly belong as incumbent members, together with a snapshot of the PSS product (i.e. OrcheStra in the study) that is concurrently used by the airlines as the Vision Alliance's common platform. As far as an 'embedded' multi-case design is applied to this study, understanding the alliance body and the PSS suite is meaningful.

6.3.1 Business nature of the passenger service systems

Since the early 2000s, GAAs have dominated the passenger airline industry with the leading commercial carriers in each location belonging to strategic alliance groupings (Iatrou & Alamdari, 2005). According to Tugores-García (2012, p. 16), strategic alliances are “bilateral or multilateral agreements in which the allied airlines share similar business objectives and they coordinate their services to achieve their common goals”, focusing on the operation of a common brand, standardised ground services and shared facilities (e.g. common IT infrastructure and shared check-in kiosks) to identify the member airlines that are in the alliance. Today, there are three dominant GAAs in the world. Based on revenue passenger kilometres (RPK), the total market share of the 'Big 3' alliances reached 62.2 per cent in 2017 (see Figure 33). Between their intercontinental hub airports, the allied airlines have significantly increased traffic volume (Tugores-García, 2012). Vision Alliance is one of the three existing GAAs with a global reach. The GAA was launched by two mega carriers in North America, two major European airline companies and one leading Asian air carrier. Combined with an aggressive expansion towards six continents, the alliance comprises 27 member airlines in 2018, including the members' affiliates (e.g. regional airlines and express carriers).

Serving the passengers of each of its airlines to a high standard on a global scale is at the centre of the Vision Alliance’s strategy. Moreover, the airline alliance has been clearing the way to better align their complex back-end IT systems with rapid changing technologies such as digitalisation of airline services and travel products; a typical example of this technological evolution is the joint development of a PSS solution to be used as its ‘common platform’ (Briody, 2004; Silva, 2012).



Source: Leading Global Airline Alliances – Vision Alliance (2018) [Unit: % by RPK, as of 2017]

Figure 33. Market Share of Airlines in Alliances vs. Non-allied Airlines

As shown in Figure 34, the platform in airline distribution and passenger services is designed to provide the alliance partners with seamless handling in ground services (ranging from booking to baggage handling at the global level) and connectivity in partnership (covering from interline to transfer across partners) in a single IT system within a common-use environment. As aforementioned in Chapter 2, the Vision Alliance’s PSS as its common platform includes seven core application modules (i.e. reservation systems, inventory systems, departure control systems, distribution channels, alliance compliance applications, online sales products and other solutions) that function as a collection of building blocks within the platform, in conjunction with a shared data

repository and a single interface for data exchanges between the adopters of the PSS.

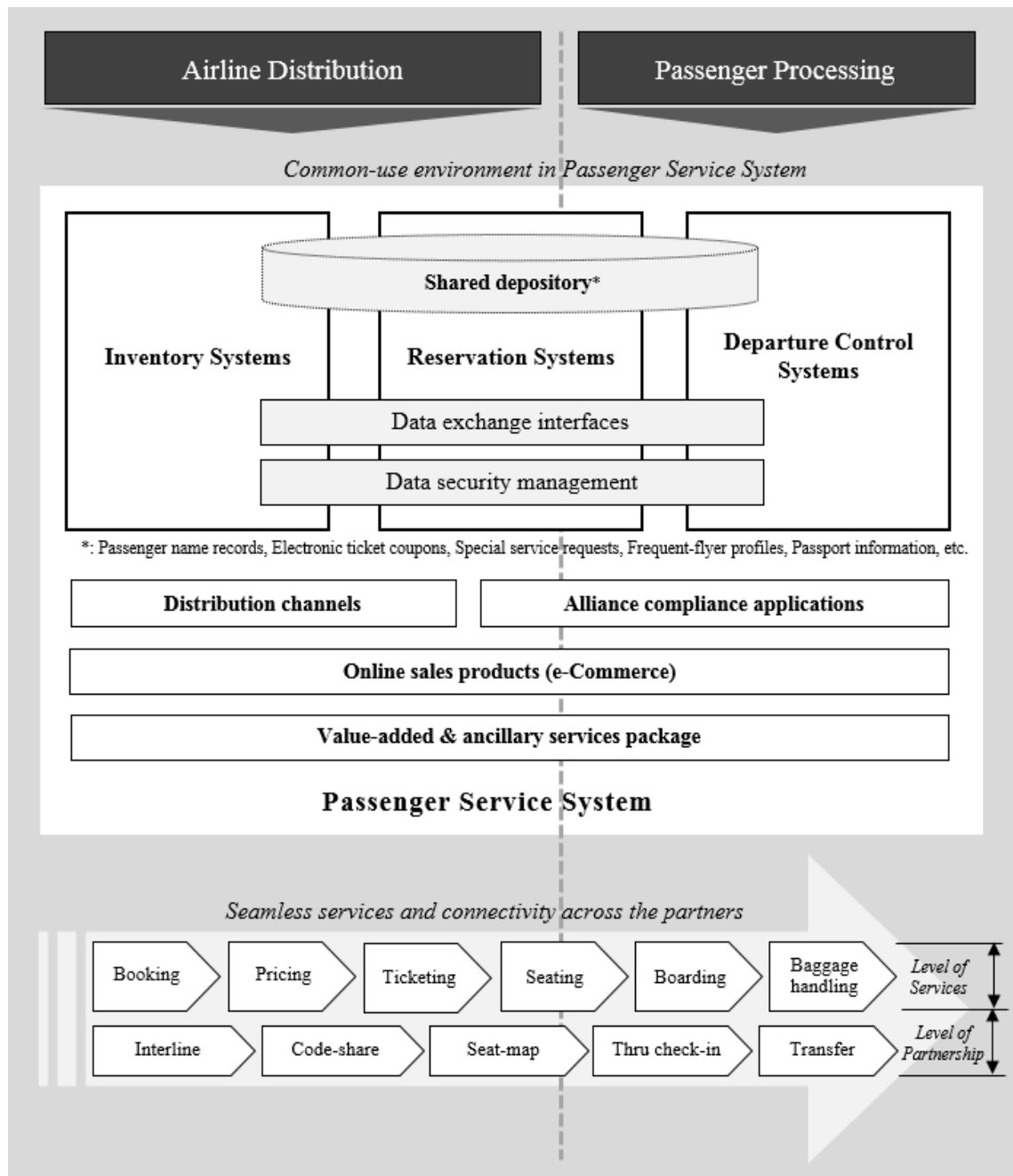


Figure 34. Research Scope on Passenger Service Systems within the Case

6.3.2 Target airlines within the alliance

Among the three case study participants (Air Lynx/ALX, Air Libra/ALB and Air Lepus/ALP), there have existed close relationships, identified by the researcher who

worked in the international airline industry. Within Vision Alliance, ALX, ALB and ALP are well known as exemplary member airlines demonstrating a close mutual sponsorship. In the airline business and in IT system operations, a GAA is generally considered to be an open, collective system in the airline industry that interacts with the environment that the alliance is embedded in (Tugores-García, 2012). Therefore, when it comes to recruiting a new alliance carrier, one of the current members sponsors a prospective member as a mentor airline in most cases (Silva, 2012). After Air Lynx, Air Libra and Air Lepus joined the Vision Alliance in the 2000s–2010s, strong inter-organisational collaboration across the three East Asian airlines was formed when they as the alliance members started a long commercial discussion on the PSS adoption with Vision Alliance and a preferred PSS vendor. A series of mutual exchanges of up-to-date information about their PSS exercises drew considerable attention to this case study researcher in selecting the most relevant target organisations for the data collection. By referring to each of the airlines' websites, Table 12 lists the participating airlines involved in this case study and their brief organisation profiles at the international and domestic transport level.

Table 12. Facts and Figures of the Case Study Participants

Company	Head office	Business model	Home region	Operation size (as of 2017)	Revenue (Fiscal year 2017)
Air Lynx (ALX)	Tokyo, Japan		East Asia (Japan-China)	22 countries 62 airports 84.6B Passenger/Km (Domestic: 47%)	US\$ 16.3B
Air Libra (ALB)	Seoul, Korea	Full-service carrier (Traditional network airline)	East Asia (Korea- Japan/China)	23 countries 75 airports 40.2B Passenger/Km (Domestic: 6%)	US\$ 5.12B
Air Lepus (ALP)	Taoyuan, Taiwan		East Asia (Taiwan- China/Japan)	18 countries 57 airports 40.9B Passenger/Km (Domestic: 16%)	US\$ 3.31B

* PSS that the three airlines adopted: OrcheStra (Provider: ComPozer)

* GAA that the three airlines belonged to: Vision Alliance

* Three carriers commonly operate regional airlines subsidiaries.

The facts and figures show that, while the business model commonly appears to be a full-service carrier (also known as a traditional network carrier) based in the same regional market, the size of their air network (i.e. the number of destinations) and the size of revenue sales in the segment illustrate the similarity of the target airlines, while Air Lynx has a relatively huge share of the domestic market.

6.4 Subcase A: Air Lynx – Japan

The first case study participant is a Japanese international carrier, Air Lynx (ALX), which is one of the world's most awarded airlines recognising its role as a leading air travel service innovator in the East Asia region. Within ALX, IT/IS has played an important role in not only expanding their distribution network, but also developing high quality service offerings.

6.4.1 Snapshot of the company

Air Lynx provides commercial scheduled and non-scheduled air transportation services worldwide. The Japanese air carrier owns multiple subsidiaries including airline IT operation firms. The ALX airline group has been engaged in offering air travel services, ground transportation processing, distribution services, information systems and other airline-related activities since its foundation. Air Lynx is headquartered in Tokyo, Japan. The Japanese carrier also has its domestic sales offices in Tokyo, Osaka and other major cities throughout the nation, while operating international head offices in key points across Asian countries, in Europe and the United States. ALX operated 260 aircraft in 2017, including a dozen freighters, in 90 destinations worldwide, carrying about 42 million domestic passengers and 9.1 million international passengers per annum. Air Lynx started to expand as an international carrier in the mid-1980s, primarily covering the Asia-Pacific region. With strong organisational pressures for globalisation in air travel

and standardisation in IT services, the Japanese air transporter has pioneered in the global alliance arena. In a bid for international expansion in operations, the airline, under the powerful support of the alliance, signed a long-term contract for the adoption of PSS with a leading PSS service provider in the early-2010s. According to Wolf et al.'s study (2012) on HRO, home-region oriented multinational firms concentrate revenue sales on their home region in which the most assets and human resources are registered; as of December 2017, ALX's domestic routes account for 57% of their total revenue, while international operations occupy more than 50% of the routes from the East Asian region. The company currently employs about 40,000 people, and almost all of them are based in their home region, Japan and East Asia. ALX has only about 11% of its total workforce outside the home-region. Considering these business characteristics (i.e. sales, market share and resources operation), it is believed that Air Lynx is a typical home-region oriented firm; this was also confirmed by the interviewees in response to a question on its HRO tendency. Compared to 2013, the ratio of international passengers has increased by 33% and the share of international routes has also increased from 37% to 43%, while the number of domestic passengers has remained stagnant for the past three years. In addition, the number of passengers on long-haul routes for the Americas and Europe in 2016 accounted for 68%, more than two-thirds of all international passengers.

6.4.2 Snapshot of the product

Air Lynx is an early decision-maker within the Asian region. It is known that ALX will be implementing a full suite of PSS (see Figure 35). Its PSS would be able to (i) automate its entire customer management services, (ii) streamline the passenger travel experience from beginning to end and (iii) specifically simplify the rebooking or repricing process affected by disruption from the travellers' perspective. ALX's PSS consists of seven pivotal modules—three central sub systems, including passenger reservation, inventory

management and departure control, and four core subsystems combining air/non-air distribution channels (i.e. external connectivity), airline alliance applications, online sales software (i.e. e-commerce) and a set of value-added and ancillary packages. The role of ALX's PSS in airline distribution and passenger processing is only for their international transport services. To do this, the PSS provides a specific technological link with a dedicated domestic system and a middleware IT system for passenger sales and ground handling for pure domestic route travellers. Each module can be customised with add-on functions to drive maximum business value by paying additional usage fees. Together with the shared depository, the platform is designed to enable Air Lynx to engage in partnerships and harmonise customer data as common proprietary resources, offering seamless connectivity and closer integration with other PSS adopters (Benckendorff et al., 2014).

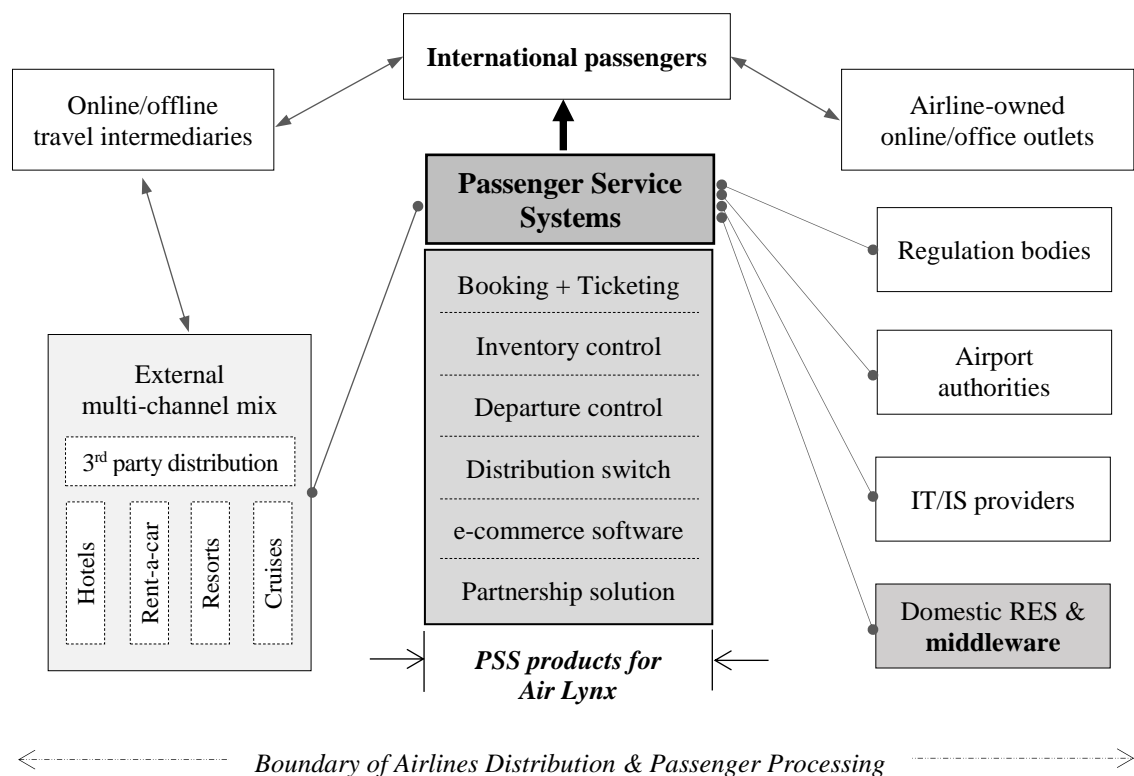


Figure 35. PSS Product Line and Architecture – Air Lynx

6.4.3 Progress of passenger service systems adoption

The simple chart in Figure 36 shows the actual milestones over time in a three-stage PSS adoption by Air Lynx. ALX decided to adopt PSS and then signed a contract with the PSS suite supplier in the early 2010s. The next year, the airline organised an enterprise-wide project office and then allocated necessary resources to the task force, followed by the preparation of data migration and six PSS subsystems implementation for three years; data migration was carried out to two separate domains: one migration to the domestic RES database and another to the PSS shared repository.



Figure 36. PSS Adoption Progress in Stages – Air Lynx

In 2015–2017, Air Lynx successfully completed a two-year full conversion process for implementing the ComPozer suite over its international bookings and passenger handling worldwide. As the important role members of Air Lynx’s Project Office, two key informants (see Table 13 and Appendix J) participated in interviews to explain their situation and reveal why the home-region oriented airline adopted the PSS and how the air transport company would generate business value after the adoption.

Table 13. Profiles of Key Informants – Air Lynx

Affiliated Unit/Department	Title/Person	Main Roles in PSS adoption
IT Innovation	Programme Director (PD, 1)	PSS project (IT resource management, 6 years)
Marketing & Sales	Deputy Programme Director (DPD, 1)	PSS project (End-user management, 8 years)

- Interview on 9 May 2016 (at a reception room in Air Lynx Headquarters)

For nearly two hours, the interview was made in the form of casual chat, which is a type of interactive conversation; both voluntary participants sit in company with this researcher (i.e. the interviewer), as answering the questions and exchanging experiences/views with the interviewer in a friendly atmosphere.

6.4.3.1 Technological context – Air Lynx

Our objective is to provide advanced technology solutions to Air Lynx and help the airline evolve in line with the changing needs of its passengers. (Vice President, ComPozer)

To explain Air Lynx's PSS adoption in the technological context, this section focuses on examining six influential factors within a causal relationship with ALX's adoption decision that are predicted as five positive and one negative variables.

***Interoperability* {+} & *Technology standards* {++}**: Interoperability and technology standards available on IOS provide adopting firms with improved capabilities for exchanging essential data from time to time (Robey et al., 2008). Relying on interoperable functions, different organisations can communicate closely together through a structured format in accordance with established information technology protocols (Roberts, 2015). Since Air Lynx had developed its own software programmes for data exchange and protocols, the Japanese airline had been troubled with fatal flaws in sharing large amounts of flight information and customer records with air transportation partners. Air Lynx Programme Director (PD) and Deputy Programme Director (DPD) commented:

For a long time, we were looking for more interoperable reservation systems to be a global airline *<interoperability> <global network: Organisation Context>*. We usually miss out the industry minimum requirements. For example, once we developed ourselves something new on code-sharing, we realised after going live it didn't work properly on the partner side, because we also ignored some technical standards setting *<technology standards>*.

Surprisingly, several times we had to do re-programming source codes from scratch. It was really hard work! (PD, IT Innovation/Air Lynx)

{Nodding his head} Our [PSS] adoption is for improving the usability of industry standards, because we saw there would be nothing more important than the future airline IT <technology standards>. That's why we wanted PSS. So, our company was very positive, when we made [a] decision on the adoption <decision making>. (DPD, Marketing & Sales/Air Lynx)

These statements offer a causal prediction that ALX's decision making initially stemmed from two requirements, *interoperability* and *technology standards*. *Interoperability* in airline distribution becomes essential, if the goal is to create and sustain a *global network*. Seen from the interview responses, the adoption decision was more strongly influenced by *technology standards*.

IATA mandates {+}: International carriers do not operate alone; they must interact with trading partners, payment processing firms, travel agents, aviation authorities and regulating bodies such as the IATA (Benckendorff et al., 2014). An interviewee explained:

Another reason is IATA mandates for us <*IATA mandates*>. Basically, international carriers sell air tickets according to IATA rules. ... Unlike small LCCs, big airlines should exchange more and more booking and ticketing data each other. However, we have faced technical problems, frequently! Because of [the] growing size of collaboration, IATA regulations change ... almost month by month. But, catching up those rules becomes more challenging for a single airline. (DPD, Marketing & Sales/Air Lynx)

At the industry level, business rules in airline distribution ought to comply with *IATA mandates* such as the IATA e-ticket campaign and ensure its technical readiness by the deadline. As the airline industry is highly regulated, IATA resolutions and new rules for IATA programmes (e.g. Simplifying Passenger Travel, New Distribution Capability)

address the diverse and complex needs in the aspect of airline operations (IATA, 2015). Therefore, on a single airline level, a correct implementation to address IATA regulations on reservation software becomes tougher and increasingly demanding, because such rules are frequently modified. Investment in resources was necessary to implement such requirements. Hence, it is predicted that more advanced compliance with IATA mandates as another antecedent factor on PSS positively influenced Air Lynx's decision making.

Common platform {++}/{-} & **Middleware** {+}: With a platform structure, PSS is designed to provide common functions in sales and passenger handling across airlines and process mass transactions within new interline standards; commonly-used services on PSS are enhanced module by module (Benckendorff et al., 2014). This means PSS adopters can safely and mutually use improved baseline functions, brand-new services and optional products for new flavours (e.g. branded fares, in-cabin pets) to cater for evolving business trends and institutional requirements (Iatrou & Oretti, 2007). The Programme Director mentioned:

Yes, our PSS is the industry-oriented common systems <common platform>. For any airline as the same PSS users, the functions inside can be equally processed in any airline of the sales side, online marketing side and the airport side. So, without fear, we just use them at any point of sales and any station of services, together with other airlines. It was very positive to our adoption decision <decision making>. (PD, IT Innovation/Air Lynx)

However, the participants did not forget to point out technical weaknesses of the platform:

On the contrary, a big issue from the common platform is ... it won't be easier than we think when we want something different technologies and functions for us <common platform>. Sometimes, we may go with something "unique", anything "not generic" to regional customers, when the Japanese

market and our customers ask [for]. So, we need another ... like a middleware <middleware> for Japanese! (PD, IT Innovation/Air Lynx)

The Deputy Programme Director elaborated about this key point as follows:

Yes, [going] international is OK. But, for the domestic part, all technology is common and [in] standard could be negative, pretty much ... So, what we will do is keeping only for us, because the Japan market is very competitive. [There are] so many flights and competitors here, including Shinkansen (the Japanese high-speed railway). So, currently, we are developing a middleware system as well to put Japan taste there <middleware>. Between PSS and our original RES to be converted as a domestic system, we hope it will run well. (DPD, Marketing & Sales/Air Lynx)

It is a significant benefit that PSS is a very powerful tool as a *common platform* jointly used by international airlines. On the other hand, the fact that some common business rules on the PSS could not fit all needs for local services became a major issue in the organisation. Thus, Air Lynx decided to separately develop a business *middleware* itself so that the airline can offer unique localised functionality that works on its domestic sales and local customer services.

Differentiation in technology {+}: On the other hand, Air Lynx has explicitly different directions to the international segments for the international passenger business, in terms of *differentiation in technology*. The development of new application software dealing with differentiated functions can be unique intangible assets, thereby enhancing global competitiveness for the local service-oriented companies (Banalieva & Dhanaraj, 2013; Curran & Thorpe, 2013). However, against the theoretical understandings, the two participants showed the following ideas on the PSS for international services:

We offer high quality services, and our company has IT skills. Actually, we are able to provide differentiated IT services to our users and customers.

However, it is unreasonable, from an operational viewpoint, to own complex business machines for the fast-changing international market <differentiation in technology>. We see it is not a trend. (DPD, Marketing & Sales/Air Lynx)

Our international business becomes more important. Fortunately, the quality of PSS is similar to we are looking at. We know even though our PSS is not high-tech behind, the fact is the ComPozer releases useful IT services in time to catch up market needs and trends. So, we are going to forget a differentiation in the international part <differentiation in technology>. Again, for domestic, we have a solution. (PD, IT Innovation/Air Lynx)

The above statements explaining causal influences of the six contextual critical factors within the technology towards PSS adoption decision making can be represented in a map of the influential relationships (see Figure 37).

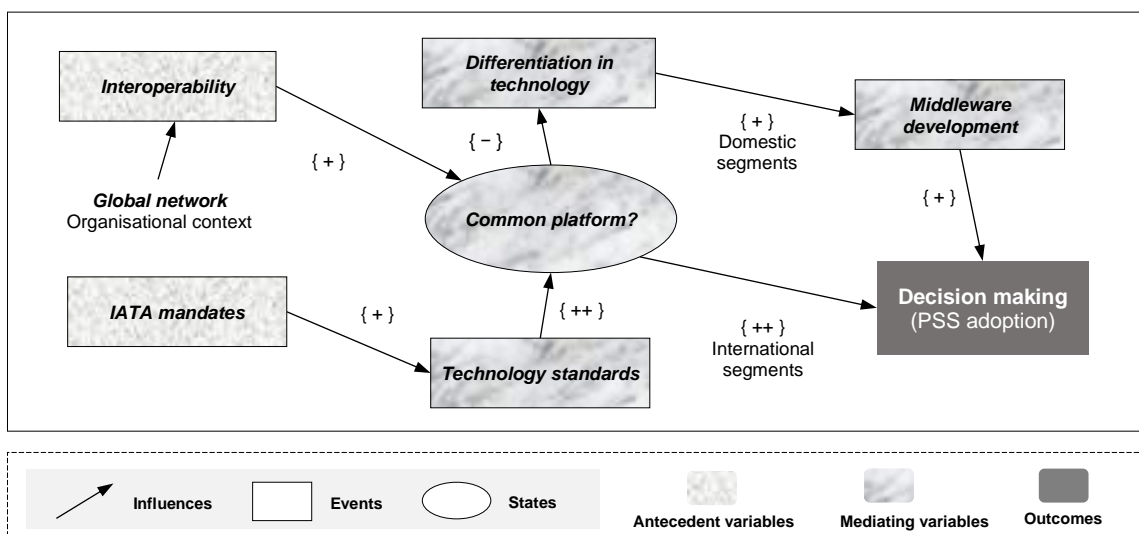


Figure 37. Event-State Causal Display: Technology Factors – Air Lynx

To recap, ALX demonstrated a unique example (as identified when the PD made mention of *Common platform & Middleware*) with the double-sided plan in adopting PSS for the international market and continuing its existing RES for local services, instead of consolidating two different businesses in the PSS. Under Air Lynx's premise, there would also be a business system as middleware supporting local requirements and connecting

two heterogeneous systems. In PSS adoption for this home-region oriented airline, the findings on differentiation in technology need a separate explanation from a firm's global orientation strategy in the technological context of HRO. Under the common-use technology environment, a middleware solution is a viable way for Air Lynx to link the domestic business where local competitiveness is intensive.

6.4.3.2 Organisational context – Air Lynx

We are convinced that the ComPozer suite will help us to expand our global marketing and improve productivity. (Executive Vice President, Air Lynx)

Within the context of organisation, this section examines seven organisational variables, including an inter-organisational one, that positively influenced decision making and resource allocation within the adoption stage.

Global network {++} & ***Strategic partnership*** {+}: The airline industry is known to be labour intensive, where the efficient management of the professional employees in organisations is important (Benckendorff et al., 2014). In making a *global network*, the backbone of interlining between *strategic partners* is how each airline engages the right experts in an airline to improve efficiency and productivity within the allowed human resource (Buhalis, 2004). Both participants talked about Air Lynx's stories in this context:

To be a leading international player, we must accomplish a global expansion of the sales network with partners <*global network*>. It is a must to do! When fellow alliance airlines adopted PSS in row and then distributed more code-share flights and connection schedules <*strategic partnership*>, we were getting anxious. (DPD, Marketing & Sales/Air Lynx)

Also, a strong co-operation with close partners needs a right system and right people <*strategic partnership*>. For these, before allocating our experienced employees in a right place <*resource allocation*>, adopting a right PSS was

our priority. And then, we placed right staff doing more joint initiatives together with our partners. (PD, PSS Programme Management/Air Lynx)

International travellers benefit a great deal from combined alliance networks, as they can fly to more destinations, with shorter connecting times and higher connection frequencies. To be able to coordinate their flight availability, carriers need jointly set schedules and fares in a single system. Multiple functions in exchanging schedules that PSS is able to serve range from optimisation of the interline schedules to instant changes of their arrival/departure times; these factors influenced Air Lynx's decision on adoption.

Cost in IS operation {+} & Organisational transformation {-}/{+}: Air Lynx had been suffering from high-level costs related to systems operation and IT resources.

And also, {with a hand motion}, we had to find a way of enhancing internal productivity between IT and the business [sides]. This is important that we must save huge IT costs. We have paid a lot for our systems operation <*Cost in IS operation*>. (PD, PSS Programme Management/Air Lynx)

The Programme Director continued in terms of the issue of organisational transformation:

Our [IT] unit would need changes and also trainings. We knew at the moment the platform would help us change our complex operation. With the common IT, necessarily we would need less IT people. Most agreed this is the way to go! But, changing an organisation was a different issue <*organisational transformation*>. (PD, PSS Programme Management/Air Lynx)

Under the ultimate goal of using a unified platform between airlines, one of the biggest advantages of having a reduced number of airline IT systems is lowered development costs (Iatrou & Oretti, 2007). From the director's comments, this case finds that cost reduction in IT development with a streamlined organisation was imperative as Air Lynx

adopted its PSS. It is predicted that these two factors, *cost in IS operation* and *organisational transformation* worked as challenging drivers at the organisational level.

***Organisational alignment* {+} & *Top management support* {++}**: In IS research, *top manager's support* and involvement in an organisation is commonly reported as a key factor for IOS adoption from the previous literature review. Similarly, in the case of Air Lynx, the PSS adoption was initiated by ALX management; however, there was a broad distinction in the procedure that the company went through. The participants mentioned:

Even though we agreed to organisational change, our company then also needed a formal alignment in an organisation, a kind of consensus *<organisational alignment>*. So, we made a proposal to our CEO and CIO, and they replied {Raise his voice} “OK, let’s take our people opinions first. Let’s hear their voices. Their ideas will tell us and then put a decision ... what to do and how to re-organise us.” *<top management support>* *<decision making>*. (DPD, Marketing & Sales/Air Lynx)

Organisational readiness and a leadership that encourages internal transformation are major factors in the successful adoption of a PSS (Källström, 2005); however, this interview offers a different insight from that prior study with a European airline.

Because of a matter of IT, it isn’t easy to do the things like, our management attempted to push ahead a corporate change. Because no one likes the shift, and many people want to stay without any transformation {Smile}. So, our CEO and CIO wanted to achieve a consensus *<top management support>*. It is our tradition. (PD, PSS Programme Management/Air Lynx)

All our voices were reported to our top managers *<top management support>*. As a result, our opinion, “In this opportunity, let’s change!” outnumbered. Fortunately, after our initial operation, the staff sitting the other side before appeared to agree as well that it was a right decision *<decision making>*.

Later, they started showing a fast-performing and producing an improvement with the new system. (DPD, Marketing & Sales/Air Lynx)

As in Baker's (2012) study on the introduction of enterprise-wide IOS, Air Lynx was determined by top management in decision making, but in the subsequent process, the point that the airline had an organisational consensus around its staff members is different from the other international airline cases.

Expert training {+}: Vaidya (2008) discovered that sufficient training on an individual level is an effective incentive for the introduction of advanced IOS, which requires high professionalism, and Robey et al. (2008) also discussed the importance of systematic education and training for organisational assimilation in line with IOS adoption. The two directors shared their experience with the researcher as follows:

We found IT people lacked business mind and communication skills, I mean English-speaking ability ... However, we could see the people from IT would like to do a technical duty regarding the common platform usage. So, we interviewed one by one and trained each candidate who wanted to be a PSS lecturer and a kind of business-IT coordinator. <Expert training>. (DPD, Marketing & Sales /Air Lynx)

In fact, our company does not have a large pool of human resources, much smaller than other big airlines. After a decision was made, we started to run concrete training programmes with the project core teams and HR side from time to time ... how to utilise each talent and develop individual skills <Expert training>, talking about who moves in and out <resource allocation>. (PD, PSS Programme Management/Air Lynx)

As Figure 38 shows, on the whole, these factors turned out to be positively inclined towards ALX's PSS adoption in terms of decision making and resource allocation. Cross-functional business tools in PSS were used to make the airline's network global together

with its partners, by creating more code-share and connection flights to make the airline's operation seamless. A series of coalitions to achieve a global network and a strategic partnership in an international airline encompasses the common initiatives that should be carried out in a collaboration.

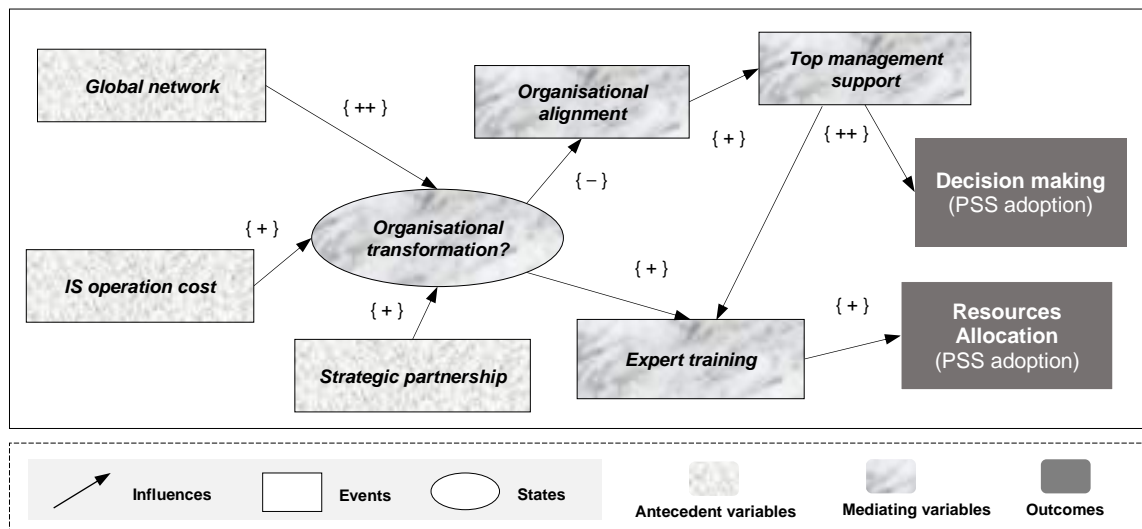


Figure 38. Event-State Causal Display: Organisation Factors – Air Lynx

In decision making and resource allocation, the Japanese airline group mobilised a series of communications, based on their corporate tradition, between the management members and the project teams as well as individuals to reduce IT costs, and it transformed its organisation to where each employee could contribute. Air Lynx underwent a company-wide settlement process before/after the thorough discussions on allocating human resources. Prior to the decision being made by the CEO, organisational alignment and individual training were also promoted after discussions, followed by well-organised corporate training programmes.

6.4.3.3 Environmental context – Air Lynx

Air Lynx will contribute to expanding global marketing and improving linkage services with members. (Vice President, Vision Alliance)

In this section, as key environmental variables, six possible factors, mainly related to institutional isomorphic forces (i.e. mimetic, coercive and normative pressures) and the competitive global environment in airlines, are suggested to explain the cause of a move to full conversion in ALX's PSS adoption.

Mimetic pressure {++} & ***Normative pressure*** {+}: In adopting an IOS, managers in an organisation tend to show an entrepreneurial spirit that responds aggressively to institutional forces (Robey et al., 2008). According to circumstances, *mimetic/imitative pressure* (i.e. relation power) and normative pressure (i.e. market power) are more sensitive to governmental mandates (DiMaggio & Powell, 1991). In response to tight competition and strategic changes in the international airline business, full conversion to PSS was influenced by these external environmental factors. The interviewees replied:

Initially, whether or not domestic competitors select PSS, our company has a big concern about their actions <*mimetic pressure*>. We really care about our competitors in Japan. Especially, we were wondering whether their PSS could lower IT operation cost and distribute more competitive services than our old RES [can do]. So, we decided to go with PSS so that we could stay competitive <decision making>. (DPD, Marketing & Sales/Air Lynx)

After the Deputy Director's remarks, his senior colleague commented further as follows:

In Japan, any cost factor is important. As for the cost reduction, we felt a big pressure against a domestic competitor's practice whenever hearing the update ... they are finding a way of cost cutting for system maintenance <*mimetic pressure*>. (PD, PSS Programme Management/Air Lynx)

As market uncertainty increases in the face of deepening collaboration and competition, the aviation industry is keenly aware of institutional arrangements in the same marketplace (Merten, 2008). In addition, Air Lynx was more sensitive to *normative*

externalities of the alliance and the PSS service vendor. The Deputy Director with the Marketing & Sales unit addressed this as follows:

There was another reason for speedy cut-over. We're the last airline in the region and the alliance [that] decided to go with the common IT. Whenever fellow airlines adopted this PSS, we're pressed by our vendor <*normative pressure*>, because they let us know what's happening! I'd say market pressure was big, from the vendor. (DPD, Marketing & Sales/Air Lynx)

Since the 1990s, airlines have focused on linking more dense connections to take advantage of route liberalisation and to address the threat posed by low-cost competitors. Thus, to connect the world with no gap, technological cooperation with airline alliances and IT vendors has become absolute, and PSS adopters within alliances are able to play on an equal footing with their peers (Belobaba & Odoni, 2009; Källström, 2005). Air Lynx was no exception to normative forces in selecting PSS. However, coercive force as a kind of regulatory power was not significantly flagged by the interview. In the words of one Air Lynx interviewee:

No! From the authorities and [travel] associations around us, it wasn't there, not like a fifty-fifty. ... In East Asia, our review on the PSS products was rather late. So, there was few pressure[s] from the airports and other powers. (PD, PSS Programme Management/Air Lynx)

***Time-to-market* {+} & *Vendor support* {+}**: Since the mid-1990s, Japanese carriers began to improve time-based competitiveness through RES, thereby leveraging their strategic value chain and reducing product innovation cycle time with technology partners (Chatfield & Bjørn-Andersen, 1997). Support from technology vendors before the deadline of the market requirement allows airlines to increase competitive advantage due to shorter time-to-market. A respondent emphasised the importance of *time-to-market*:

Before the final adoption stage, we had to consider the element of time-to-market *<time-to-market>* *<full conversion>*, I mean a matter of timely technical support. This is critical for us to catch up something like superior services and business growth. ... Next, our PSS vendor was a good IT partner in that, initially we were anxious about ComPozer's support though. They offer ideas on business process change and new interline service forms as airline IT leader *<vendor support>*. Yes, their [timely support] capability was a positive factor. (PD, PSS Programme Management/Air Lynx)

Foreign operation from home region {+} & Mutual worldwide learning {+}: At the head-office level, an international firm develops absorptive capacity, on a remote basis, to acquire up-to-date information and intangible resources in relation to the regulations, institutions and knowledge of local countries and learn valuable skills created in a country from the home region (Banalieva & Dhanaraj, 2013). Both interview participants shared the following experiences and comments:

Absolutely! Foreign operations [from home region] through IT is a key factor *<foreign operation from home region>* as well. Air Lynx is a network carrier, and we are operating many long-haul routes and planning to open more. So, we need to exchange critical knowledge in different markets with many airlines and ... each partner's inside know-how in [term of] different regulations and market requirements around the world *<mutual worldwide learning>*. This factor was positive to our full cut-over *<full conversion>*. (PD, PSS Programme Management/Air Lynx)

He and the Deputy Programme Director continued in this topic, by taking an example.

For instance, business rules, immigration rules, flights flown, operational disruptions and so on, any time we can look up what's happening through the common IT database, and they can be our potential knowledge. All we have to do is our headquarters do research and conduct bench-marking by ourselves. This mean, not necessarily, we establish a costly branch in each market we will open up. (PD, PSS Programme Management/Air Lynx)

As my boss already told you, one option is [to] operate remotely new global market in home country. Our PSS is [a] useful information tool. We can gather global market trends in terms of schedule, fares, comfort, services and like that. So, to get foreign market operation bigger, worldwide learning is important. (DPD, Marketing & Sales/Air Lynx)

A causal relation with six influential factors towards decision making and full conversion within the environment context can be mapped in Figure 39. Air Lynx has been in intense competition with its domestic aviation market players and international airlines in Japan. This competitive force stimulated ALX's decision making in PSS adoption. However, coercive forces did not appear from the local authorities, while ComPozer fulfilled the role of supportive vendor in a full conversion; with the PSS vendor's strong support, the acceleration of time-to-market could be expected to lessen the normative forces from the market. The expectation of foreign operation from home region on a remote basis and mutual worldwide learning through the PSS would synergise its full conversion to PSS.

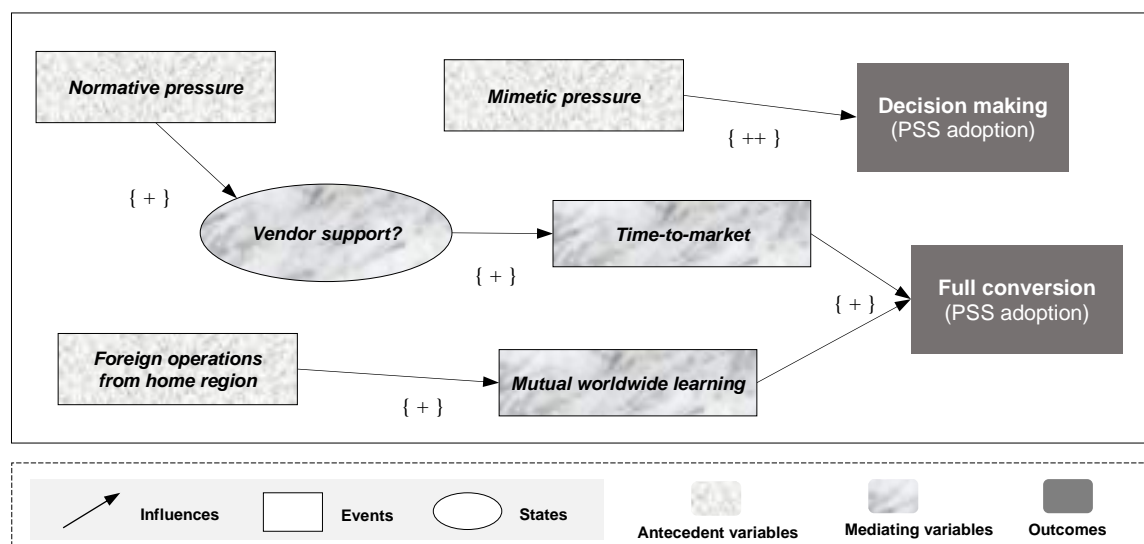


Figure 39. Event-State Causal Display: Environment Factors – Air Lynx

6.4.4 Expected impacts on business value

Our PSS adoption decision will help globalise the operation of the air network, reduce overall IT costs, and help improve productivity (Air Lynx, Executive Vice President).

Robey et al.'s work (2008) on the organisational consequences of IOS adoption and Källström's case study (2005) with a European airline on PSS value estimation classify the business value of IOS/PSS in terms of strategic and operational benefits. Strategic benefits mean the business impacts on organisations, including opening of new markets, developing new services and increasing market-level performance, and operational benefits refer to the operational impacts facilitating more efficient operations or more effective coordination structures (Robey et al., 2008). Air Lynx's business value is predicted as follows:

6.4.4.1 Strategic benefits – Air Lynx

According to media sources, Air Lynx expects to gain business value from PSS from 2017 after completing a full implementation of the PSS and phasing out its existing legacy systems for international segments; the airline was convinced that its PSS would facilitate globalisation of its airline operations, improve passenger services at the strategic level and strengthen its cooperation with other alliance members. The two interview participants explained in detail in terms of expected strategic benefits, giving several examples:

Global market & Competitive service

As our business case and internal studies analysed, using the platform our PSS task team thought unlimited access to the global market and the delivery of competitive services around the world [could] be more easily realised <wider access to the global market> <greater competitive services>. (PD, PSS Programme Management/Air Lynx)

Before the PSS, we could make an inter connectivity with other carriers. At that moment, however, whenever we did code-sharing before, we had to bilaterally reach a technical agreement and then ran a connection testing from A to Z. Now, on the same platform and as a PSS community member, we can

deliver more simultaneous allied connections and unlimited code-share flights <wider access to the global market: *simultaneous interlining; unlimited code-sharing*>. (DPD, Marketing & Sales/Air Lynx)

Also, we can sell more add-on, ancillary products and value-added items with partners. Linkage products would be a trend <greater competitive services: *up-selling; cross-selling*>. (PD, PSS Programme Management/Air Lynx)

Based on the explanation from the key informants, Air Lynx's key expected impacts on the strategic level of business value are predicted as wider access to global markets through unlimited code-sharing and greater competitive services by up-selling (ancillary) travel items and cross-selling (value-added) products together with ALX's interline/code-share carriers or non-air trading partners.

6.4.4.2 Operational benefits – Air Lynx

Air Lynx announced in 2011 that the PSS would introduce ALX's international flight reservation, inventory and departure control systems across the airline's global network to improve organisational productivity, drive a new efficient process and reduce operational costs. The Executive Vice President of Air Lynx mentioned in the press:

Efficient process

The new IT platform will automate all airport processes and streamline our passenger travel handling from beginning to end. Then, we can improve our efficiency. For example, the PSS suite can simplify the flight re-booking, re-seating processes, in a more productive way, for the passenger[s] affected by disruption <Higher efficient processes: *productive disruption control*>. Then, we will be able to re-book passengers on alternative flights and re-assign seats with the simple click of a button. (Executive Vice President/Air Lynx)

Disruptions in airlines are damaging events (e.g. punctuality issues and transportation errors) that may create losses and cause inconvenience to passengers, but also provide

airlines with learning opportunities at the organisational level to resolve disruption problems cross-functionally (Rapajic, 2016). Air Lynx has understood that disruption issues are critical obstacles to customer services and organisational productivity; however, the issues can be better controlled by a highly automated IT system such as PSS and system knowledge that the end users utilise using the platform. The Executive and an interviewee added:

The ComPozer Departure Control module is designed to handle most possible passenger process cases from check-in to disruption. We can find more hidden opportunities for efficient processing, as enhancing on-time performance <new efficient processes: *enhanced on-time operations*>. (Executive Vice President/Air Lynx)

In our [old] distribution channel, there were many discrepancies in complex data processing between alternative flights. Such technical problems caused disruptions at our international [airport] counters, in fact. No more we will see such terrible cases from now. It would be the significant operational benefits to us as we use the new system. (DPD, Marketing & Sales/Air Lynx)

The Air Lynx directors mentioned the feasibility of cost reduction by adopting PSS that replaces the existing legacy RES as follows:

Cost reduction

We expect PSS will [enable us to] decrease transaction costs and operating expenses, as we expand our global marketing <operation cost reduction: *transaction cost*>. (DPD, Marketing & Sales/Air Lynx)

I agree ...not sure much in a way, I mean, more or less. The PSS channel is highly compliant with the new standards, technically. So, we can save money leaking till now. However, it also depends on how we use maximumly the new channel, commercially. So far, we have kept an optimal level of distribution costs. Now, it is time to make more distribution saving [with

PSS]. For example, without paying additional fees, we can exchange more complex transaction data between airlines <operation cost reduction: *distribution fees*>. Then, we have to squeeze our idea how we can sell more. (PD, PSS Programme Management/Air Lynx)

In terms of IT cost reduction, the Programme Director commented in the end:

In an IT cost overall, we are sure to reduce the costs, annually a lot. So far, we [have] spent too much in maintaining our legacy system and old technologies <operation cost reduction: *overall IT costs*>. (PD, PSS Programme Management/Air Lynx)

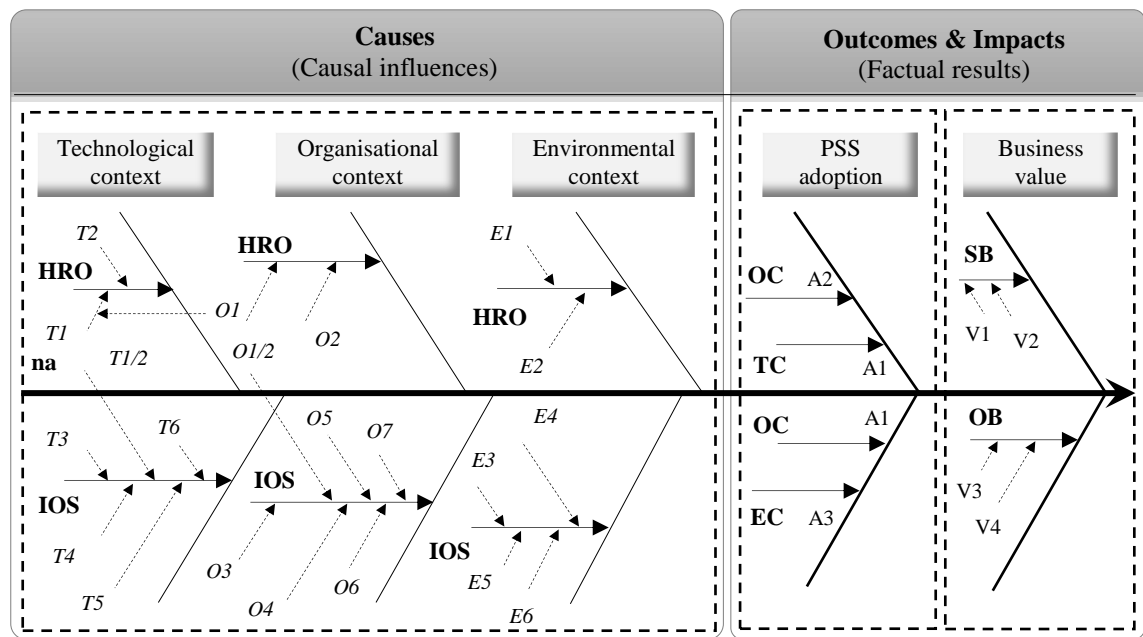
Judging from some of the press release sources and the interview conversations, these findings predict that Air Lynx will be able to improve internal efficiency and productivity and raise its operational efficiency with the full implementation of PSS over all its workplaces, while markedly lowering its operational and transaction costs, including overall IT maintenance expenditure and distribution fees. In particular, the airline will be capable of controlling disruption events and enhancing on-time performance by simplifying key processes of the disruption cross-functionally and resolving the disrupted situation in a simple process on PSS (see Table 14).

Table 14. Impacts on Business Value after PSS Adoption – Air Lynx

Expected strategic benefits	Expected operational benefits
<p>Wider access to the global market</p> <p>Achieved/obtained by:</p> <ul style="list-style-type: none"> - <i>Unlimited code-sharing</i> - <i>Allied interline connections</i> <p>Greater competitive services</p> <p>Achieve/obtained by:</p> <ul style="list-style-type: none"> - <i>Up-selling (add-on products)</i> - <i>Cross-selling (value-added products)</i> 	<p>Higher efficient processes</p> <p>Achieve/obtained by:</p> <ul style="list-style-type: none"> - <i>Productive disruption control</i> - <i>Enhanced on-time operations</i> <p>Operation cost reduction</p> <p>Achieve/obtained by:</p> <ul style="list-style-type: none"> - <i>Reduced distribution costs (long-term)</i> - <i>Lowered overall IT costs</i>

6.4.5 Causal influences and factual results

Based on the aforementioned findings on Air Lynx's PSS adoption, a visualised causal relationship between the adoption factors in the TOE context and three outcomes defined within the PSS adoption phase, as well as impacts on business value at the strategic benefit and operational level benefits, can be synthetically mapped in a fish-bone diagram as shown in Figure 40.



HRO: Home region-orientation **IOS:** Inter-organisational Systems

T1: IATA mandates, T2: Technology standards, T3: Interoperability, T4: Common platform

T5: Organisational alignment, T6: Middleware development

O1: Global network, O2: Strategic partnership, O3: IS operation cost, O4: Organisational transformation

O5: Organisational alignment, O6: Expert Training, O7: Top management support

E1: Foreign operations from home region, E2: Mutual worldwide learning, E3: Normative pressure

E4: Mimetic pressure, E5: Vendor support, E6: Time-to-market

TC: Technological context **OC:** Organisational context **EC:** Environmental context

A1: Decision making, A2: Resource allocation, A3: Full conversion

SB: Strategic level benefits **OB:** Operational level benefits

V1: Wider access to global market, V2: Greater competitive services, V3: Higher efficient processes

V4: Operation cost reduction

Figure 40. Fishbone Diagram: Adoption Factors and Business Value – Air Lynx

Positive characteristics that work as drivers to the adoption of PSS are described on the left side of the diagram. Collectively, these have one-directional influences on factual results on the right side—outcomes (i.e. three adoption phases) and impacts on business

value—while each of the technological, organisational and environmental factors, including a few negative variables, has a different influence on the adoption. In the diagram, theoretical sources and empirical backgrounds of the influential factors are also specified as IS (IOS) and IB (HRO) on the basis of the literature.

6.5 Subcase B: Air Libra – Korea, South

This subcase section illustrates the second case study on PSS adoption, undertaken by a South Korean airline, Air Libra (ALB). The Korean carrier is the winner of multiple prestigious awards from distinguished air transport magazines in recognition of its quality services and outstanding performance. Since its foundation, Air Libra has focused on technology-based airline operations in terms of passenger sales and services by launching RFID-tagged baggage identification, mobile booking services and self-check ticketing kiosks in the early and mid-2000's.

6.5.1 Snapshot of the company

Air Libra, based in Seoul, offers air transportation services in domestic and international routes from the Republic of Korea. From its inception of international services in the early 1990s, the airline has been deeply interested in strategic partnerships (e.g. codeshare agreements) even when global airline alliances were still in their infancy. A major leap ahead for Air Libra was made after it became a new member of one of the global alliance bodies. The airline's global network comprises more than 15 long-haul destinations and many regional destinations in East Asia, offering an alliance fare package called the "North Asia Circle Fare" with its multiple regional partners. The Korean air carrier also currently codeshares with 23 different carriers. With ten thousand employees, ALB currently operates a modern fleet of 71 aircraft for passenger transportation, covering 89 destinations in 24 countries and carrying nearly 20 million passengers. Air Libra is well-

known as a technology-leading airline providing its IT-savvy customers with the newest services such as RFID embedded bag tags, self-service ticketing kiosks and web/mobile check-in that were implemented in the early 2000s. The company's IT service unit developed technology on its own for the ALB website for online booking and application support for passenger-flight status. By selecting the Vision Alliance common platform, ALB expected to (i) have more advanced integration with its strategic partners in collaborative IT services, (ii) offer a more seamless experience across the alliance network and (iii) enhance its passenger management process. Similar to Air Lynx, Air Libra is also regarded as a home-region oriented firm with three regional head offices in East Asia, operating over 90% of their corporate resources within the home-region.

6.5.2 Snapshot of the product

After taking stock in a long-term review on a prospective PSS, in 2011, Air Libra decided to go with the ComPozer OrcheStra suite as shown in Figure 41, the Vision Alliance platform that would replace its legacy technology RES. Before selecting the ComPozer as its PSS, Air Libra had been self-managing an IBM mainframe-based RES, adopted from a British airline in the 1990s. After their review, Air Libra chose a full suite of ComPozer, including automated sales and reservations, inventory management, departure control, comprehensive distribution (i.e. direct/indirect channels and non-air content—hotels, car rental, and resorts) and partnership components. ALB was already an early adopter of ComPozer's e-commerce solution to quickly power its online shopping capabilities before making their decision on the broader PSS adoption. All elements in the complete PSS are based on passenger booking records, customer profiles, dynamic airline schedules (i.e. flight schedules that can be changed on a real-time basis), graphical seat maps (i.e. advanced seat maps that interactively return a seat status response in a graphic mode) and codeshare records. The common platform is also connected to highly

sophisticated internal facilities and external networks through standard communication schemes, including Application Programming Interface (API) over the Internet protocol.

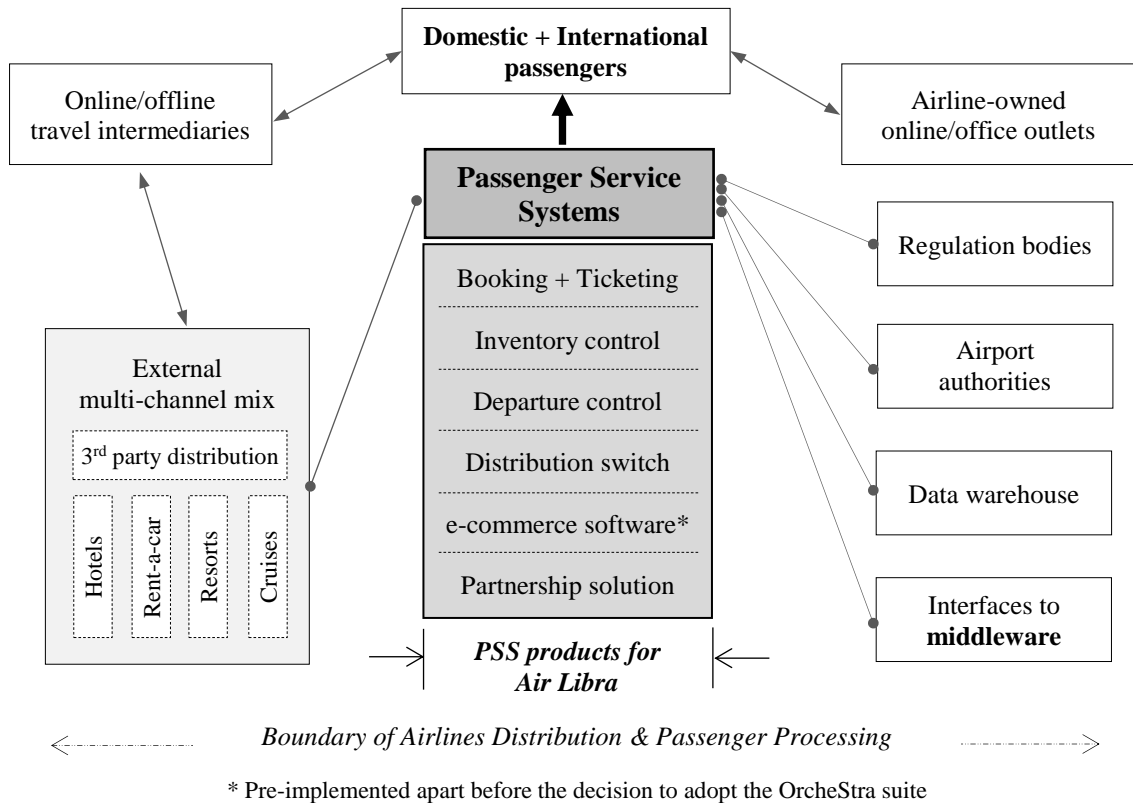


Figure 41. PSS Products Line and Architecture – Air Libra

6.5.3 Progress of passenger service systems adoption

Air Libra decided to adopt as its PSS the OrcheStra suite after a five-year review. After the initial conversion in November 2013, Air Libra became the first PSS adopter in the Korean market, fully deploying the PSS product in the domestic and international service outlets and all points of sale around the world by the end of 2015 (see Figure 42).

<u>Y2011</u>	<u>Y2012</u>	<u>Y2013</u>	<u>Y2015</u>
Decision making ▲	Resource allocation ▲	Initial cut-over ▲	Full conversion ▲
		* Domestic and hub airports	* Feeder route airports

Figure 42. PSS Adoption Progress in Stages – Air Libra

Air Libra adopted a package of the five main PSS modules in stages. With the organisational formation of a task force, it had started to allocate necessary resources from the year after the decision was made, including manpower, financial and technical resources for an initial implementation and a subsequent full conversion of the PSS solution in a step-wise manner: a big-bang (one-time) deployment of distribution software and ground handling products in all domestic airports and major international hubs, followed by a gradual cut-over to the departure control of regional airports on the feeder routes. This step was designed to minimise the risk of disruption in airline operations. From Air Libra, two key persons in charge of the PSS programme management office took part in on-site interviews on 20 May 2016. The interview was pre-arranged by invitation, and the interactive conversation was smoothly carried out in an informal atmosphere (at a business lounge for staff) at their offices. The single interview session was conducted on the basis of the prepared interview questions. Table 15 describes the interviewees and their roles in PSS adoption from Air Libra. At the time of the adoption process, their roles were cross-functional and involved managerial and operational issues concerning PSS-related IT planning.

Table 15. Profiles of Key Informants – Air Libra

Affiliated Unit/Department	Title/Person	Main Roles in PSS adoption
Passenger Business Division	Programme Director (PD, 1)	PSS business programme (Project management, 6 years)
Airline Operation Division	Deputy Manager (DM, 1)	Decision making support (Resource management, 4 years)

- Interview on 20 May 2016 (at a business lounge within the Air Libra facilities)

6.5.3.1 Technological context – Air Libra

Air Libra will facilitate inter-connectivity and information-sharing between partners and enhance the exchange of pertinent data. (Vice President, Vision Alliance)

This section tests seven technological factors multi-directionally influencing ALB's decision making, including two elements that showed negative effects on the adoption in the process of conducting the business case.

High quality data {++}: Given the high cost of airline operations, how much should air carriers invest in quality data within a limited IT budget? Quality of data refers to the state of completeness, consistency, accuracy, validity and timeliness of managed data (Rapajic, 2016); ensuring quality data in line with these essential elements has been a key to overall airline activities to lower the risk of disruptions, and the desired level of data quality might be a compromise between time and the cost associated with data processing across different applications. The Programme Director (PD) of Air Libra started talking over the past history about *high quality data* as follows:

Actually, many disruptions [have] broke [out], for 20 years, while we're using the past system. The old technology was poor, in data consistency, data accuracy, data links also. Initially, it wasn't a big deal. But, as messaging formats and exchanging rules were getting complex year by year, data discrepancy became a hot issue. A real problem was, between booking and seating data, between seating and boarding data and {raising his voice} between flight schedules in our system and external systems, I mean other carriers', we had growing discrepancies. (PD, Project Office/Air Libra)

Data discrepancy is known as one of the root causes of disruptions; it is an irregular service resulting from unpredicted inconsistent/inaccurate data processing between IT systems (Armstrong & Hardgrave, 2007). Airline disruptions hurt a service's reputation, operational performance and on-time arrival/departure. The Deputy Manager (DM) asserted:

Unfortunately, inaccurate data across different modules may end up with disruptions. As for airlines, disruptions are fatal. Furthermore, disruptions cause trust issues in partnership. Our PSS, because of a single system, makes

sure quality data at very much higher level <high quality data>. (DM, Airline Operation/Air Libra)

It was imperative that Air Libra should resolve the data discrepancy to protect its reputation regarding quality services, on-time operations and partnership initiatives. To do this, the airline would need to remove the technological barriers and replace the legacy technology-based RES. As the most feasible option, ALB considered leveraging the PSS suite, which is based on *common standard* technologies and a shared database structure.

Legacy systems {+/-} & **Common platform** {++/-}: Air Libra was a typical airline using a mainframe computer-based RES, which was originally activated back in 1994. In the era of the Internet, a long-standing problem with the conventional RES was the poorly implemented common technologies and open standards used in the air travel industry (Roberts, 2015). The Director spoke about their *legacy systems* in the past:

At some point, we had asked ourselves, multiple times! Should we keep the legacy technology? <legacy systems> What else? Why many airlines considered PSS, the variable cost level is quite high though? It was a key issue, but the answer was straightforward. (PD, PSS Project Office/Air Libra)

The background of choosing PSS as a common platform was highlighted by the two respondents as follows:

In the early stage of the internal discussion, we left a possibility of rebuilding our spaghetti-like software <legacy systems>. But the way turned out to be a waste of money. Instead, we switched to a ready-made PSS platform. It was used by many airlines already. (DM, Airline Operation/Air Libra)

Can't be compared. PSS is advantageous! Mainly, no more data discrepancy. Well, [it] happens, but very much rare! Because [of] a common IT <common platform>, {raising his voice}, we could finally solve two demands also; compatibility, interoperability as well. (PD, PSS Project Office/Air Libra)

Compatibility {+} & Interoperability {+}: Compatibility and interoperability of an airline's customer sales and ground handling systems with those of its online distributors and third parties is a prime requirement to minimise disruption events (Rapajic, 2016, Roberts, 2014). After talking about the issues of data discrepancy, the informants then started bringing up another technical limitation that Air Libra had encountered:

Behind the legacy [systems] issue, in the past day we got responses due to [a] poor compatibility, “pending”, “no reply” and “no message” frequently. But, we couldn't find fundamental clues, until we knew about our OrcheStra; the modules are compatible inside and also core handlers are interoperable outside. ... After visiting this and that [PSS] user airlines and attending PSS workshops, we discovered those things and became convinced the common IT is going to be essential soon. (PD, PSS Project Office/Air Libra)

As using a good platform, now we come to know PSS is a real cross-platform and so compatible <compatibility>. It means, mainly we will be able to apply this and that similar software programmes to online engines, another booking engines and other web applications. The only we do is some configuration work, not by IT guys, but by users. More powerfully, OrcheStra offers many interoperable sources, [which are] XML based. We use the standard features even at no extra charge <interoperability>. (DM, Airline Operation/Air Libra)

The project team perceived the importance of compatibility between the different internal software such as online sales applications. Air Libra learnt the hard way about there being a lack of *compatibility* and *interoperability* from the old RES that resulted in several problems such as low responsiveness and internal/external disruption operations.

Definitely, [they were] positive drivers. Why not! Such strong points were good things for us, as we're waiting for a long time. So, we decided to go then <decision making>. Well, PSS services are costly, because of not a fixed cost, but instead we do sell much more. (PD, PSS Project Office/Air Libra)

Differentiation in Technology {+} & Middleware development {++}: Airline IT providers have rolled out a set of standards that can be used by airlines. Technology standards are critical issues for potential PSS adopters that want to do something in the way of service differentiation; there is confusion in the industry about what they would accomplish. The Director made mention of yin and yang on *differentiation in IT*:

Regarding new technology development, ... we know the PSS vendor will do modernise PSS regularly and develop new ones timely, so we can forget the points. But, differentiating *<differentiation in technology>* is something else! Because of PSS is a single IT, mainly we thought of something technical differentiation. Suppose, once our own system is gone, how can we handle what we want? We saw a big matter there. (PD, PSS Project Office/Air Libra)

For clarity, the two informants elaborated more about the issue of standards and shared their ideas of a technology alternative—a flexible infrastructure that can support Air Libra’s individual efforts:

Standards can’t solve everything. IT standards are good, but our users don’t want standard services for everything. ... Not only for Korean, but it will be useful for customers who like our own faster processing and more secure handling! So, we came up with a middleware system, instead. Well, the business machine is costly in nature. But, along with having a PSS platform, the idea turned out to be positive in decision making *<middleware development> <decision making>*. (DM, Airline Operation/Air Libra)

Fortunately, at the same time, we discovered by chance our Japanese partner would develop their middleware too. It was a good signal, meaning our insight was right. Currently, the middleware is working well with the PSS and complex application servers. Developing the middleware was quite expensive, of course, but it would be worthy in the long term *<middleware development>*. (PD, PSS Project Office/Air Libra)

Based on the above interviews with the informants, these adoption factors in the context of technology, including three antecedent events and four mediating issues/events that affect decision making, can be organised in the causal display in Figure 43.

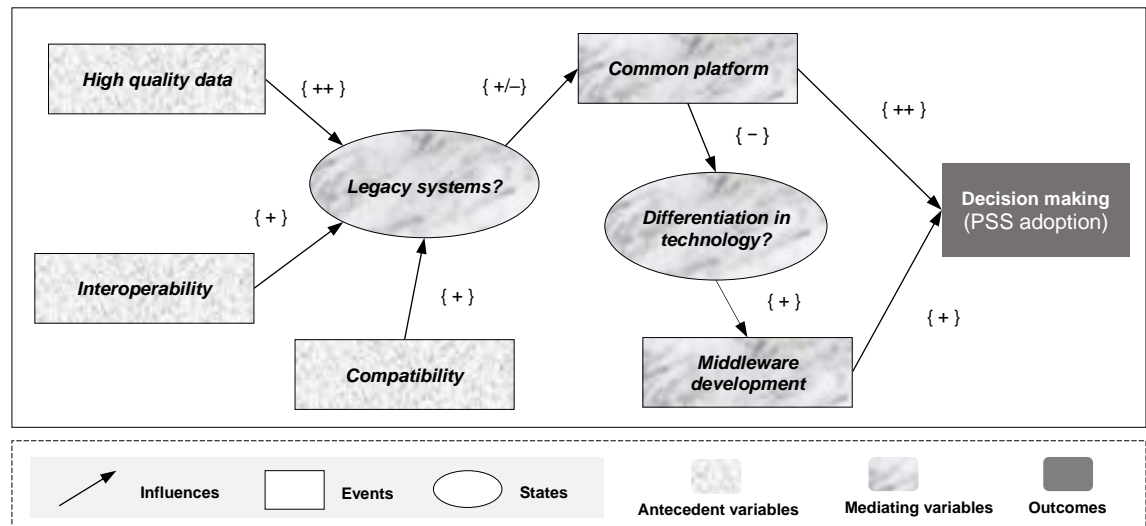


Figure 43. Event-State Causal Display: Technology Factors – Air Libra

6.5.3.2 Organisational context – Air Libra

Our goal is to offer airlines organisation-oriented services to meet the changing needs.
(Vice President, ComPozer)

This second section, where finding regarding Air Libra's PSS adoption in the organisational context are explained, deals with six different influential factors in the organisational context—joint marketing, seamless services, cost in IS operation, organisational formation, top management support and expert training—that influence decision making and resource allocation within the PSS adoption phase.

Joint marketing {+} & Seamless services {+}: One motivation for PSS adoption is the organisational recognition that PSS is able to facilitate marketing with air/non-air content partners through highly compatible system components (Rieple & Helm, 2008). Accumulating or redeeming travelled mileage in the host airline and any of its partners is

an example of a combined effort; *joint marketing* for frequent flyers is an option to promote passenger business together. According to the Deputy Manager, joint marketing was the first order factor that would drive PSS adoption at the organisational level, because PSS can stimulate more opportunities of joint marketing online as follows:

We were planning to develop more joint marketing programmes <*joint marketing*> for travellers who may fly with us and our partners. Fortunately, a strong distribution in OrcheStra was a good open channel to distribute a good price and develop good co-brands, together with air and even with non-air players. (DM, Airline Operation/Air Libra)

In a similar vein, making cross-border connection services by partnering with foreign carriers would be easier if the airlines exchange flight data via a single data repository.

Because of a PSS user, we are allowed to access a single shared database that other airlines in the same PSS simultaneously use. Our offices can be more cooperative, looking for developing more appealing joint marketing with target airlines <*joint marketing*> ... and making more real-time code-share flights and connection schedules. It is a prerequisite to offer seamless travel services worldwide <*seamless services*>. ... Yes, it was positive to a speedy full-scale usage <full conversion>. (PD, PSS Project Office/Air Libra)

Under the shared database infrastructure, all airlines in the same PSS can sell any number of code-share seats and connection flight seats and exchange frequent flyer information without processing errors or delayed responses between partner airlines. This advantage encouraged Air Libra to complete its full conversion to the PSS environment to achieve more aggressive joint marketing and give *passengers smooth travel* (seamless service) experience everywhere across the joint network.

Cost in IS operation {–}: The multiple functions ranging from real-time schedule operations and back-office application for common ground handling available on PSS

enable the PSS user airlines to reduce the *IS operation cost*; “the biggest advantage of having a reduced number of systems are lower development costs, with the ultimate goal of easing integration between the partners” (Iatrou & Oretti, 2007, p. 82). However, the double-sided feature of using PSS in cost structure was expressed by the Deputy Manager in Airline Operation and PSS Programme Office Director with Air Libra as follow:

In terms of cost saving, actually ... {with a wry smile} it worked as dilemma. [After] business case and value proposition, we couldn't see much cost cutting in terms of short-term operational costs *<cost in IS operation>*. But, in the long run, hard to add now, as we have a few points and can use some free products like 'XML-feeding', though. (DM, Airline Operation/Air Libra)

As mentioned, basically, the level of PSS usage is priced quite high. On the other hands, our IT division has offered a chain of labour cost-effective supports in software development based on the legacy technology. (PD, PSS Project Office/Air Libra)

It is predicted that due to relatively lower labour cost, the Korean carrier could control IT operation expense before the adoption of the PSS. After reminding himself of several technical and commercial terms for a minute, which are specified in the PSS service contract, the Director continued talking about the reason of the high cost of PSS:

Our PSS has merits like 'secondary disaster recovery', 'automated schedule downloading-uploading' and 'automatic data discrepancy handling', for example. Those are totally new to us. They're what we wanted. ... Of course, we must pay more, without few cutting [IS] costs, for the time being *<cost in IS operation>*. Internally, it was controversial. Using a better system, instead we do sell more tickets, carrying more passengers. So, we were told by our CEO and we would keep an eye on the bottom line changes. (PD, PSS Project Office/Air Libra)

Likewise, under the pressure of tangled financial affairs, *top manager's support* helps ensure a clear line of organisational communication and lead to a strong commitment across the entire teams when new IT system initiatives are pursued (Kurnia et al., 2015).

Top management support {++/+}: The importance of a top-level manager's behavioural support of IT systems adoption within an organisation was reiterated in comments made in the interviews with Air Libra's participants as follows:

Actually, between business units and IT division, business case on the adoption was getting longer. Even a war of words had erupted for many years, when the world economy was depressed. The project was in a critical stage. After our functional reviews and commercial negotiations, our CEO was able to understand the PSS capabilities would be a key to our future business. Finally, the company reached a big decision and approved the long-lasting plan like staffing and funding <*top management support*> <decision making> <resource allocation>. (DM, Airline Operation/Air Libra)

Our CEO decided to adopt [PSS] in the end. Also, he advised us not to recruit new people, but to foster young professionals in Air Libra. This means our staff had to do ourselves, internally. Later, he delegated most of his managerial responsibilities to CIO and the project body <*top management support*>. (PD, PSS Project Office/Air Libra)

These comments give a clue predicting that when the airline was facing financial challenges in a worldwide economic downturn in 2008–2010, Air Libra decision teams had the notion that, in these circumstances, strong managerial support would be essential for the adoption of PSS; their understanding and knowledge of the PSS potential had been relayed to the top manager through ongoing reports. It can be identified from the verbal evidence that, as a result, the most powerfully influenced aspects in the organisation context were top level management's PSS awareness and changed guidelines on human resource management by considering ALB's financial constraints, such as well-designed

training and organisational transformation, in terms of Air Libra's decision making and resource allocation.

Expert training {++}: After formal approval was obtained from top management, Air Libra became a PSS adopter. After the initial adopting process, a series of *expert trainings* was highlighted by the Programme Office and processed by a well-planned strategy:

The old system was command-line based. No doubt, all trainees were happy with the new GUI screen, mouse-click method and menu-driven mode. Those were all new to our super users, but much easier and more efficient to learn!

<Expert training> (PD, PSS Project Office/Air Libra)

The graphical user interface (GUI) mode of the PSS desktop not only helps airline staff facing a steep learning curve, but also reduces training time and costs. In Air Libra, one barrier was how full-time staff would arrange time for joining in the training sessions while sticking to their own services and original tasks; the solution was remote training.

However, there were many hidden, optional functions for add-on and value-added services that they had never used in the old system. Because everyone was busy doing their regular work, we had to arrange a mixed training, in classroom and by online, for individuals by user group like code-share team, contact centre, regional offices and so on. (PD, PSS Project Office/Air Libra)

Basically, the training programmes were consisted of two tiers; trainings for trainers and trainings for users who experienced PSS for the first time <Expert training>. First, the PSS provider offered professional trainings to the trainees to be internal elite trainers later. Then, our corporate trainers helped all end users understand and adapt to the new concepts and configurations on PSS. (DM, Airline Operation/Air Libra)

According to the Deputy Manager, the well-organised training programmes were mainly divided into three parts: user training for trainers by field, user training for trainees by

department/region and technical training for dedicated IT experts. Lastly, the Project Director advised of the importance of vendor support in training IT professionals:

The PSS platform is productive for IT side as well. For example, OrcheStra provides data transmission web service and mass data exchange API. Such products are all new, but so useful for processing diverse user requirements, customer interaction histories and individual special requests. For these, technical trainings for IT individuals were also made by them. In this case, our vendor helped a lot <Expert training>. (PD, PSS Project Office/Air Libra)

Organisational transformation {+}: As part of a firm's strategic move in line with the use of IOS, an *organisational transformation* involves active changes in business processes, work practices and individual roles to maximise a firm's achievement (Morton, 1991). Informants spoke about the organisational challenge in transformation:

Before using the new [PSS] platform, each time we had to ask IT teams to obtain data for business analysis, to see our travellers' diverse travel patterns, for example. In fact, such a process was inefficient and cumbersome. Now we can do ourselves without their help. Also, we don't need boring work for data discrepancy processing. Our people welcomed them! Using ComPozer, we could simplify the business procedure and streamline some parts <organisational transformation>. (DM, Airline Operation/Air Libra)

Also, the frontline service procedure between the Korea offices and overseas branches has become more efficient. The internal cycle of handling ad-hoc services for connection passengers is getting shortened. So, some B2C and B2B teams would need a change, not a big positive though, as they can come up with something new <organisational transformation>. From the management view, it is a good signal. (PD, PSS Project Office/Air Libra)

As shown in Figure 44, in sum, the aforementioned six factors examined within the context of organisation turned out to be the drivers (except for cost in IS operation) that contributed to PSS adoption by Air Libra in the aspect of organisational decision making

and resource allocation. Two first order variables of joint marketing with trading partners and hassle-free services played as the driving force in PSS adoption, while cost reduction in IS operation in the short-term period was uncertain. The decision of adoption was made in a timely manner by top level management based on a series of close communications between the top executive and the PSS Programme Office. Being empowered to manage financial and human resources, the Programme Office, in cooperation with the PSS vendor, prepared the various choices of well-organised training programmes by team and by role across the business, services and IT units, followed by a successful organisational transformation in accordance with simplified business and productive service procedures; they were driven by innovative technologies and new application functions in the PSS.

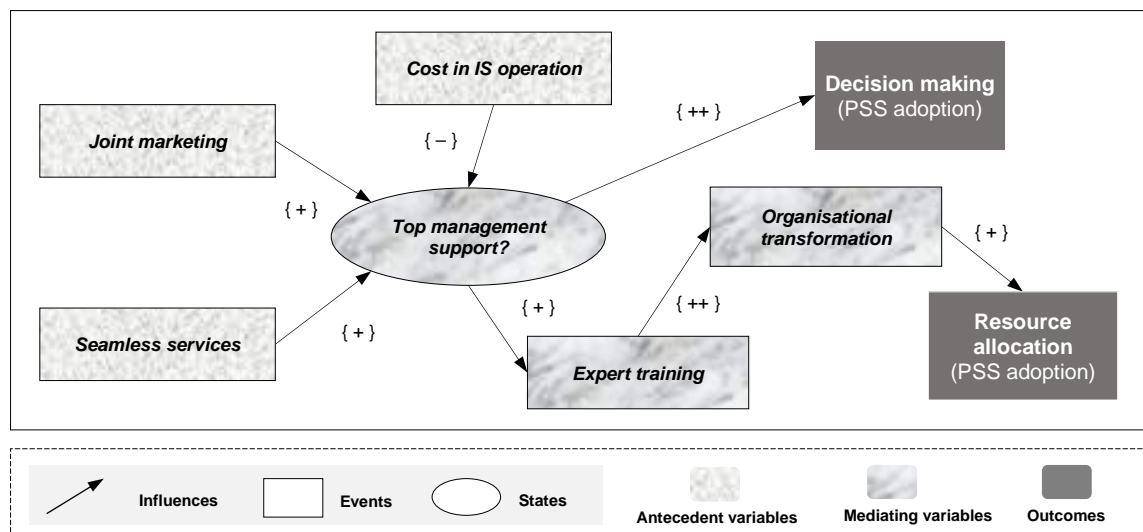


Figure 44. Event-State Causal Display: Organisation Factors – Air Libra

6.5.3.3 Environmental context – Air Libra

Working together with the ComPozer teams, we have had a dedicated organisation in place to ensure a seamless transition. (Executive Vice President, Air Libra)

This section explains six critical environmental factors, including normative (industry) forces and mimetic (competitive) forces within institutional isomorphic pressure, vendor

support, time-to-market, industry knowledge acquisition and mutual learning on a worldwide scale; these are examined as the most influential variables in Air Libra's decision making and full conversion toward the PSS environment.

Normative pressure {+} & **Mimetic pressure** {++}: Based on the related studies (Dimaggio et al., 1991; Dwivedi et al., 2011; Lounsbury & Zhao, 2013), normative, mimetic and coercive forces within the isomorphic pressure are the institutional external factors that influence an organisation's IOS adoption. In the case of Air Libra, the presence of *normative isomorphism* in relation to professionalisation in the industry and *mimetic isomorphism* as competitive reaction towards uncertainty, as two prime antecedent variables, were indirectly explained by the respondents as follows:

First of all, our company must interact with fellow airlines. We should develop more joint marketing campaigns, aggressively, for global travellers who may fly with our operating, marketing flights. If the marketing flight partners use this PSS, after all, we should consider choosing the same one <normative pressure>. We can say such dynamics worked on our decision making, more or less <decision making>. (DM, Airline Operation/Air Libra)

This is something else at the same level. ...Korea air travel market is very competitive! So much competitions are there. All the time, we have to look at competitors and keep seeing what they're doing, otherwise? ... Our choice of PSS was [in] the same situation. Which PSS they were looking at, why they were looking at OrcheStra. This reaction is no wonder, at all! {Smile} It was natural, at that moment, our decision [was] affected <mimetic pressure> <decision making>. (PD, PSS Project Office/Air Libra)

And, the Director made additional remarks on competitive pressure as follows:

Not simply ... [a] PSS system isn't merely [an] IT solution. It's a powerful distribution channel itself and [an] efficient tool for passenger processing. There are numerous fellow airlines, today's competitors and potential

competitors in a [PSS] user group <*mimetic pressure*>. The air was a bit subtle, but all [airlines] were quite serious when selecting which [PSS] would be the best for the future business. (PD, PSS Project Office/Air Libra)

***Vendor support* {+} & *Time-to-market* {+}**: Many IS studies commonly claim that vendor support is one of the critical external factors; lack of vendor support can be a barrier to a firm's IS adoption, and the factor is closely associated with adoption success or failure (Kaur, 2015). The following is what two participants said about *vendor support* and their cooperation on *time-to-market*.

We have closely worked with the ComPozer Group. However, we asked ourselves many times at that moment, even though it's a leading IT service vendor. 'Are they reliable...?' Because, it would be a potential risk, unless they are supportive <*vendor support*>. (DM, Airline Operation/Air Libra)

They bring a good quality of technology benefits to this region, and also responds well to commercial requirements, industry mandates and alliance standards. Their products are flexible, scalable and responsive, in terms of Korean culture fit. For better local supporting, they established a service centre in Korea <*vendor support*>. We considered these all before making decision <*decision making*>. (PD, PSS Project Office/Air Libra)

In confirming new IT initiatives, much of the activity across the PSS user airlines and IT service providers is project-based. Each stakeholder has a right to participate in the speedy decision-making process for setting the time of launching. This evolutionary approach enables participant carriers to shorten the time-to-market and speed up delivering new functions to market—the time between generating an idea for a product and completing a prototype—of their new services and products (Iatrou & Oretti, 2007; Oz, 2004). The Programme Director further commented:

We've heard ComPozer delivers new standards and subsequent patches with lead time, far before the deadline *<time-to-market>*. We saw the things, positively from the market and put them on the table for our decision to go *<decision making>*. (PD, PSS Project Office/Air Libra)

Mutual learning on a worldwide scale {+} & Industry knowledge acquisition {+}: Air carriers should encourage *mutual learning* that will embed knowledge within an individual, group and entity by sharing integrated experiences; they can mutually learn best from quality information and sophisticated airline IT systems, including the databases in PSS (Rapajic, 2016). Both informants further mentioned:

The community is very global. Major airlines come from this continental and that continental. ... We're able to catch up industry trends and exchange knowledge, theirs and ours, while talking each other at the user meetings *<mutual learning on a worldwide scale>*. (DM, Airline Operation/Air Libra)

Big airlines, sometimes, bring their specs and something brilliant ideas. Then, we join in the co-review meeting, discussing pros and cons. In fact, from the workshops, we learn a lot. Similarly, we know the [major] airlines also learn from us, especially on regional, local rules *<mutual learning on a worldwide scale>*. We can make some of the good ideas as ours, as our intangible assets by doing changes something this way. (PD, PSS Project Office/Air Libra)

To meet passenger requirements in different markets, airline partners may take advantage of the expertise of each partner in terms of schedule, comfort and inflight services; each airline's inside knowledge also helps the allied carriers to make the best choices for the connection services (Iatrou & Oretti, 2007). That's why the PSS maintains a large volume of the real-time databases from which the participating airlines can learn and share knowledge about recent skills in PSS usage, IT services and market information.

I think, that's a real win-win, as we all industry players exchange together own global experiences, local knowledge *<industry knowledge acquisition>*

and best practices each other <*mutual learning on a worldwide scale*>. So, I can say PSS is not [an] ordinary system. (PD, PSS Project Office/Air Libra)

Airlines in an alliance acquire industry knowledge learning on two levels; this happens for technical skills and alliance management skills level (Kleymann & Seristo, 2004). In the words of the two interviewees:

This is a new topic. A key point is. PSS is a community model solution. I mean it's developed in a society. Our airline is still small. So, we must learn more there <*industry knowledge acquisition*>. (DM, Airline Operation/Air Libra)

In addition, our PSS user group manages together the quality of information, for example, in terms of customer request in boarding records, in line with market needs and an institutional rule or certain local regulations. We do analysing together, and then every airline can build up its own knowledge <*industry knowledge acquisition*>. (PD, PSS Project Office/Air Libra)

To recap briefly, all positive environment factors towards decision making and full conversion can be arranged in the causal map in Figure 45.

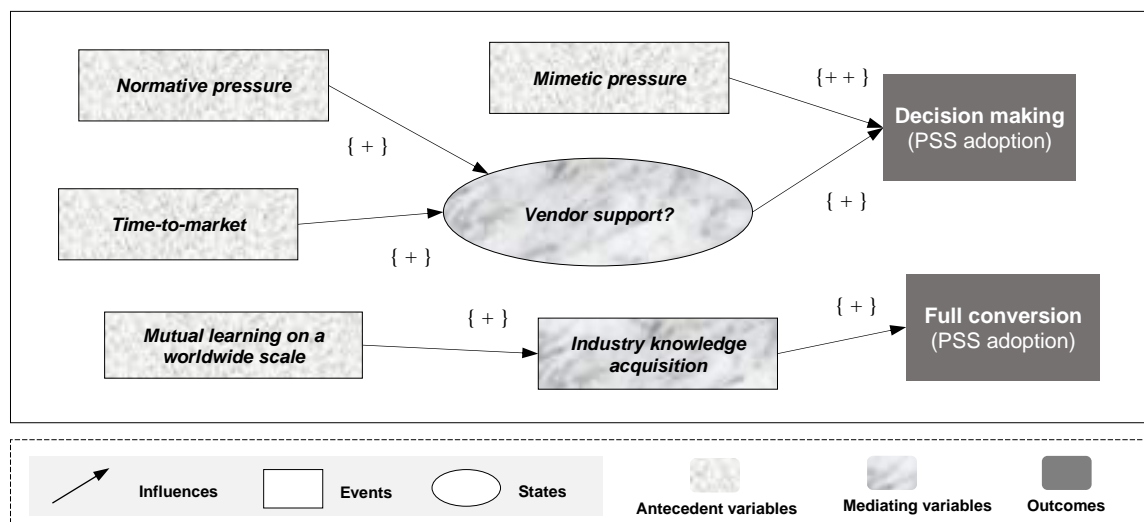


Figure 45. Event-State Causal Display: Environment Factors – Air Libra

Two of the isomorphisms and the need of time-to-market, along with strong vendor support, which was an internal issue, led to a decision on PSS adoption. Mutual

worldwide learning, together with a subsequent event of industry knowledge acquisition, brought about the action of full conversion.

6.5.4 Expected impacts on business value

Our PSS will support our growth strategy by responding more efficiently to customer needs and driving more efficient business operations. (Executive Vice President, Air Libra)

Relying on the interviews with Air Libra and multiple secondary data (i.e. media sources), this section delivers an explanation of impacts on business value as the effects of Air Libra's PSS adoption. Similar to the previous explanation on Air Lynx's business value in Section 6.4.4, the expected consequences on Air Libra's performance are explained in a two-fold classification of impacts: strategic and operational benefits.

6.5.4.1 Strategic benefits – Air Libra

Strategic benefits that the PSS brings business impact on the passenger business growth, including customer service improvement, global reach expansion and closer relationships with strategic partners (Källström, 2005). Air Libra expressed its commitment to intrinsic passenger services upon the initial cut-over of PSS as per the following interview excerpts:

Global coverage

The common platform we launched the service this month offers an impressive range of functions that allow us to enhance our passenger service for international travellers, whilst also enabling closer integration with global alliance members on the OrcheStra <passenger services with a global coverage>. (Executive Vice President, Air Libra)

It is predicted by the remarks that the airline's expectation from the PSS functionality includes the enhancement of core parts of the passenger services in the international segments and the provision of better integration with member airlines across their global

network. The following interview conversation on Air Libra's PSS adoption contains two elements of the potential strategic benefits from PSS at large. Specifically, the Deputy Manager commented about the sources of one strategic benefit as follows:

After finishing business case, we're sure that PSS will give us a sustained opportunity of gaining global market access and service competitiveness to customers around the world <passenger services with a global coverage: *competitive services on a global scale*>. (DM, Airline Operation/Air Libra)

After the adoption of the PSS products, Air Libra's passenger services as a promising international carrier can be accelerated by increased competitive customer services in conjunction with greater global reach. An enlarged joint network with strategic partners using the same PSS is also another possible fruit that may contribute to passenger services with a global coverage, according to the Program Director's comments:

For us, delivering a wider joint network, through more aggressive code-sharing for example, with allied partners is a key [to the strategic benefits] <passenger services with a global coverage: *joint networking with strategic partners*>. (PD, Project Office/Air Libra)

Two prospective sources from the other strategic benefit perspective—market performance increase—have to do with product development and customer needs, as the Deputy Manager stated as follows:

Market performance

Also, we expect to make the best use of PSS as an innovation tool in developing value-added products without technical limitation. ... These days, flexible pricing, instant repricing and dynamic packaging for wider range of customers have become mainstream in the air travel market <market performance increase: *value-added products development*>. We can respond more efficiently to such a market trend with one simple action of Enter Key

in front of customers, raising our performance <market performance increase: *effective response to customer needs*>. (DM, Airline Operation/Air Libra)

Under the functional limitation in a structured data exchange with the fare data, Air Libra were unable to offer various ancillary/add-on products in the past that required automated pricings. The airline will be able to increase market performance with a positive impact on its bottom line, developing value-added items and catering for various customer needs.

6.5.4.2 Operational benefits – Air Libra

Air Libra planned to take advantage of one of the most advanced PSS that facilitates enhanced exchange of travel records and of customer profiles, with up-to-date flight schedules from reservations through to check-in, according to quotes from the Vice President in an Air Libra press release:

Technology innovation

Our PSS is a sophisticated platform that reengineers the end-to-end air travel experience using innovative automating flight schedule, preferred seating control and quick re-accommodation. We believe it enables Air Libra to improve business efficiency further and lower IT-related costs, particularly in the software development <air travel technology innovation: *greater business efficiency; cost-effective IT operation*>. (Vice President, Air Libra)

Judging from his comments, it is possible to foresee that the PSS that ALB selected would enable the service-leading airline to offer a snag-free travel experience to existing customers and potential flyers with Air Libra, because the end-to-end passenger system, which is accessible through multiple channels and touch points, is designed to confidently handle information on the passengers from the booking query through to the boarding control. In addition, under greater pressure to increase cost reduction, Air Libra planned to reorganise departure processes by utilising automated boarding control, so that the

airline can accomplish larger, efficient IT operations and reduce the on-going efforts for developing costly application programmes that execute challenging flight schedule changes and complex passenger processing. This was validated by the Programme Director during the on-site interview:

The commercial benefits by using this common platform for Air Libra is clear; we will be able to take advantage of the market-oriented system and benefit from ongoing technology innovation in a cost-effective way <air travel technology innovation: *cost-effective IT operation*>. (PSS Programme Director, Air Libra)

Economies of scale also take place among the PSS adopters; in other words, PSS users can capitalise on economies of distribution network size without expanding the number of their own distribution channels (Iatrou & Oretti, 2007). When asked to explain the expected operational benefits from PSS, the ALB's Director replied:

This is a bit long story. Suppose [that] one airline wants to open a new foreign market, in no time! Then, the airline might pay this search costs and that entry costs, while trying to secure new direct, indirect channels in a hurry. On top of that, can they do in a week? (PSS Programme Director, Air Libra)

By answering his own question, the respondent also talked about cost saving as follows:

Reduced entry costs

But, Air Libra already became one of the subscribers to a dominant PSS network, then not necessarily we pay such entry fees for the new region. Instead, we pay transaction commissions, which are variable, as many as we sell tickets by selecting offline, online or hybrid channels already available on the PSS, by just like turning on the tap <reduced cost to enter new foreign markets: *entry cost and distribution expense reduction; fee-based cost structure*>. "Hey! ComPozer, please open up this channel to Brazil by

Monday.” Simple! That’s why we can say using PSS is more efficient, effective and productive in that sense. (PSS Programme Director, Air Libra)

Table 16 summarises potential business value for each of the two elements of strategic benefits and operational benefits, including ideas and examples that Air Libra expects in term of how it will realise them over time.

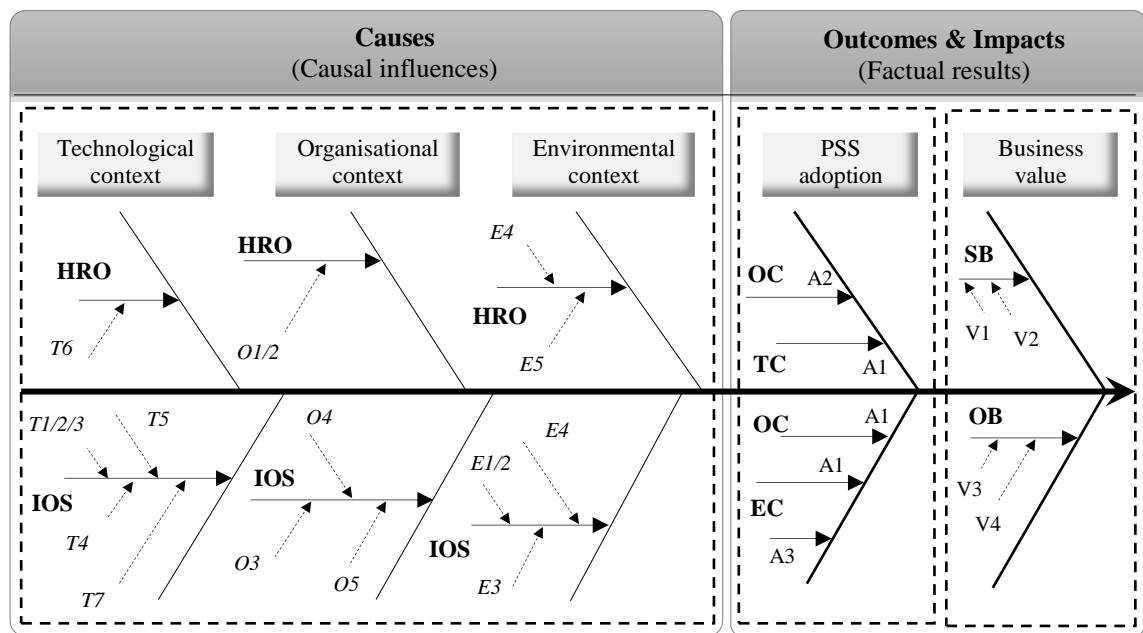
Table 16. Impacts on Business Value after PSS Adoption – Air Libra

Expected strategic benefits	Expected operational benefits
<p>Passenger services with global coverage</p> <p>Achieve/obtained by:</p> <ul style="list-style-type: none"> - <i>Joint networking with strategic partners</i> - <i>Competitive services on a global scale</i> 	<p>Air travel technology innovation</p> <p>Achieve/obtained by:</p> <ul style="list-style-type: none"> - <i>Common standard technologies</i> - <i>Greater efficient IT operation</i>
<p>Market performance increase</p> <p>Achieve/obtained by:</p> <ul style="list-style-type: none"> - <i>Value-added products development</i> - <i>Effective response to customer needs</i> 	<p>Reduced costs to enter new foreign markets</p> <p>Achieve/obtained by:</p> <ul style="list-style-type: none"> - <i>Fee-based cost structure (shift to variable cost)</i> - <i>Entry cost and distribution expense reduction</i>

Instead of spending large amounts of money as transaction cost to enter unfamiliar markets overseas, a PSS-user airline can slightly update the existing comprehensive contract, when the carrier wishes to activate a new online/offline distribution and airport service channel, without making any further capital investment; the PSS vendor can then quickly provide efficient connecting service to the new origin-destination market. Corresponding to their functional selections, additional passenger processing fees (or passenger-boarded fees) will be charged per capita as a variable later. This advantage can be significantly greater, in cases where the airline has a sizable code-sharing network with its strategic partners. As a PSS adopter, Air Libra penetrates this operational benefit that helps the airline enhance airline technology innovation and reduce various transaction costs prior to entering a new region.

6.5.5 Causal influences and factual results

Based on the findings addressed in Section 6.5.3 and 6.5.4 on PSS adoption of Air Libra, a causal map is visualised in a fish-bone diagram as shown in Figure 46. It depicts a multi-directional influential relationship between the adoption factors within the context of TOE and three outcomes defined as a PSS adoption in stages.



HRO: Home region-orientation **IOS:** Inter-organisational Systems

T1: High quality data, T2: Interoperability, T3: Compatibility, T4: Legacy system

T5: Common platform, T6: Differentiation in technology, T7: Middleware development

O1: Joint marketing, O2: Seamless services, O3: Top management support, O4: Expert Training

O5: Organisational transformation

E1: Time-to-market, E2: Normative pressure, E3: Vendor support, E4: Mimetic pressure,

E5: Industry knowledge acquisition, E6: Mutual worldwide learning

TC: Technological context **OC:** Organisational context **EC:** Environmental context

A1: Decision making, A2: Resource allocation, A3: Full conversion

SB: Strategic level benefits **OB:** Operational level benefits

V1: Passenger services with a global coverage, V2: Market performance increase

V3: Air travel technology innovation, V4: Reduced cost to enter new foreign markets

Figure 46. Fishbone Diagram: Adoption Factors and Business Value – Air Libra

The causal display also includes impacts on business value from the strategic benefit and operational benefit perspectives. Therefore, Figure 46 is a unified diagram where Figure 43–45 as well as Table 16 are condensed into a single representation. In a similar

approach as used in the Air Lynx' case, the positive characteristics that contribute to PSS adoption are displayed on the relationship diagram.

6.6 Subcase C: Air Lepus – Taiwan

The Taiwanese air industry has grown substantially in recent years, demonstrating exceptional double-digit annualised growth in the 2010s in the aspect of international inbound and outbound travel. In the mid-2010s, its international segment occupied nearly 90 percent of the industry's aggregate volume, while the domestic segment equated to about 10 percent of the industry's overall volume. In Taiwan, where the global travel outlook is promising, Air Lepus has a strong market position, expecting to develop new growth avenues as a major passenger transport player in East Asia. The following section illustrates the third individual case study, with the leading Taiwanese carrier.

6.6.1 Snapshot of the company

Air Lepus is one of Taiwan's national flag airlines. Headquartered in Taoyuan City, the airline company owns regional head offices in China and the United States. Since its first scheduled flight operation in the early 1990s, ALP has primarily focused on short-haul services further to its existing domestic air network, while continuing to stretch from East Asia to North America over recent years to establish a worldwide network of destinations across the globe. As a result, the company today provides passenger air transportation services in the Taiwanese and international markets, operating a fleet of 79 aircraft for flights to 64 destinations worldwide, including major domestic cities and multiple countries across the Asia Pacific, Oceania, Europe and the United States. At present, it has about 11,700 employees and reports sales revenues of about 4.49 billion US dollars. Air Lepus has endeavoured to strengthen its international expansion with the backing of highly automated systems in a common technology setting. In contrast to those of its

strong local competitors, ALP's rapid expansion and increased technological capacity have been boosted after it bonded itself to an alliance community. With the introduction of PSS to the airline industry in the mid-2000s, the Taiwanese air carrier began to be concerned about implementing an integrated distribution channel and coherent passenger services management across the potential partners. With a two-year evaluation of the prospective PSS, the airline decided to adopt the OrcheStra suite as its new generation passenger sales and services solution by reaching a conclusion (i.e. decision making) on the selection of the full package, allocating human/financial resources a year later and completing a full deployment on its domestic operation subsidiary; Air Lepus became one of the early PSS movers within the East Asian region by adopting a dominant PSS with the short- and long-term vision of: (i) meeting Vision Alliance's requirements, (ii) expanding its global customer base and (iii) improving the efficiency of its whole passenger processing.

6.6.2 Snapshot of the product

The ALP's OrcheStra suite includes seven modules of booking and ticketing, inventory control, departure control, air travel distribution, e-commerce, airline partnership and revenue management, dealing with domestic and international travellers (see Figure 47). A big picture of the architecture domains around the PSS products adopted by Air Lepus encompasses travel intermediary architecture, airline-owned outlets architecture, external multi-channel architecture, in-house business solutions architecture and several 3rd party architectures for regulation ground handlers, airport authorities and regulation bodies. Compared to those of the other two airlines, one of the characteristics within the PSS architecture boundary for Air Lepus is a supplementary business solution known as revenue management system that enables the airline to more accurately price its packages (e.g. branded fare families + ancillary services) and increase profitable passenger sales.

By paying extra usage fees, each module can be customised with add-on software or unique functions to support an airline's individual efforts and maximise business value. In conjunction with the shared depository, the PSS products forming a common platform are designed to enable participating airlines to engage in partnerships and harmonise customer data as common proprietary resources, thereby offering seamless connectivity and closer integration with other PSS adopters (Benckendorff et al., 2014).

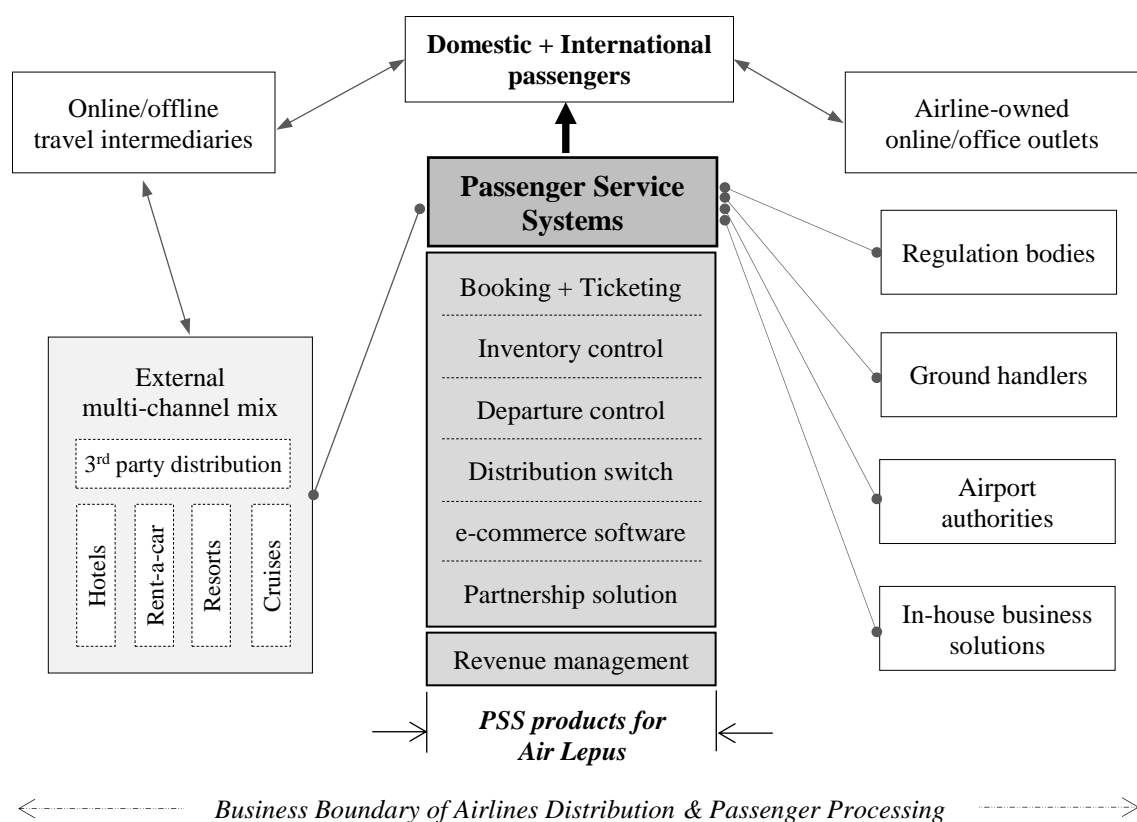


Figure 47. PSS Product Line and Architecture – Air Lepus

6.6.3 Progress of Passenger service systems adoption

The chronological chart in Figure 48 shows, that with a two-year intensive business case and product evaluation work, Air Lepus adopted its PSS over three years, beginning with decision making in 2013, allocating human/financial resources a year later and completing a full deployment on its domestic operation subsidiary in 2016. By going live

in 2015, ALP became the first PSS adopter among the East Asia region airlines. Unlike the other two PSS adopters considered in this research (i.e. Air Lynx and Air Libra), this Taiwanese carrier applied the major PSS products to its domestic business at the last conversion stage by prioritising the international segments to meet the numerous alliance requirements as soon as possible and improve the efficiency of its whole international passenger handling more quickly.

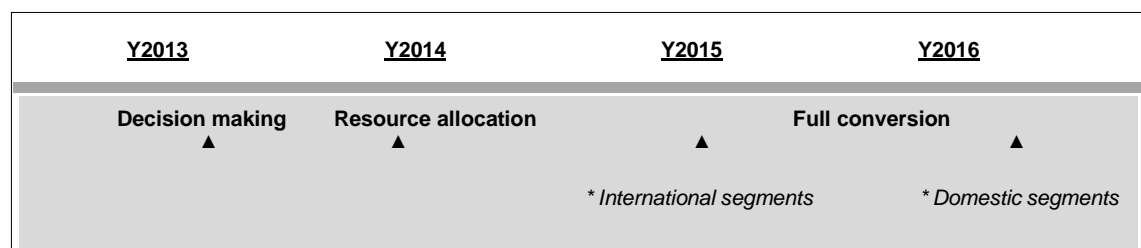


Figure 48. PSS Adoption Progress in Stages – Air Lepus

Two key informants with Air Lepus participated in an in-depth interview on 10 May 2016, interviewing as a pair. After the face-to-face interview, they also delivered several parts of the answers to all the interview questions that their senior executives (i.e. paper-based respondents) had printed out; the valuable written materials were used subsequently as secondary data, at the time of data analysis. Due to these supplementary data from Air Lepus, the ALP within-case led to more detailed explanations than other two airlines cases. Table 17 summarises the profiles of two high-ranking position interviewees who provided this case study with the conversations on Air Lepus' PSS adoption. Within the division to which the informants belonged, they were responsible for maintaining the legacy RES and then currently operating the PSS in charge of the first line of service of the IT products, including e-commerce and mobile applications as well as passenger reservation and departure control. They answered the first of the two open questions on whether Air Lepus was home-region oriented, in terms of its business structure and asset

management across their regional headquarters. The respondents replied that Air Lepus must be a typical home-region oriented structure, as it currently holds the majority of its assets within Taiwan and relies on obtaining most of its revenue from its home region.

Table 17. Profiles of Key Informants – Air Lepus

Affiliated Unit/Department	Title/Person	Main Roles in PSS adoption
Computer Division	Junior Vice President (JVP, 1)	PSS project (Migration management, 5 years)
Software Design Development	Section Manager (SM, 1)	PSS project (Data/Application migration, 3 years)

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

- Paper-based participants:

- . Deputy Senior Vice President (DSVP, 1), Alliance IT Committee
- . Senior Vice President (SVP, 1), PSS Migration

6.6.3.1 Technological context – Air Lepus

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

Interoperability {+} & Technology standards {++}: International airline operations with IT systems can be achieved not through a single function alone but through a collection of services based on a structured interface with partners. To identify, capture and update the status of air travellers, interoperability on open software standards is a key to PSS functionality (Benckendorff et al., 2014). *Interoperability* and *technology standards* in airlines within PSS are regarded as integral technological elements in supporting the instantaneous processing and transmitting of critical data between the air transport partners. This indicates why international FSCs have mutually become dependent on simultaneous processing to exchange numerous pieces of flight and passenger information. For Air Lepus, code-sharing and ground-handling with prospective partners in the 2000s was a business imperative—the coordination of massive flight schedules in

a standard setting and the integration of passenger services together with its preferred carriers was where the discussion started. In the words of Senior Manager (SM), Software Design and Deputy Senior Vice President (DSVP), Alliance IT:

First of all, the external requirements of interoperable functionality <interoperability> and industry standards for our industry <technology standards> are key drivers behind [the adoption]. Because it was impossible for us to develop all requirements for industry mandates and rules in airport processing. I do think these two reasons must be important parts regarding our decision <decision making>. (SM, Software Design/Air Lepus)

For instance, as of 2016, the Taiwanese air carrier had code-share agreements with 17 international airlines, including the two North American mega carriers and major airlines in each geographic region, collaborating with the leading carriers to provide global services to a wide range of destinations. However, because ALP had insufficient technical capabilities to meet all the requirements for the continued challenging coalitions with bigger partners in fleet size, the airline would need to improve interoperability across disparate RESs using the open industry standards and within different PSSs.

In the airline sector, that's why there is a strong trend moving to open platforms [that can] support the common and industry standards <technology standards>. (SM, Software Design/Air Lepus)

Finally, both interoperable functionality <interoperability> and industry standards are positive influences in our decision <decision making>; the standards issue was heavier and ahead though, at that moment <technology standards>. (DSVP, Alliance IT/Air Lepus)

The importance of fitting future-driven standards to be used in commercial airlines was emphasised by the manager and the executive. As such, it is understood that the

technology requirements of *interoperability* and *technology standard* in passenger sales and services worked as positive drivers that influenced ALP's decision making.

Legacy systems {–} & ***Common platform*** {++}: PSS is designed for adopters to raise internal operational efficiency due to a continuous evolution process as well as to enable enriched compliance with industry mandates initiated by international aviation authorities, thereby encouraging airlines to replace the mainframe computer-based *legacy systems* on individual premises; this is because PSS function as *common platforms* upon the basis of open technology standards (e.g. Electronic Data Interchange; EDI over XML) for the air travel industry (Iatrou & Oretti, 2007, Roberts, 2015). From many industry reports on airline IT systems, it is clear that shifting to new industry standards has been driven by regulatory bodies such as the IATA. Air Lepus has exemplified why and how PSS adopters facilitate seamless, integrated functions and standards infrastructure for a high level of interoperability. Senior Vice President (SVP), PSS Migration Project and Deputy Senior Vice President commented:

Back to 2011, before looking for common IT, when we were facing our international business expansion. So, we tried to do with our legacy first, because we were the system owner <*legacy systems*>. We put a lot of efforts and resources to implement all necessary standards on our in-house applications. But, we couldn't make them all. (DSVP, Alliance IT/Air Lepus)

Well, eventually ... these [two factors] worked a bit on our top manager before a decision was made due to many on-going standard restrictions from our old reservation systems <*legacy systems*>. Back in 2012, there was no choice when more than 80 requirements were given to join the alliance. It was a top issue inside. (SVP, PSS Migration/Air Lepus)

Then, he continued, addressing the necessity of a common platform as a practical solution:

We found our mainframe applications too limited to support common standards and compliance <common platform>. It was not a simple matter of reprogramming codes [in use] from scratch. So, we had to go with the PSS platform soonest. (SVP, PSS Migration/Air Lepus)

Air Lepus previously used the mainframe computers and legacy applications available in the 1990s, which had provided the airline with limited alliance compliance. Meanwhile, the airline decided to join a GAA in the 2000s; a number of essential preconditions to be a full member were given by Vision Alliance. ALP was willing to cross the many existing hurdles associated with its legacy host system on its own and, therefore, attempted to meet all prerequisites in line with industry-wide standards possible on the mainframe-based RES. In time, however, the carrier was confronted with technological barriers in redeveloping all the application programmes because of its legacy technology and updating interfaces to be highly structured in open technology standards. Thus, ALP looked for a radical technological change in the structure of passenger sales/processing by having a common platform, which was used by potential partners and alliance airlines.

New technology development {no influence} & ***Differentiation in technology*** {no influence}: During the interview, *new technology development* and *differentiation in technology* were discussed as to whether both factors could be identified as drivers or barriers in PSS adoption, because the factors can be converted into intangible assets that lead to competitive advantage and global orientation of service firms in international markets from the IB perspective (Banalieva & Dhanaraj, 2013); unlike this IB research, however, the respondents from the on-site interview expressed views considerably opposed to what several studies related to HRO have found. An opinion with emphasis from an informant, Junior Vice President (JVP) was:

The topic of developing new IT products was not a mainly considered during the decision-making process <*new technology development*> <decision making>. Requirements for airline IT become similar these days, and there is little difference between this PSS and that PSS. ... On top of it, we can make better using ours <*differentiation in technology*>! Well, making something different and new on our systems would be more advantageous than on common [IT]. (JVP, Computer Division/Air Lepus)

Further to the director's comment, the Senior Manager developed the theme as followed:

That's why developing [something] new was a separate issue here. Not necessarily we thought of such options like new and different <*new technology development*> <*differentiation in technology*>, because we only focused on using PSS well. (SM, Software Design/Air Lepus)

In Air Lepus' case, neither new technology development nor functional differentiation was taken into consideration in PSS adoption. The carrier planned to stay as simply 'a PSS user' without paying for new technology and differentiation in function, which could be easily made in ALP's RES in future; their approach was that the PSS adoption was a business decision and IT is simply an enabler. This is because they believed that the core business in airlines is not to offer IT services to customers but to sell passenger seats and serve travellers on the ground. In that sense, they decided to go with the future-driven common technologies and standards.

IS personnel staffing {+}: In the past, Air Lepus pursued development of new IT services and functional differentiation in distribution and service channels on its own legacy systems to enlarge their international air network and improve competitiveness. However, the airline realised that such a stand-alone IT operation was costly, as ALP had to hire rare IT experts in mainframe programming and regularly update large-scale host systems.

Two informants made some remarks on *IT personnel staffing* as follows:

No more money-wasting on hiring legacy system programmers and the old skills <IS personnel staffing>. Well, training people for legacy skills is very costly these days <expert training>. We must go this way to the common solution. (SM, Software Design/Air Lepus)

Our CEO and all users already knew how to handle the common platform without a complex process of customising specific functions only for us, and without hiring expensive programmers <IS personnel staffing>. Our CEO wanted us to do no manpower increase. (JVP, Computer Division/Air Lepus)

Now that Air Lepus operates the industry-oriented, common-use platform, the airline came to concentrate on merely making the best of use of PSS within the planned budget, thereby reducing the high costs of new technology development and free from the functional customisations on an individual airline level. Regarding *top management support* and *strategic partnership*, the informants then added to the former remarks:

So, we reported to our top manager <top management support> that without [additional] changes, we would be satisfied with the quality [of PSS]. (JVP, Computer Division/Air Lepus)

It was hard work! We had to launch ASAP! Because, we must catch up all initiatives with many important partner airlines <strategic partnership>. (SVP, PSS Migration/Air Lepus)

All responses from the participants give this study not only confirmatory findings but also meaningful rival competing explanations (i.e. alternative views) that, within the common-use environment, new IT development and functional differentiation may be restricted to multinational service enterprises such as international airlines. In other words, this implication corresponds to the limitation of findings on the impact of HRO, and the phenomena of IOS adoption in the context of common-use technology should be further empirically generalised. As Figure 49 shows, this study finds seven key technological

factors, including a negative factor between legacy systems and IS personnel staffing. It presents a set of causal relationships that influence the outcome of the decision during the PSS adoption phase. In the next chapter for cross-case discussion, a combination of synthetic causal links with the organisational context offers clearer evidence.

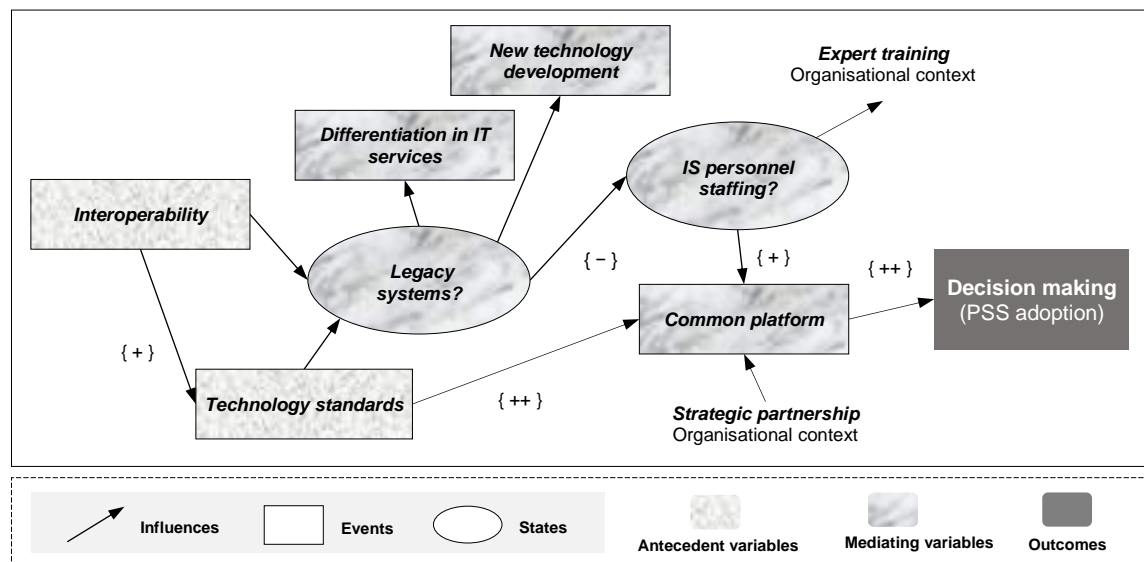


Figure 49. Event-State Causal Display: Technology Factors – Air Lepus

6.6.3.2 Organisational context – Air Lepus

Top management fully supported this project, wishing new PSS could help us to expand [our] business with a less manpower increase. (Senior Vice President, Air Lepus)

Global network {++} & Seamless services {+}: Since the 1990s, numerous airlines have prospected a larger network and denser connections due to the impact of open-sky policies and the rise of LCCs. They have turned their attention to enlarging their *global network*, offering a comprehensive distribution channel to customers worldwide (Belobaba & Odoni, 2009; Tugores-García, 2012). Executive Vice President (EVP) with PSS Project spoke in an industry seminar about a plan for future with the PSS:

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 within the alliance. I am proud to say this is a right decision that we have made <decision making>. (EVP, PSS Project/Air Lepus)

Specifically, he also made the following strong statement on *seamless services*:

Thereby, it is the obvious choice to improve our end-to-end customer services and offer a seamless experience together with global network airline at a worldwide level <seamless services> by making easier to issues tickets to passengers all the way to final destinations. (EVP, PSS Project/Air Lepus)

In this context, there might be a theoretical thread of connections between his remarks and the findings of Briody (2004) as well as Silva (2012), that new IT platforms in airline distribution and passenger processing would provide customers with *seamless air travel* and enable airlines to improve passenger flow and satisfaction.

***Strategic partnership* {++}**: To enlarge potential benefits and promote business opportunities, a *strategic partnership* and a combined effort are made with multiple airlines (Laudon & Laudon, 2005; Silva, 2012). By means of the PSS as a new technological platform, Air Lepus' need for greater *strategic partnership* for a broader range of collaborations via electronic integration is also identified as an internal motive within the organisation context; Deputy Senior Vice President stated as follows:

Some partners moved to PSS first, and then looking for a greater partnership through the alliance <strategic partnership>. So, they influenced our decision making much, actually. Because [of joining] a bit late, we should quickly catch [on] the common platform. (DSVP, Alliance IT/Air Lepus)

***Expert training* {+} & *Organisational transformation* {+}**: The air travel industry is human-resource intensive (Benckendorff et al., 2014), and the strategic use of IT systems

in airlines relies heavily on IT expertise. When it comes to maintaining legacy reservation systems for airlines, *training human resources* in business and IT has become a major task in the organisational context. The two participants stated as follows:

The more up-to-date business rules from partners [we received], [the] further complex applications we had to develop quickly. However, it was not that easy for us to catch up [with] their timeline without skillset... At last, we thought ‘Yes! We are doing airline services, not doing IT business at all’. So, not necessarily [we] hire and train costly people. No more stress due to a training issue <*expert training*>. (JVP, Computer Division/Air Lepus)

In the recent open [system] environment, the most difficult thing is recruiting qualified mainframe analysers. ... As far as people get more used to things new, year by year, we have fewer experts who want to be a mainframe developer. Thanks to PSS, now our IT manpower can switch to new software. So, [the] IT sides are doing internal transformation the next step, allocating this and that persons to the right place <*organisational transformation*> <resource allocation>. (SM, Software Design/Air Lepus)

In Air Lepus, there has been a significant shortage of IT system experts who could handle the mainframe computer languages. The explanation of Air Lepus’ manager implicitly offers that the lack of skilled professionals in outdated airline technology worked as a critical factor in influencing the adoption of PSS pertaining to resource allocation. Alternatively, the airline has concentrated on *internal transformation* within the IT unit by maximising potential talents and other expertise and reducing IT labour costs.

Top management support {++}: Top managerial power is decisive in organisational changes (Vaidya, 2012), and thus *top manager support* may also be a key to an airline’s PSS adoption. According to the Air Lepus Deputy Senior Vice President:

Before the final decision was made, for several years, Business and IT departments were involved in the evaluation. {By snapping fingers} ‘Yes! it is also right time to change ourselves’. But, the project teams could not reach a conclusion. Then, based on our evaluation reports, the decision to move PSS was made by our top manager <top management support> <organisational transformation> <decision making>, totally by [our] CEO; We go with the platform as soon as possible! (DSVP, Alliance IT/Air Lepus)

The top manager’s support leads to a strong commitment across the entire organisation and presents the firm’s vision to innovation, when organic organisational structures are intricately involved in the IT adoption process (Baker, 2012). This is also confirmed by an interviewee who indicated that the initiative of PSS in Air Lepus was strongly advised by top management:

From our management [point of] view, new technology implementation on PSS for now is not [a] major concern <top management support>. If [the] right PSS accommodates our needs, it should be enough. It means key functions in the PSS work well on our service strategies and meet business objectives, [we] will be happy. That’s all. (SM, Software Design/Air Lepus)

These conversations can be encapsulated by a causal map (see Figure 50) and the following short explanation: a causal display in the organisation context presents two antecedent factors (global network and seamless services) and one critical issue (expert training) that is related to a technology factor (IT personnel staffing). And, three mediating salient events (strategic partnership; top management support; and organisational transformation) positively influence the subsequent outcomes: decision making and resource allocation. Top manager support was a decisive influential factor in decision making and resource allocation, thereby encouraging strategic partnership and seamless services through the platform and motivating organisational transformation.

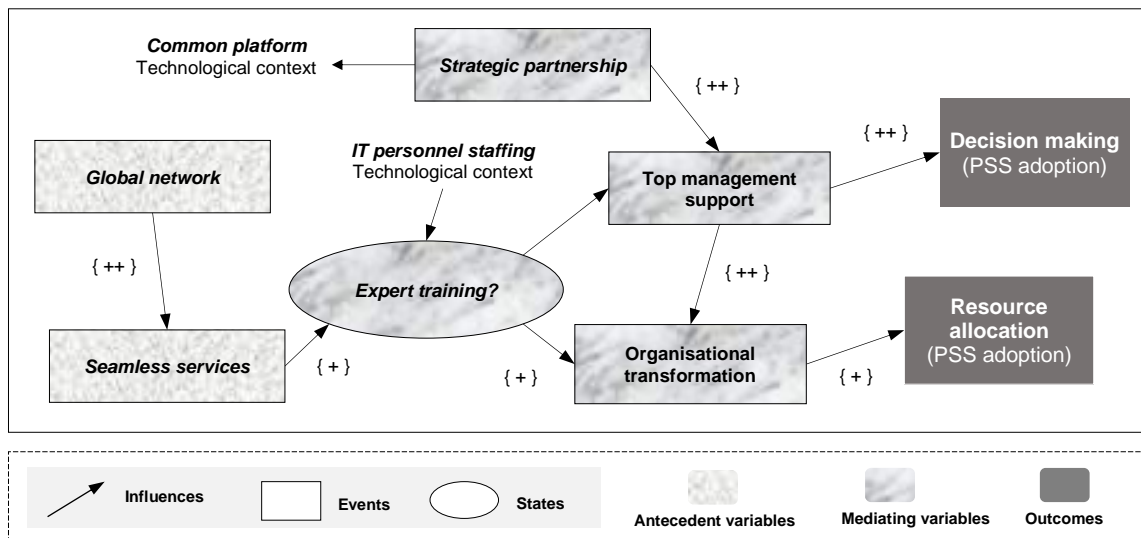


Figure 50. Event-State Causal Display: Organisation Factor – Air Lepus

6.6.3.3 Environmental context – Air Lepus

The decision, as the first Asian carrier to choose its PSS, will be viewed positively by other airlines in the Asia-Pacific region. (Executive Vice President, ComPozer)

Normative pressures {+} & **Mimetic pressure** {+/-}: In the environment context, the adoption of IOS can be rather seen as an organisation's outcome resulting from isomorphic pressures, including coercive forces, normative forces and mimetic forces; government policies, professional networks and competitors are examples of those (DiMaggio and Powell, 1991). Under the growing cooperation and competition of the aviation market where environmental uncertainty exists, institutional regulations and industry initiatives might be considered to be strong external enablers in a commitment to airline innovation (Merten & Teufel, 2008). In the case of ALP, these external forces were addressed by the two key informants as follows:

In [this] region, some airlines in the other alliance shared their PSS experiences with us at the PSS user meetings, because we're in the same boat. So, as pure PSS users, not competitors, they affected our decision <normative pressure> <decision making>. (SM, Software Design/Air Lepus)

We are in the process [of migrate] our host to PSS in a multi-carrier community environment to meet the industry-wide requirements. ... Vision Alliance and a few PSS providers advised us [of] how to smoothly move to the common platform that was already used by major airlines <*normative forces*>. (JVP, Computer Division/Air Lepus)

Thereby, to some extent, there were *normative forces* around Air Lepus that might influence its PSS adoption. On the other hand, in response to pressure from partners, the two participants specifically held different views on the normative force that might influence its decision making as follows:

Well, pressure from our partners? ... {with a wry smile} No! I don't think we have felt such a pressure from the [alliance] members <*normative pressure*>. Our decision making was not influenced by our partners, because we focused on the just internal objectives and simply studied the hidden value of partnership. (SM, Computer Division/Air Lepus)

Subsequently, his senior colleague dropped a different view against the other informant:

Well, this topic is complicated. ... Partners are our allies <*normative pressure*>. However, they may be competitors as well, potentially I mean. In fact, one of our partners has a higher landmark, and the others are better than us in terms [of] customer services. We have felt some pressures from them <*mimetic pressure*>. In that sense, I can say their decisions on the adoption affected us <decision making>. (JVP, Computer Division/Air Lepus)

These different views on *mimetic forces* are identified as mixed influences that can be explained by a firm's strategic orientation; a strategic orientation is an indicator of the process developed to integrate new information, to coordinate decisions and to assess new projects (Miles, Snow, Meyer & Coleman, 1978). This means that executives and managers in a firm may differ in their strategic orientation, thereby viewing their external pressures in other ways. (This strategic orientation is discussed further in the next chapter.)

Likewise, in the ALP's case, this pressure was addressed in a slightly different tone by both respondents based on their understanding. The Senior Manager commented more on competitive forces:

As per pressure from today's competitors, my understanding is ... it's not big significant. Because, in Taiwan, we're the first mover doing initial cut-over. So, not necessarily we kept our eyes on their decision <*mimetic forces*>. (SM, Software Design/Air Lepus)

The majority of IOS-related studies claim that mimetic isomorphic mechanisms result as IOS adopters respond to uncertainty by mimicking the actions of other firms as a competitive necessity. However, this Air Lepus case implies that mimetic forces seemed limited. It is because Air Lepus was in the position of an early adopter and normative mechanisms in a specific inter-organisational network permeated through the channels of professional groups and the user conferences hosted by market leaders, as Liang, Saraf, Hu and Xue's study (2007) revealed in a similar situation.

Vendor support {++} & ***Time-to-market*** {+}: Similar to the other two airline cases, the Air Lepus PSS teams also had been interested in *vendor support* and *time-to-market* during the project as follows:

Regarding the vendor support, I think our vendor also has [done] it. Because of the economy of scale, actually, ComPozer wants to support more PSS users, only not for us <*vendor support*>. Their support is [a] key to shorter time-to-market and the final stage [adoption] <*time-to-market*> <full conversion>. (SM, Software Design/Air Lepus)

We 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>. (SM, Computer Division)

This evidence indicates that Air Lepus were attentive to the products and services that the PSS vendor would provide promptly. The changing environment has forced airlines to be transformed to cater for institutional practices; such IT vendor support in the travel sector is indispensable inasmuch as the development of air distribution is closely dependent on technological cooperation (Roberts, 2015).

Mutual learning on a worldwide scale {+}: In a bid to obtain mutual worldwide learning opportunities, Air Lepus was motivated to utilise the information channel available for the PSS user airlines. They continued, stating as follows:

As a shared platform, our PSS allows enhanced interconnectivity for knowledge sharing between airlines at worldwide level *<mutual learning on a worldwide scale>*. (JVP, Computer Division/Air Lepus)

As mentioned, several airlines in the other alliance shared specific experiences at the PSS workshop. Great chance to learn more from others. *<mutual learning on a worldwide scale>*. (SM, Software Design/Air Lepus)

This view can be supported by Executive Vice President that the common platform along with knowledge of specialised products and targeting long-haul destinations would play important roles in Air Lepus' fostering mutual learning and reaching global markets:

Fortunately, we have more and more alliance airlines using our PSS. Because we and they can see different sales patterns like how to do up-sell and cross-sell at higher price, as looking for special price and nego fare [on] real time basis *<mutual learning on a worldwide scale>*. (EVP, PSS Project Division)

Foreign market operation from home region {+} & ***Industry knowledge acquisition*** {+}: When firms look for global expansion but face higher costs than local firms due to a lack of local information and knowledge, they tend to locate foreign operations from their home region and exploit valuable knowledge learned in one country in another

country (Banalieva & Dhanaraj, 2013; Berger, DeYoung, Genay & Udell, 2000; Cerrato, 2009). Both interviewees responded as follows:

{By stating emphatically} Taiwan is a small country, and the number of [its] outbound travellers is not growing. So, we want to carry more foreign passengers using Origin-Destination [based] revenue management to sell more seats to foreigners online, from Southeast Asia to other regions. That's why our PSS is the key IT [that] offers a new way of online sell *<foreign operations from home country>*. (JVP, Computer Division/Air Lepus)

As per foreign market operations in Taiwan, for the full operation, we saw it could be a positive driver *<foreign operations from home region>*. But, we'll figure out the effect later *<full conversion>*. (SM, Software Design/Air Lepus)

The airline industry was not truly global in the past, as airlines faced significant institutional and environmental restrictions when operating in foreign markets (Narula & Verbeke, 2015; Rugman & Verbeke, 2008). For this reason, to be successful in foreign markets, international carriers started to leverage 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 & Sleuwaegen, 2005, p. 579). After chatting about cost-effective foreign operations, SM continued:

More and more, we have complex rules and unfamiliar cases we haven't met before. We must catch up industry updates for new solutions, collect other airlines' practices [and] select wider possible options also. *<industry knowledge acquisition>*. ... Yes, [it was] positive influences before the full implementation *<full conversion>*. (SM, Computer Division)

For a prospective PSS user, for instance, data synchronisation in an internet-based EDI format is a key service that PSS offers towards homogeneous platforms at little or no cost. Hence, PSS adopters are capable of providing their point of sales and touch points with

homogenised content of passenger information in a structured standard format through the shared distribution and service networks without incurring additional cost. From an industry report, this was supported by the Senior Vice President:

Taking an example, free data transfer is more important for airlines than price, but there was no free information exchange channel between different airlines systems. ... But, OrcheStra is the only one that offers the full suite of airline solutions, including free data transfer. Through the information channel, we were able to get to know this free service available before our business case. It was one of the useful industry knowledge, for instance *<industry knowledge acquisition>*. (SVP, Alliance IT/Air Lepus)

It has been known that the air distribution chain is a typical example of the impact of IT/IS on inter-organisational relations, and it has mutually created knowledge-based global marketplaces. However, this study discovered from this conversation that, in the past, Air Lepus had trouble producing “technology-generated information” (Stonehouse, Pemberton & Barber,, 2001, p. 116) through their old reservation systems:

Regarding TSA²⁰'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 the platform, now we see [the] right sources available *<industry knowledge acquisition >*. (JVP, Computer Division/Air Lepus)

Stonehouse et al.'s research (2001) suggests that the utilisation of technology-generated information through distribution channels has become a powerful means of creating new knowledge to enhance 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. Based on the above

²⁰ The Taipei Songshan Airport; it is one of the major commercial airports located in Taipei, Taiwan.

conversations in terms of environmental adoption factors, this research predicted that seven variables positively interacted with decision making and full conversion within the PSS adoption phase, and the interaction of these environment external factors can be displayed linearly in the diagram in Figure 51. While vendor support, as the only state-variable in a bubble that created an issue, is mediating between industry pressure as well as time-to-market and full conversion, the other six variables directly influence two outcomes of PSS adoption. In ALP, mimetic forces are particularly limited in playing a role as an adoption driver, it being the case that the pressure comes from the same alliance members that would be regarded as potential competitive players within the East Asia airline market, not from existing market competitors.

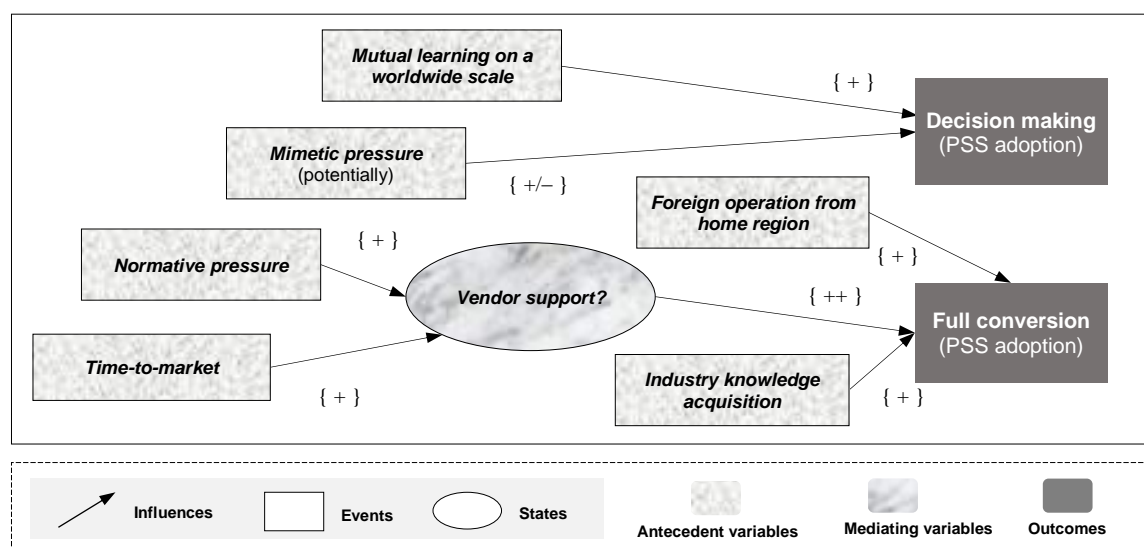


Figure 51. Event-State Causal Display: Environment Factors – Air Lepus

6.6.4 Expected impacts on business value

This new long-term PSS agreement is testament to our continued strategy to strengthen Air Lepus' service enhancement and expand not only our global customer base but also our network to other continents. (Executive Vice President, Air Lepus)

6.6.4.1 Strategic benefits – Air Lepus

Strategic benefits from the effects of IOS adoption include the opening of new global markets and the development of advanced 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 in the global marketplace with similar or dissimilar partners (Zhu et al., 2006). In airline distribution, access to a wider global network (Roberts, 2015) and greater availability of competitive services to offer to passengers (Silva, 2012) are identified as strategic benefits by sharing advanced booking platforms and distribution channels. Air Lepus informants mentioned the expected strategic benefits as follows:

Access to global market

Even though we already had our distribution channels in the old system before the adoption this time, the new PSS will give us more flexible linkage and rapid responses to all partners. ... Our PSS products will be useful tools to expand the distribution network more globally <Access to global market: *additional strategic airline partners*>. (JVP, Computer Division/Air Lepus)

On the plus side, we can easily look for O&D-based²¹ flight schedules to the potential global partners as well <Access to global market: *increased number of code-share/connection flights*>. (SM, Software Design/Air Lepus)

In the case of Air Lepus, one of the two core PSS impacts on strategic benefits as part of business value is access to global markets; according to the interview participants, the effectiveness of this benefit can be mainly achieved by the growing number of strategic partners that use the same PSS, in particular. This view from the airline business

²¹ An ad-hoc IT system in airline distribution enables airlines to forecast future demand for different fare classes and sell each seat with the highest possible revenue based on origin-destination (O&D) statistics, forecasting, modelling and decision support. Compared to a leg-based control (i.e. point-to-point), O&D control can retrieve more benefits by creating potential connection flights (Benckendorff et al. 2014).

perspective is supported by Roberts (2015) in relation to the effect of running compatible reservation systems. The other strategic benefit from the interview with the informants is a wider range of competitive services. As the two informants put it:

Competitive services

I think this benefit would be outstanding. In fact, offering competitive services is what we can do more, using the new system, in the whole the passenger services <more competitive services>. It ranges from, for example, online re-booking, automated repricing, automated refund, ... faster aircraft change process and so on <competitive services: *automated functionality*>. The new system can provide the automated functions that make our customers more convenient on the Internet and comfortable at the counters (SM, Software Design/Air Lepus).

For further, we see the new system will bring us more competitive way of ancillary services and streamlined passenger services. Unlike our old system, our PSS supports these new trend services in function <competitive services: *customised add-on services*>. (DSVP, Alliance IT/Air Lepus)

Collectively, a wider range of competitive services can be delivered by automated functions in booking, ticketing and re-seating without human intervention that enable travellers to be hassle-free online or at the airport. Higher competitive services may be possible due to managing ancillary or customised services such as special baggage handling, aisle seating and car hiring on code-share/connection flights or surface transportation. This explanation is also supported by Silva's (2012) findings on greater access to competitive services from the airline alliance's common IT platform.

6.6.4.2 Operational benefits – Air Lepus

Classic operational benefits in the IOS environment include greater cost efficiency through the advanced distribution channels and more efficient coordination structure

(Robey et al., 2008). In a similar vein, operational benefits from PSS involve reduced transaction costs through extended distribution channels, which would bypass the intermediaries (e.g. travel agents); this results from the interoperability of PSS that enables PSS-user airlines to interplay directly with the marketplace (Roberts, 2015). In ALP's case, at this stage, the two informants in fact deferred their answers about the cost reduction effect from PSS adoption. Senior Vice President and Senior Manager made the following statements about the impacts on operational benefits:

Reduced transaction costs

Well, it is hard to say now we'll have reduced transaction costs through the PSS distribution channel. Because, using a better system ... the more can sell tickets, the more we pay fees. So, I think the effect is equivalent, isn't it? Rather, our company has focused on generating a higher yield <Transaction cost reduction: *yield management*> from the PSS total solution. (SM, Computer Division/Air Lepus)

Yes, still too early to compute this effect by number. I mean it's not easy to judge now [whether] how much we can save [the money] in operating [the new] system, because the variable cost of using PSS is based on the number of boarded passengers. But, the cost structure of operating old in-house systems was fix based. So, one or two years later, we'll able to gauge it whether OrcheStra brings us cost-saving benefits in distribution. (SVP, PSS Migration/Air Lepus)

Then, the executive and the manager continued to emphasise the alternative way of generating benefits from the ALP's perspective as follows:

Revenue-focused operation

Along with the PSS inventory module, we also adopted revenue management system in a package; such a combination and operation changes would contribute to more benefits as revenue-focused airline, not just saving

distribution costs. So, this means we're going with the way ... we can sell more and much higher <revenue-focused operation: *optimised pricing*>! (SVP, PSS Migration/Air Lepus)

Together with an ad-hoc IT system known as their revenue management system, seamless connectivity through the homogeneous platform allows airlines much improved control over their seat inventory between strategic partners over the global network (Belobaba and Odoni, 2009). Taking examples, the manager briefly commented on how to increase benefits using the ad-hoc application in association with the PSS core module as follows:

Maybe, the new functions like O&D based inventory control in our PSS will give us more tools to earn money. From a different perspective of view of seating and selling, just like we sell additional services and add-on products with partners, rapidly and quickly, without any software development <revenue-focused operation: *O&D based seat allocation*>. (SM, Computer Division/Air Lepus)

This is consistent with the view of Chatfield and Yetton (2000) who claimed that the implementation of sophisticated solutions enables a fast response to customer-focused products for new varieties of diverse travellers such as cross-sell and branded fares. Based on the comments of the Air Lepus respondents, Table 18 summarises the technological, organisational and environmental impacts on business value using the PSS package. These findings on the expected business value predict that Air Lepus will be able not only to access a wider global air travel market and greater competitive services at the strategic benefit level, but also to apply enhanced origin-destination control to their inventory management at the operational benefit level.

In terms of the possibility of saving transaction costs through the PSS, the Air Lepus key members in charge of the PSS adoption programme suspended judgement during the interview, because the airline has decided to focus on revenue-based operation in

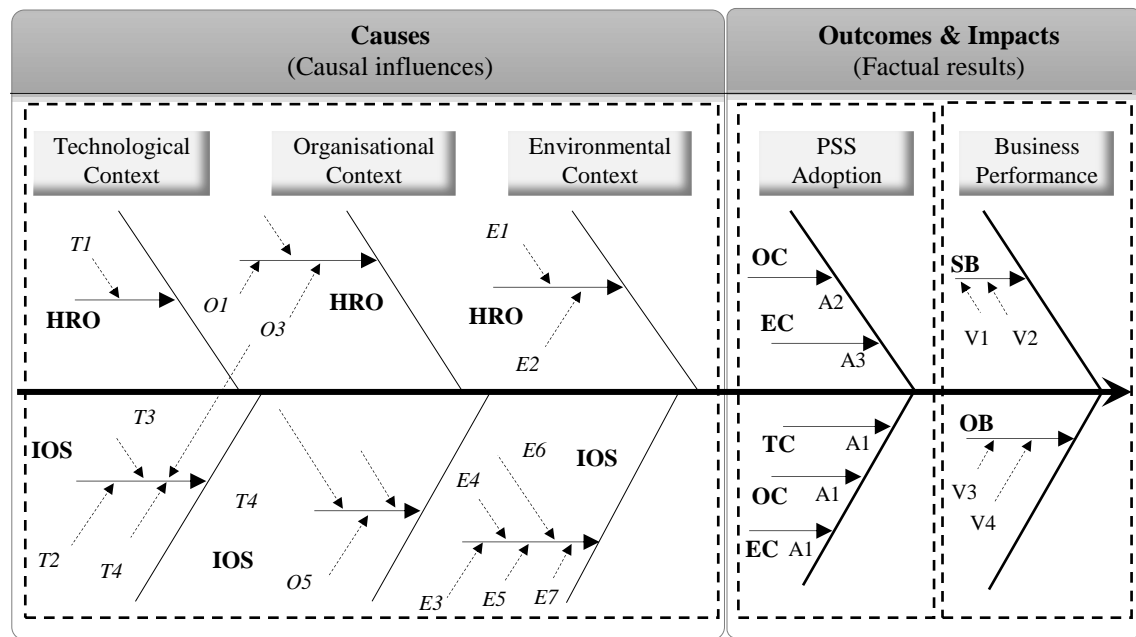
distribution and passenger sales at this present time. Instead, they believed that advanced automation in pricing and optimised revenues per passenger through the revenue management software in association with the PSS inventory module should enable ALP to raise its operational benefits by rapidly maximising route yield and interactively offering higher pricing on its package (e.g. branded fares and seasonal prices) to cater for travellers' new flavours and varieties.

Table 18. Impacts on Business Value after PSS Adoption – Air Lepus

Expected strategic benefits	Expected operational benefits
<p>Access to global market</p> <p>[Key initiatives]</p> <ul style="list-style-type: none"> - Additional strategic airline partners - Increased number of code-share/connection flights 	<p>Reduced transaction costs (reserved)</p> <p>[Key initiatives]</p> <ul style="list-style-type: none"> - Cost reduction operation -> Yield management
<p>Competitive services</p> <p>[Key initiatives]</p> <ul style="list-style-type: none"> - Automated functions online and at the airports - Customised add-on services 	<p>Revenue-focused operation</p> <p>[Key initiatives]</p> <ul style="list-style-type: none"> - Optimised pricing - Origin-Destination based seat allocation

6.6.5 Causal influences and factual results

Similar to the previous sections of 6.4.5 and 6.5.5., three causal relationship displays (Figure 49–51) across the PSS adoption factors within each of the TOE contexts and impacts of PSS on business value in Air Lepus may be synthetically represented in the fish-bone diagram as shown in Figure 52. This simply-visualised map can explain the interrelation between influential variables in PSS adoption and factual results (i.e. outcomes in the adoption stage and impacts on business performance) for better understanding of the multi-directional causal mechanisms.



HRO: Home region-orientation **IOS:** Inter-organisational Systems

T1: Technology standards, T2: Interoperability, T3: IS personnel staffing, T4: Common platform

O1: Global network, O2: Seamless services, O3: Strategic partnership, O4: Expert training

O5: Top management support, O6: Organisational transformation

E1: Mutual learning on a worldwide scale, E2: Foreign operation from home country, E3: Time-to-market

E4: Normative pressure, E5: Mimetic pressure, E6: Vendor support, E7: Industry knowledge acquisition

TC: Technological context **OC:** Organisational context **EC:** Environmental context

A1: Decision making, A2: Resource allocation, A3: Full conversion

SB: Strategic level benefits **OB:** Operational level benefits

V1: Access to global markets, V2: Competitive services

V3: Reduced transaction costs, V4: Revenue-focused operation

Figure 52. Fishbone Diagram: Adoption Factors and Business Value – Air Lepus

6.7 Summary of the Chapter

In sum, this Chapter 6 delved into three sub cases that explain why and how the selected home-region oriented airlines adopt PSS, in the form of a within-case study that covers a snapshot of the company, the PSS products and the overall phenomena related to PSS adoption. Together with the empirical data collected from a set of international carriers in Japan, Korea and Taiwan in an airline alliance as the same PSS subscribers, the embedded cases unveil the causal influences in PSS adoption, outcomes from the influential factors and expected impacts after the adoption of PSS.

The cases also explain the causal relationships in the TOE context and predict the business value of PSS. Relying on in-depth interview conversations, written post-interview replies and some public reports, the case study results provide evidence-based explanations in conjunction with supporting literature and empirical findings. To show this theoretically, the TOE framework, a causal display skill and a fishbone diagram are utilised in arranging and representing the underpinning qualitative variables and their relationships.

End of Chapter 6

CHAPTER 7: DISCUSSION ON FINDINGS

7.1 Outline of the Chapter

Based on the case study results, this chapter reports a series of discussions on the three PSS adoption cases in a within-case format followed by a cross-case study as per the embedded research strategy. Section 7.2 presents a precis of the discussion ‘from a bird’s-eye point of view’. Based on each of the subcase results reported in Chapter 6, Section 7.3 focuses on explaining: (i) why each home-region oriented airline adopted the PSS, (ii) how the adoption factors influenced the adoption as drivers and barriers in the TOE contextual elements, and (iii) how PSS would impact business value to enhance its benefits through the considered PSS. The discussions, considered in conjunction with the case-oriented approach, highlight the findings on cause-effect in PSS adoption at the single firm level (i.e. the within-case) and present the airline’s expectation of business value. Section 7.4 discusses generally similar results and contextual patterns (i.e. a literal replication) and also adds complements to the related findings, expanding the single case to the multi-firm level (i.e. the cross-case). The cross-case discussion finalises the conceptual research framework and briefly debates rival explanations with alternative views to the existing body of knowledge in the adoption of IOS and HRO. Section 7.5 draws implications for theory and practice, followed by insights relevant to incumbent/prospective top managers in the airline industry.

7.2 A Precis of the Discussion

This section describes how this study approaches the discussion of the findings and the relevance of the propositions, beginning with a revisiting of the research questions:

- 1. Why do the target airlines need PSS?**
- 2. How influential are the identified factors to their PSS adoption?**
- 3. What are the predicted impacts of PSS on their business?**

In response to the set of research questions, this study offers speculative research answers based on in-depth evidence drawn from on-site interviews, field notes and secondary data sources from three East Asian air carriers that are understood to be home-region oriented firms. With a view to understanding the PSS adoption phenomenon under a qualitative positivist paradigm, this embedded case study offers grounded explanations, addressing why and how types of questions. As shown in Figure 53 regarding the method of drawing out answers, the explanations and answers incorporate theoretical interpretations based on the identified research gaps and constructs within the pre-specified scope of the study using an existing theoretical framework.

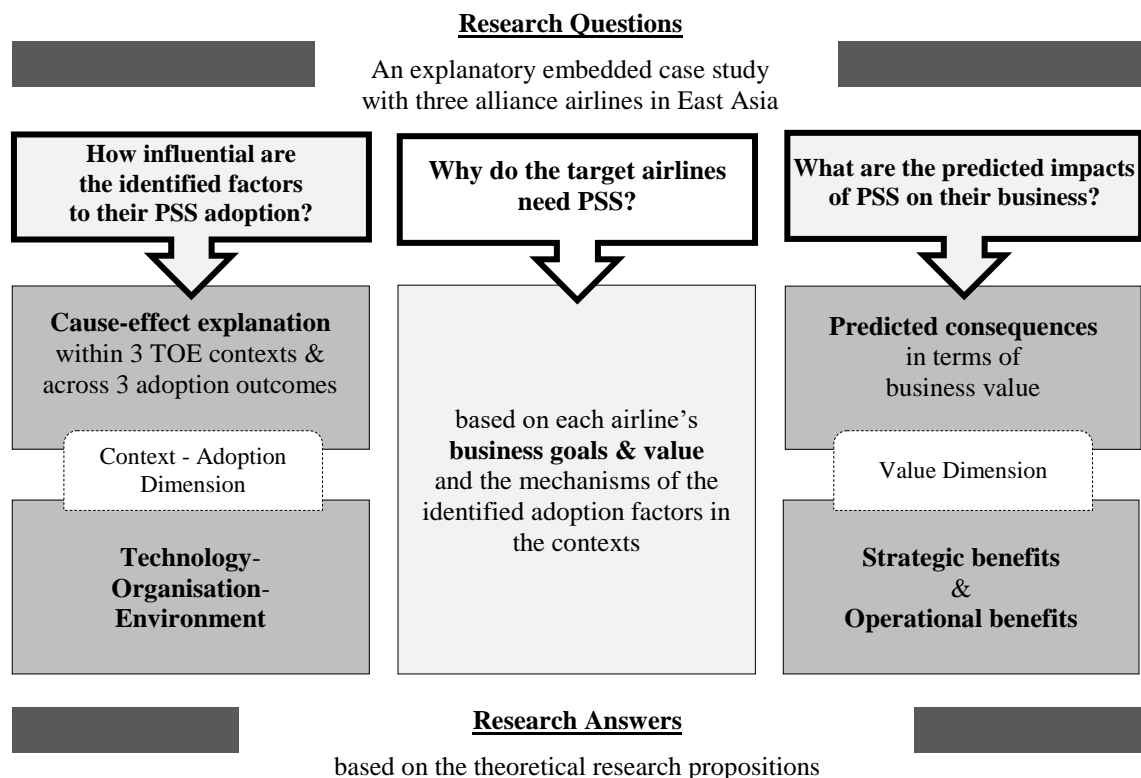


Figure 53. Approach to Drawing Out Research Answers

Within the cases discussed in Section 7.3, the first answer focuses on analysing key events and states (issues) that might influence PSS adoption and affect the business value of each

carrier based on the business goals, as described in detail in Chapter 6. The second answer describes how 28 contextual adoption factors were considered in decision making, resource allocation and full conversion by using a synthesised cause-effect display within TOE, causal narrative paragraphs and a causal relation map. The third answer then covers the expected organisational consequences based on predicted business value across two kinds of benefits. Section 7.4 condenses common and meaningful findings from the within-case study into an embedded discussion across the cases, in accordance with theoretical replication and comparison, as well as considering alternative views on specific findings that differ from the existing research on IOS adoption and HRO.

7.3 Within-case Discussion

The following three sub-sections include three single case analyses on Air Lynx, Air Libra and Air Lepus. Each sub-section also comprises three different discussions to respond to an individual research question. The first discussion on the reasons for PSS adoption requires an analytic mapping of business goals and business value (see Figure 54); the business goals are sourced from the snapshot of each airline's profile and PSS products in Chapter 6, and corresponding business goals are then identified within the business value of context dimension. The second discussion evidences the case study findings in the form of a within-case (i.e. a single analysis) network; a unified causal network per each airline presents three consolidated causal displays derived from those in the previous chapter (Figure 37–39: Air Lynx, Figure 43–45: Air Libra, and Figure 49–51: Air Lepus) and offers a causal network narrative that assists each causal display. The causal network is a summarised form that presents meaningful events and states on a multi-directional cause-and-effect display at the inferential level of analysis, while the causal narrative enables the qualitative explanatory research to better reflect the main streams in causation across factors, outcomes and impacts by writing out the narrative as

a tale or story of facts. The last discussion on business value from PSS then comes with three business value maps (in Figure 56/58/60) in tabular form to manifest strategic benefits and operational benefits.

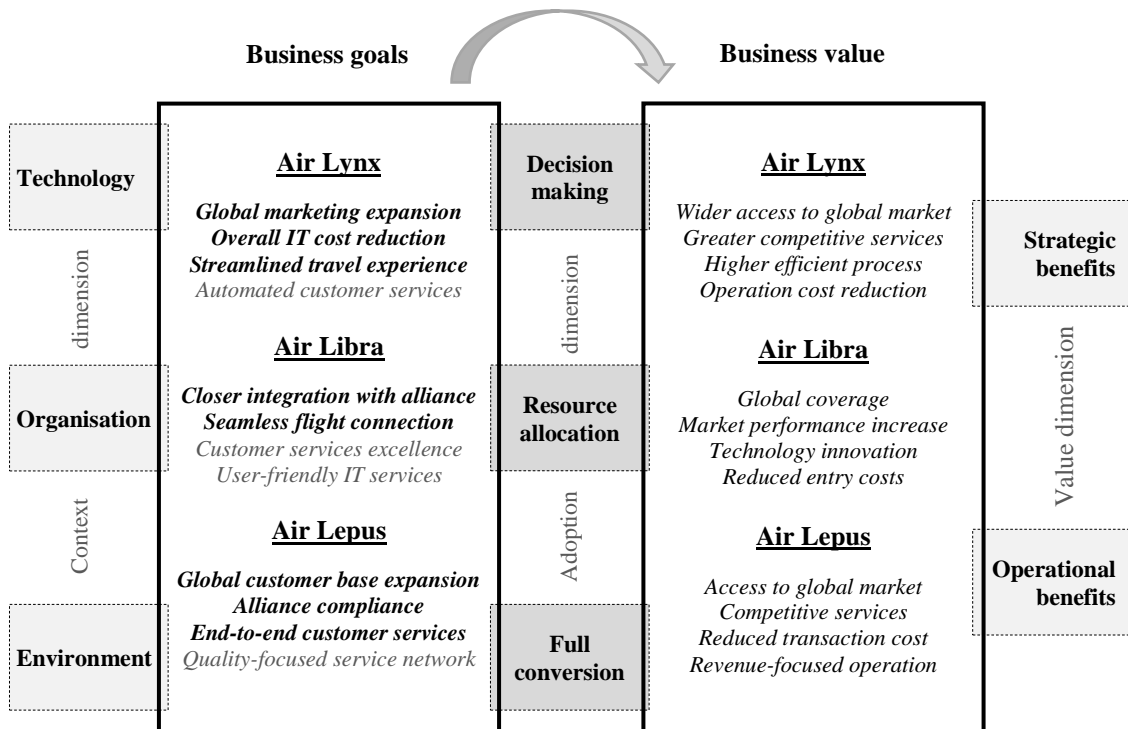


Figure 54. Business Goal - Business Value of PSS adoption

7.3.1 Air Lynx (ALX), Japan

This sub-section provides a single within-case analysis on Air Lynx, a Japanese commercial carrier, and answers the given research questions. As described in Chapter 6, ALX completed six years on its PSS adoption project, starting with decision making in 2012 and ending with full conversion in 2017.

7.3.1.1 Why does ALX need PSS?

Air Lynx's executive members formally mentioned the business goals of the project upon its PSS adoption decision making in their press release in 2012; briefly, ALX's primary business goals due to the adoption were: global marketing expansion, overall IT cost

reduction, streamlined travel experience and automated customer services. Amongst these goals, this study finds that the first of the three elements (shown as bolded items in Figure 54) correspond in meaning and context with previously specified internal factors (i.e. <global network, cost in IS operation and seamless services: organisational context> in Table 3–5 of Section 3.4.1, and they were also validated by Air Lynx’s informants during the interview²². However, the opinion regarding the remaining goal of overall IT cost reduction was reserved during the on-site interview.

In terms of the business value of PSS, ALX’s Programme Director and Deputy Programme Director responded that wider access to global markets, greater competitive services, more efficient processes and operation cost reduction would be the major business value contributors that Air Lynx could expect from the adopted PSS. These would be strategically and operationally achieved by increasing interconnectivity with partners, developing add-on products and value-added services, enhancing on-time operation through productive disruption control and reducing distribution costs in the long-term. Consistent with these findings from the evidence, in short, the reasons why Air Lynx adopted PSS can therefore be explained as the first research answer:

The reasons for PSS adoption: Air Lynx should (i) **expand its global marketing**, (ii) **save overall IT costs** and (iii) **streamline the passenger travel experience** by means of the PSS capabilities of (iv) **increasing interline connections with strategic partners**, (v) **lowering transaction and distribution costs** and (vi) **simplifying the passenger service processes** from beginning to end.

²² With a reference to press releases in December 2016, global market expansion and streamlined travel experience were identified by the secondary data as evidence that Air Lynx would be able to deliver seamless passenger management from customer marketing to lounge service and increase code-share arrangements and global connections due to the enhanced inventory control capability.

7.3.1.2 How influential are the identified factors to ALX's PSS adoption?

To answer to this question in the form of explanation, consistent with the identified adoption variables and the set of influential relationships between the critical adoption factors, this individual case study on Air Lynx reveals a cause-effect diagram using a cognitive mapping skill and a process model technique (see Figure 55).

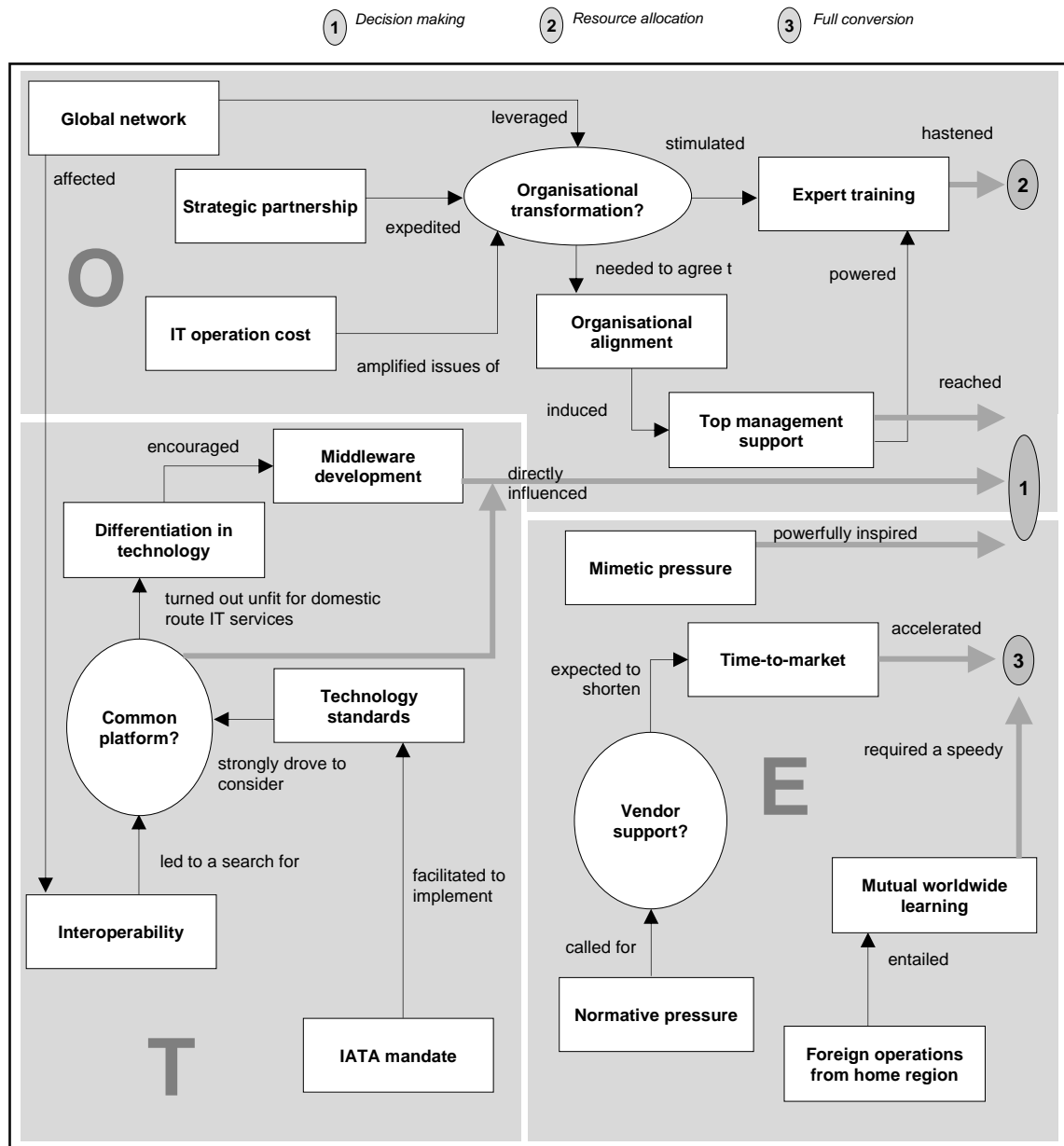


Figure 55. Cause-Effect Map: Adoption Factors and Outcomes – Air Lynx

The causal display depicted in Figure 55 contains 19 adoption components in the TOE contexts that might positively influence PSS adoption, classified in stages as affecting

three outcomes: (1) decision making, (2) resource allocation and (3) full conversion. A brief narrative for the influences between the adoption factors in the TOE contexts and the three adoption outcomes is as follows:

Technological factors – (1) Decision making: Driven by an organisational commitment to a *global network*, a need for *interoperability* led to a search for a PSS as a *common platform*. In parallel, *IATA mandate* strongly required implementation of the industry *technology standards* on the old reservation systems, and the resulting challenges also led to considering a *common platform*. However, Air Lynx was arguing how to then implement *differentiation in technology* for the domestic segment of its business where a differentiated, unique service is key to the local market. Alternatively, Air Lynx **decided to go with the PSS** for its international domain only and develop a *middleware application* for the domestic market.

Organisational factors – (1) Decision making & (2) Resource allocation: It was imperative that Air Lynx promote a *global network* and a stronger *strategic partnership*; these were not sufficient causes of PSS adoption. Together with the necessity of *reducing IS operation costs*, these three elements induced an *organisational transformation* that was a pre-requisite to PSS adoption. Nonetheless, *organisational transformation* was a critical internal issue, because *organisational alignment* and *expert training*, ranging from all users to IT experts at the firm level, were essential. A successful *enterprise-wide alignment* through organisational consensus finally led to *top manager support* in **decision making**. *Well-prepared training programmes* powered by ALX's top manager facilitated the **allocation of human and financial resources**.

Environmental factors – (1) Decision making & (3) Full conversion: *Normative pressure* from the airline market called for the *PSS vendor's strong support* while, as a

direct driver, *mimetic pressure* from competitors influenced Air Lynx's **decision making**. Air Lynx's PSS vendor's commitment to *time-to-market* accelerated **full conversion**, together with a mediating variable, the need for *mutual worldwide learning*, which was a pre-requisite of *foreign operations from home region*.

7.3.1.3 What are the predicted impacts of PSS on ALX's business?

This third question within-case study regarding Air Lynx discusses the impact of PSS on the airline's business, incorporating airline distribution and passenger services to predict business value at strategic and operational levels in the value dimension of the research model. Inferred from the work of Källström (2005) and Robey et al. (2008), strategic benefits refer as indirect benefits to impacts of PSS on passenger business growth through distribution and sales channel, while operational benefits are direct benefits that reflect the impacts of PSS on the airline's efficient operation related to passenger processing. Relying on the interview data and Air Lynx's press release, as explained in Section 6.4.4, this section summarises that there would be two impacts on each of the expected strategic benefits and operational benefits, respectively. Those benefits can be leveraged by eight kinds of different practices and activities focused on by Air Lynx (see Figure 56).

Strategic benefits: Air Lynx anticipates that **global market expansion** and the **competent products/services in airline distribution** that accompany PSS will become the main strategic benefits to the Japanese carrier. Specifically, these strategic benefits will be likely to result from *unlimited code-sharing* through the widened distribution channels that the related PSS modules provide, and *up-selling* (i.e. add-on products available on booking and ticketing) through the PSS online sales software known as e-commerce and its built-in functions for ancillary item sales. ALX also forecasts and nominates that *allied interline connections* using the advanced alliance solution for

strategic partnership management in PSS and *value-added services* (i.e. cross-selling available on airports and in flights) through the e-commerce package and online check-in for the value-added services will contribute to its **passenger services**.

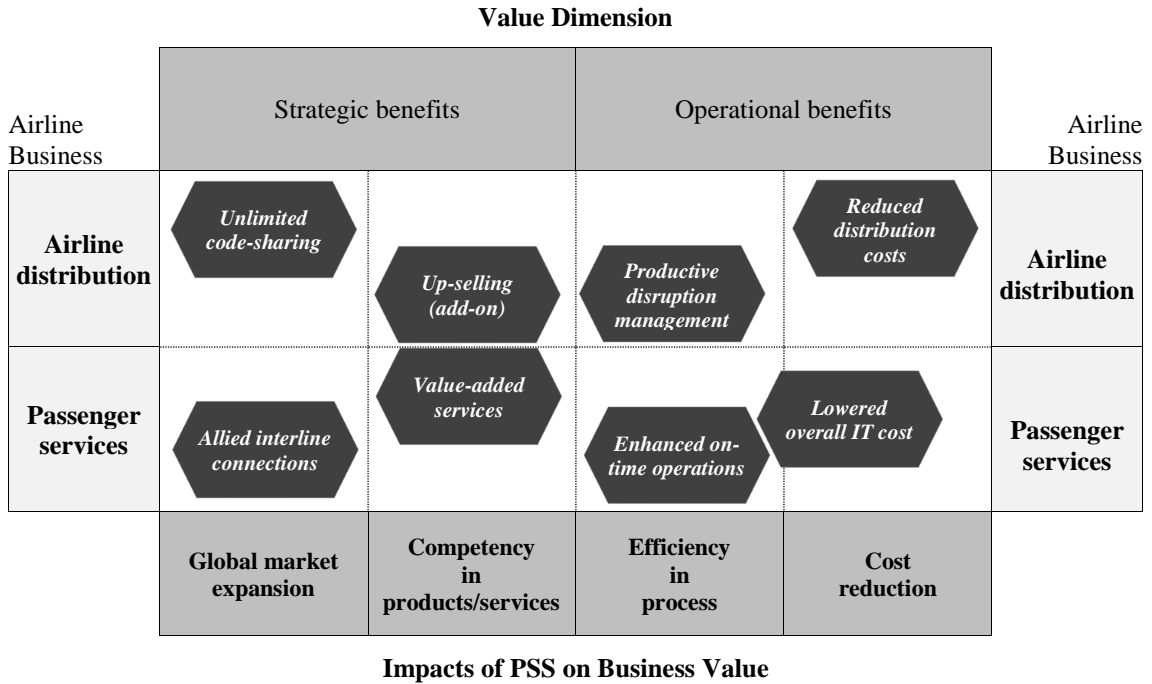


Figure 56. Business Value Map on Airline Business through PSS – Air Lynx

Operational benefits: **Higher efficiency in process** and **operational cost reduction** will be two of the most explicit impacts of PSS on operational benefits. In term of **airline distribution**, ALX expects that *productive disruption management* due to high quality of data processing between reservation and inventory, which are the solid building block-like modules in the PSS, and *reduced distribution costs* through the direct sales channels between PSS adopting airlines, will make a contribution to the realisation of operational benefits. Air Lynx also predicts that *enhanced on-time operation* using automated re-accommodation and pre-seating management as well as *lowered overall IT costs*, for instance, by means of the secondary disaster recovery service and free data transfer over XML, will enlarge Air Lynx's operational benefits in **passenger services**.

7.3.2 Air Libra (ALB), Korea

Similar to the previous within-case report, this second sub-section discusses the single case of Air Libra's PSS adoption based on the case study results in Chapter 6. The Korea-based airline had introduced its PSS over four years to replace the legacy technology-based RES; decision making took place in 2011, and full conversion was achieved in 2015.

7.3.2.1 Why does ALB need PSS?

According to quotes regarding the business goal and priorities of its platform-based PSS solution from a member of the Air Libra executive board in an ALB press release in 2011, Air Libra's ultimate business goals of PSS adoption were: closer integration with strategic partners, seamless flight connection, excellent customer services and user-friendly IT system services. Based on an analytic abstraction, this researcher identifies that the first two descriptions (shown as bolded items in Figure 54) coincide in meaning with the organisational adoption factors in Table 3–5 within Section 3.4.1, and the two goals—closer integration with strategic partner airlines <*strategic partnership*> and seamless flight connection <*seamless services*>—were confirmed by the interview participants, which were identified by secondary data sources from the Korean air carrier before the interview. On the other hand, the factors referred as customer service excellence and user-friendly IT services did not appear to be parts of business goals in conversation. Corresponding to the business goal and priorities, the Programme Director as well as the Deputy Manager, during the on-site interview, commented that global coverage, market performance increase, air travel technology innovation and reduced costs of entry to new foreign markets would be Air Libra's key business value predictions as the PSS's direct and indirect advantage when the adopter started to operate its PSS in earnest. At the strategic and operational levels, these expected values would be obtained by competitive

services with joint programmes on a global scale, effective responses to customer needs such as value-added services, efficient IT operation using a common-standard technology platform and distribution cost reduction for new long-haul markets. Based on the above findings and evidence from the public articles and the interview data, the leading reason behind adopting PSS in the case of Air Libra may be explained in brief accordingly as the answer to the first research question:

The reasons behind PSS adoption: Air Libra should provide its existing customers and potential travellers with (i) **closer integration between strategic partners** and (ii) **more seamless flight connections** by primarily using common functionality within the PSS such as (iii) **advanced flight schedule management for code-sharing** with allied partners across all distribution channels and (vi) **automated reservation and departure processes** from booking, boarding to disruption.

7.3.2.2 How influential are the identified factors to ALB's PSS adoption?

Using the same analytic template as in the Air Lynx case, this section for Air Libra offers an explanatory answer to the second research question. Based on the critical PSS adoption factors working in interrelated relationships across the TOE contextual factors, this individual case study on the Korean carrier produces a process model in the form of a causal network map; in the context of TOE, Figure 57 shows 19 adoption factors (Technology: 7, Organisation: 6 and Environment: 6) that identified as mostly positive drivers to PSS adoption on (1) decision making, (2) resource allocation and (3) full conversion. To enable a fuller understanding of the influential relationships in the cause-effect map, three TOE-based narrative explanations are as follows:

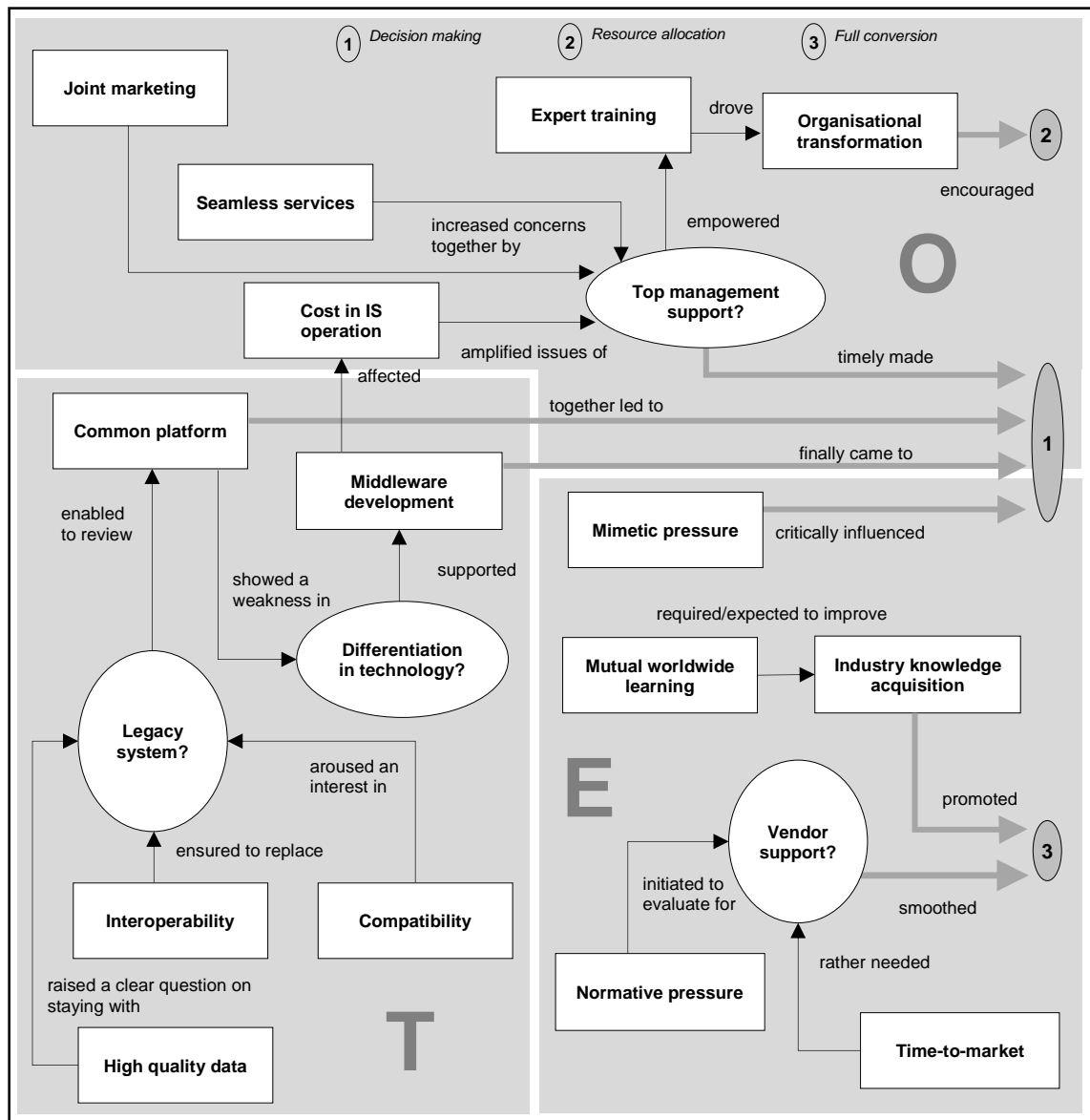


Figure 57. Cause-Effect Map: Adoption Factors and Outcomes – Air Libra

Technological factors – (1) Decision making: Two antecedent factors of causal variables in *interoperability* and *compatibility* aroused a furious discussion on phase-out of the *legacy systems* for more than five years. Meanwhile, the increasing number of data discrepancies, a fatal IS service, was fuelling the controversy. **High quality data** was a priority for Air Libra’s partnership programmes in mutual booking, ticketing and boarding with its strategic airlines. As a member of an airline alliance, ALB expressed interest in one of the PSS solutions, a prototype of the airline *common IT platform* that

showed a weakness in *differentiation in technology* for the Korean local services. Air Libra finally reached a conclusion (i.e. **decision making**) to adopt PSS and **develop a middleware** business server apart on its own, so that the airline could continue to support the localised services.

Organisational factors – (1) Decision making & (2) Resource allocation: While a stream from the technological domain, *middleware development*, was exerting a good deal of pressure for *IS cost increase*, induced by the facts that *joint marketing* and *seamless services* were becoming important in passenger sales and services within the alliance, Air Libra's top manager faced a big dilemma. With a long-drawn-out consideration of the business case, the top manager finally approved the PSS adoption—**top manager's decision making**, followed by *expert training* at the firm level that the management empowered the project team to monitor. After completing training programmes, Air Libra carried out a sizable *organisational transformation* before the necessary **resource allocation**.

Environmental factors – (1) Decision making & (3) Full conversion: An increasing *normative pressure*, together with a shorter *time-to-market* demand, initiated an evaluation for feasibility of *vendor support*. As a result, the PSS vendor's support, which proved to be a good fit in the industry with Air Libra's needs, worked as a positive factor in **decision making**. In parallel, *competitive forces* on the Korean air transport provider critically influenced ALB's decision on PSS adoption. It was also expected by Air Libra that *industry knowledge acquisition*, one of the merits of using PSS, would enhance *mutual learning on a worldwide scale*, in terms of the institutional changes and other adopters' PSS usage in booking/pricing, contributing to a speedy **full conversion**.

7.3.2.3 What are the predicted impacts of PSS on ALB's business?

This section provides a discussion on the impact of PSS on Air Libra's airline business in airline distribution and passenger services by predicting business value incorporating strategic benefits (i.e. indirect benefits to impacts of PSS on passenger business growth through distribution and sales channels) and operational benefits (i.e. direct benefits that the impacts of PSS have on the airline's efficient operation in relation to passenger processing). Based on the interview data and secondary data sources, and similar to that of ALX's case, this section also identifies four components of impacts on the possible strategic and operational benefits in terms of airline distribution and passenger services. ALB informants selected eight practices and initiatives in detail (see Figure 58).

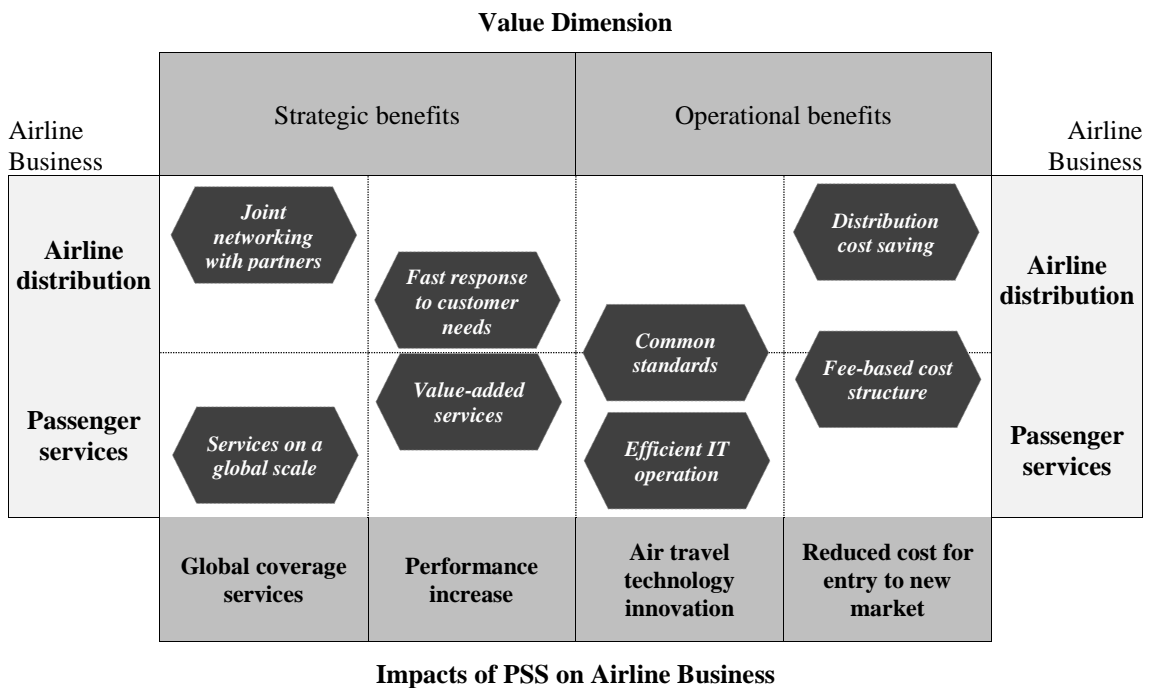


Figure 58. Business Value Map on Airline Business through PSS – Air Libra

Strategic benefits: Global coverage services and performance increase are selected as key strategic benefits that Air Libra expects from its PSS. More specifically, the Korean carrier focuses on the fact that strategic benefits in **airline distribution** will come from *joint networking with partners* through shared customer management in the alliance

solution module, and *rapid response to customer needs* due to a configurable application structure that enables service owners to cater for customer needs without an IT developer's support. Key informants of the airline also foresee that **passenger services** within strategic benefits will be enriched by *services on a global scale* using the widened distribution channels and *value-added services* via online sales and online self check-in for up-selling ancillaries and personalised pricing, for instance.

Operational benefits: This research identifies that **air travel technology innovation**, together with **reduced cost for entry to new market** will be the major impacts of PSS on operational benefits for Air Libra. According to the informants, operational benefits in **airline distribution** would be challenging to achieve, only to be realised over the long haul; nonetheless, Air Libra expects that *common standard technologies* in the PSS infrastructure level where the management of airline distribution and passenger services co-exist and *distribution cost reduction* through bypassing the connection to costly indirect sales networks for offline/online travel agents will make a potential contribution to the maximisation of operational benefits. Air Lynx's expectation of operational benefits in **passenger services** is composed of *efficient IT operation* and *fee-based (passenger-boarded) cost structure*, which will be flexible depending on the volume of passenger transportation and the selection of optional IT services specified in the PSS commercial agreement.

7.3.3 Air Lepus (ALP), Taiwan

This last sub-section of the within-case discussion deals with the single case analysis addressing PSS adoption by Air Lepus. In a surprise move, the service-leading Taiwanese air carrier decided to adopt its PSS in 2013 just before joining an airline alliance. With a three-year adoption period, ALP's full conversion was successfully completed in 2016.

7.3.3.1 Why does ALP need PSS?

During the adoption ceremony (after a formal announcement of decision making) in September 2012, when an Air Lepus executive board member made comments (supplemented by additional following remarks in industry articles) on the business goals in his speech, the goals of PSS adoption were identified as: alliance compliance, global customer base expansion, end-to-end customer services and quality-focused service network. By conducting a series of content analyses on the collected data, this research discovered the first three elements (shown as bolded items in Figure 54) to be the most well-aligned to the identified variables in meaning; they belong to the technological context as an external factor <*common platform*: alliance compliance> and the organisational context as internal factors <*global network*: global customer base expansion>, <*seamless services*: end-to-end customer services> in Table 3/4/5 of Section 3.4.1. The Air Lepus interviewees described a similar meaning and focus of the airline's business goals and background during the interview and through a subsequent interview answer sheet by email. However, any factor that could be regarded as the clue to quality-focused service network was identified from neither the interview nor the written responses.

During the on-site interview in May 2016, the Junior Vice President and Section Manager left their remarks on positive impacts on ALP's bottom line as the business value of PSS; Air Lepus would expect to realise access to a global market, competitive services, reduced transaction costs and revenue-focused operation as strategic benefits and operational benefits. The ALP's business value of PSS could be made by additional international connection flights with code-share partners, automated functions online and walk-in touch points, cost reduction using yield management tools and optimising sales price based on origin-destination inventory control. On the basis of the findings from evidence

between business goals and business value, the answer to the first research question of why Air Lepus adopted its PSS can be addressed:

The reasons for Air Lepus' PSS adoption: The Taiwanese airline might provide its existing customers and potential travellers with (i) **global customer base expansion**, (ii) **concrete alliance compliance** and (iii) **end-to-end customer service** through the PSS competitive IT services of enabling (vi) **increased number of code-share flights** with strategic partners and (v) **customised passenger sales and whole passenger processing** in line with the alliance's requirement.

7.3.3.2 How influential are the identified factors to ALP's PSS adoption?

To underpin an answer regarding the factors relevant to Air Lepus' PSS adoption, this section discusses the set of influential relationships among the identified adoption variables and adoption outcomes, based on a cause-effect diagram and causal narratives (see Figure 59). 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.

Technological factors – (1) Decision making: 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 favourable, in terms of *differentiation in technology* and *new technology development*. But, due to the heavy maintenance burden of the legacy systems, Air Lepus was challenged by *IS personnel staffing*. Encouraged by a commitment for *strategic partnership* and the advantage of using a *technology standard*, Air Lepus started to consider adopting an airline common system and **made the decision** to adopt the PSS. This decision meant that ALP would need *expert training* to prepare workaround

procedures for end-users and IT staff by giving up the development of new technology and functional differentiation.

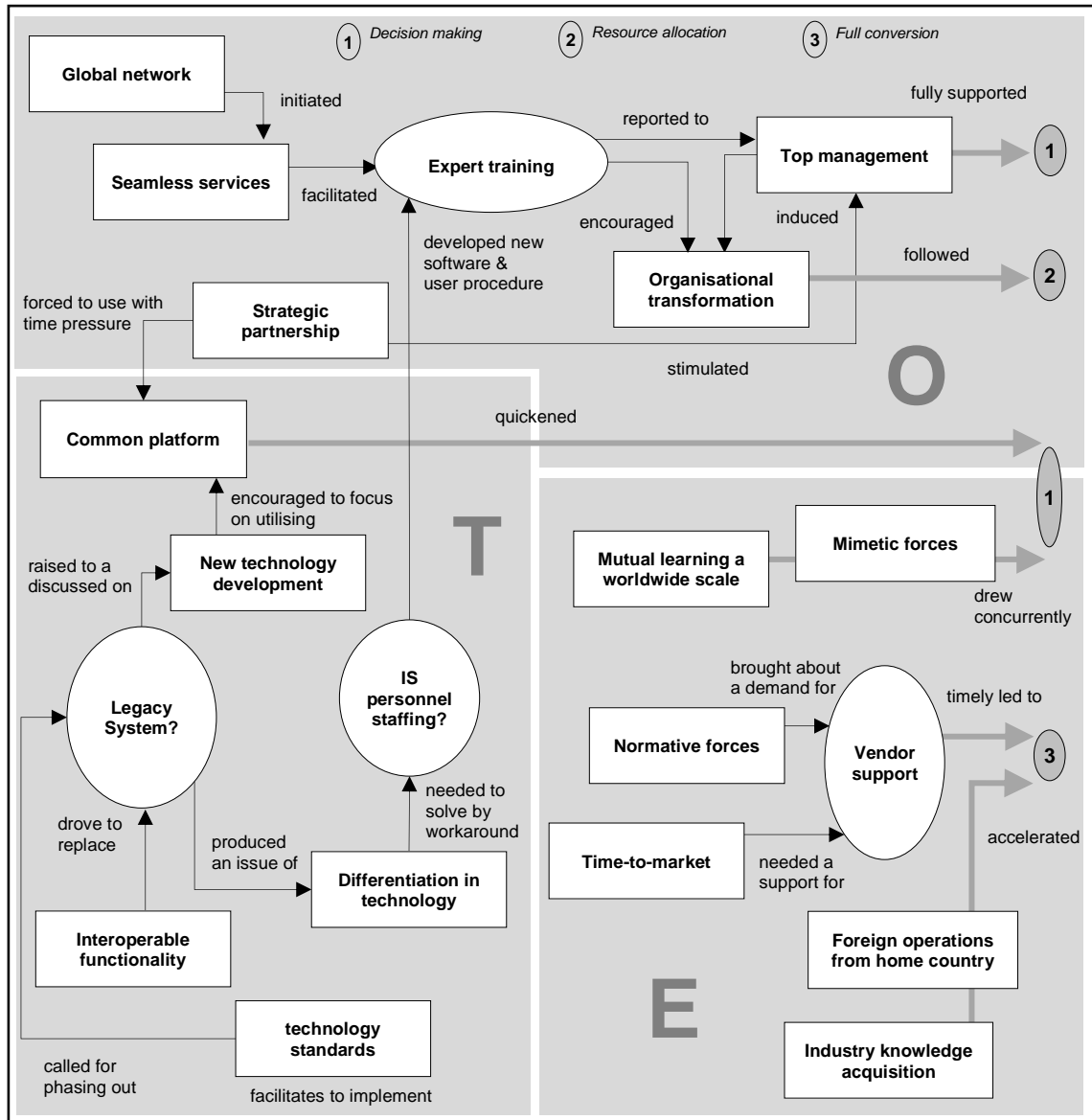


Figure 59. Cause-Effect Map: Adoption Factors and Outcomes – Air Lepus

Organisational factors – (1) Decision making & (2) Resource allocation: From the organisational 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 timely adoption. Facilitated by the necessity of strategic partnership, Air Lepus' *top management (support)* made the **decision** to go with PSS and **approved** an *organisational transformation* between IT and business units. His charismatic managerial power influenced **resource allocation** at the right time.

Environmental factors – (1) Decision making & (3) Full conversion: *Normative forces* in conjunction with *time-to-market* exerted power over discussion on an issue of *vendor support*. Because the PSS vendor had demonstrated great support in catering to the airline IT industry, the *vendor support* factor eventually worked as a driver to **full conversion**. Also, Air Lepus' particular requirements, *foreign operation from home-region* and *industry knowledge acquisition*, accelerated a prompt **full conversion**. Before the full implementation, **decision making** was directly influenced by a commitment to *mutual learning on worldwide scale* and *mimetic pressure*, including the forces from today's partner airlines using the same PSS that would be potential competitors in future.

7.3.3.3 What are the predicted impacts of PSS on ALP's business?

As the final part of this section, the within-case findings on Air Lepus lead to an answer regarding the impact of PSS on ALP's airline business and predicts how the airline will be able to leverage business value incorporating strategic benefits and operational benefits. Based on the evidence from Air Lepus, this study identifies that there would be three anticipated elements and one potential element as impacts on the combined business value by adopting PSS. They can be produced by eight initiatives and practices that Air Lepus will work towards (see Figure 60).

Strategic benefits: In **airline distribution**, Air Lepus predicts that **access to global market** and **competitive services** would be key strategic benefits; the benefit of **access**

to **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 *customised add-on services* through the e-commerce online shopping channel. The Taiwanese airline's focus in order to obtain benefits in **passenger services** will be *increased number of code-share/connection flights* and *automated online/airport IT services* that the PSS alliance module, interline function and automatic ticket exchange/reissue/reprice software enable the PSS adopter to produce.

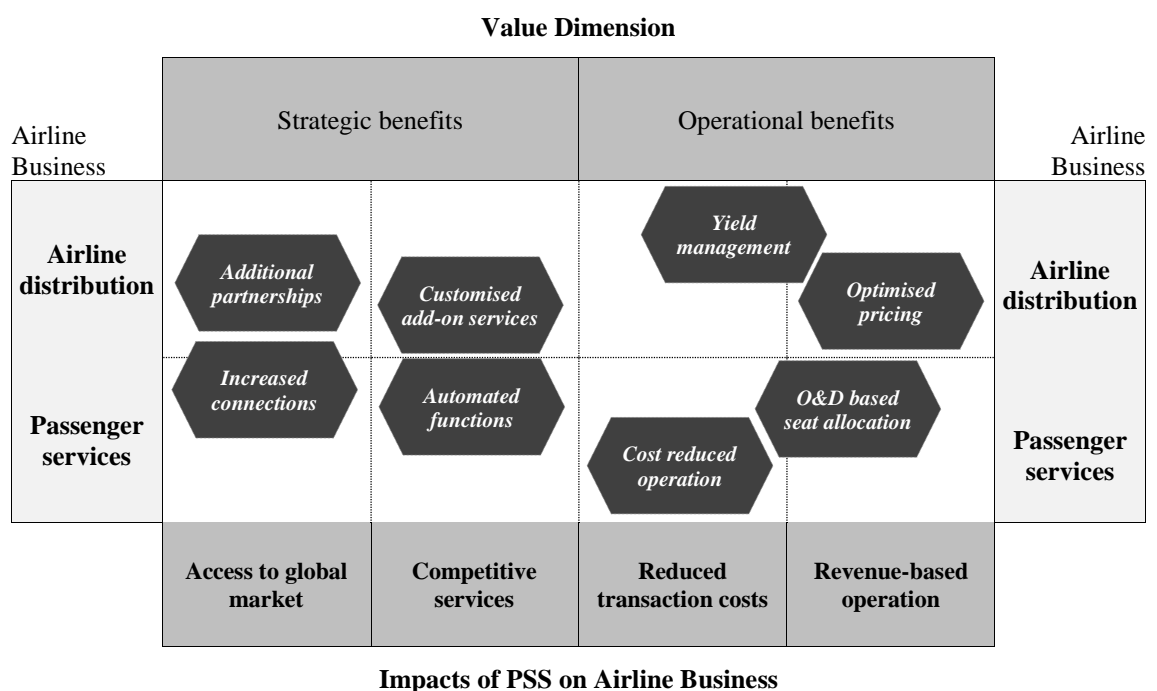


Figure 60. Business Value Map on Airline Business through PSS – Air Lepus

Operational benefits: According to respondents with Air Lepus, **reduced transaction costs** and **revenue-based operation** will be two of the strong impacts of PSS on operational benefits. In terms of **airline distribution**, the Taiwanese air carrier anticipates that, rather than cutting distribution cost through the PSS sales channel, *yield management* and *optimised pricing* using revenue management software, which is a high-end optional product of the PSS, will contribute to Air Lepus' operational benefits in association with the inventory control module in the short-term. Regarding the benefits in **passenger**

services, Air Lepus predicts that *cost reduced operation* could be embodied in the long-term by maximising the effect of cost reduction on volume-based usage fees. However, *origin-destination-based inventory control* for the global market and long-haul routes will probably bring the expected direct operational benefits to the airline.

7.4 Cross-case Discussion

Based on the three within-case discussions, this section now reports a synthesised cross-case analysis. As Yin (2009) advises, because each individual case study in an embedded multi-case design already enabled in-depth analysis and information-rich replication by other individual cases, as reported in Chapter 5 and Section 6.4–6, this cross-case discussion offers generalised findings and inferences in summary. In an embedded view, hence, it proposes specific and contextual patterns, demonstrating a literal replication. In a similar way to how they were addressed in the within-case discussions, this cross-case section responds to the research questions, leading with the three sub-sections. Based on the within-case findings on business goals versus business value, the first sub-section addresses the first research question by identifying commonality in meaning. With two tabular representations, the second sub-section summarises common influential factors, including the two most salient elements, in PSS adoption across the three airlines. The third sub-section then discusses the commonly predicted business value by comparing strategic benefits and operational benefits and presents a list of cause-effects on PSS adoption, followed by a simplified diagram of the final research model.

7.4.1 Why do the target airlines need PSS?

Based on an analysis of the interviews and comments on the background of their PSS adoption, Table 19 contains three different reasons behind PSS adoption from Air Lynx, Air Libra and Air Lepus, which were explained in Section 7.3.1, 7.3.2 and 7.3.3. Thus,

this section highlights that *global marketing expansion* and *global customer base expansion* are commonly identified business goals from the evidence.

Table 19. Reasons for Adopting Passenger Service Systems

Airline	Business goals matching business value	Commonality	Common goals
Air Lynx	<i>Global marketing expansion</i>	●	'Global network'
	<i>Overall IT costs reduction</i>		
	<i>Streamlined the passenger travel experience</i>		
Air Libra	<i>Closer integration between strategic partners</i>		'Seamless services'
	<i>Seamless flight connections</i>	●	
Air Lepus	<i>Global customer base expansion</i>	●	'Strategic partnership'
	<i>Concrete alliance compliance</i>	●	
	<i>End-to-end customer service</i>	●	

These goals have a thread of connection in meaning with **global network** within the organisational context. Similarly, *seamless flight connections* and *end-to-end customer services* make a pair with a keyword of **seamless services** amongst the nine organisational factors, and *closer integration between strategic partners* and *concrete alliance compliance* coincide in contextual meaning with **strategic partnership**.

Cross-case analyses can work powerfully when moving from case-specific explanations to more generalisable constructs (Miles et al., 2014). Based on these common goals across the three airlines, this cross-case study that utilises specific contextual patterns offers the first answer to the primary research question:

Common reasons for PSS adoption: Three home-region airlines in East Asia sought to (i) **develop their global network**, (ii) **provide seamless travel services** and (iii) **establish a strategic partnership** by means of the PSS capabilities of simultaneously increasing code-share flights and interline connections with strategic partners and automating all reservation and departure processes from booking, boarding to disruption.

7.4.2 How influential are the identified factors to their PSS adoption?

Drawing on the previous single case studies, this cross-case work identifies 18 common contextual factors amongst possible 28 variables (Technology: 6/11, Organisation: 6/9, Environment: 6/8) and influential interactions within the TOE contexts, as shown in Figure 61. In the tabular chart, a theoretical basis (i.e. field or area) is associated with each of the identified factors.

Context	Identified factor	Field/ Area	Air Lynx	Air Libra	Air Lepus
Technology [6/11]	Interoperability	IS	+	+	+
	<i>Compatibility</i>	IS		+	
	Technology standards	IS	++		++
	<i>IATA mandate</i>	IB/AI	+		
	<i>High quality data</i>	IS		++	
	Differentiation in technology	IB	+/-	+	
	<i>Legacy systems</i>	IS		+/-	
	Common platform	IS/AI	++	++/-	++
	<i>New technology development</i>	IB			
	<i>Middleware development</i>	IS	+	+	
	<i>IS personnel staffing</i>	IS		+	+
	Outcomes of the adoption:		DM	DM	DM
Organisation [6/9]	<i>Strategic partnerships</i>	IS/AI	+		++
	<i>Joint marketing</i>	AI		+	
	<i>Cost in IS operation</i>	IS	+	-	
	Expert training	IS	+	++	+
	<i>Global network</i>	IS/AI	++		++
	<i>Seamless services</i>	AI		+	+
	Top management support	IS	+	++	++
	<i>Organisational transformation</i>	IS	+/-	+	+
	<i>Organisational alignment</i>	IS	+		
	Outcomes of the adoption:		DM, RA	DM, RA	DM, RA
Environment [6/8]	Mimetic forces	IS/IB	++	++	(+/-)
	<i>Normative forces</i>	IS/IB	+	+	+
	<i>Coercive forces</i>	IS/IB			
	Vendor support	IS	+	++	++
	<i>Foreign operations from home region</i>	IB	+		
	<i>Industry knowledge acquisition</i>	IS		+	+
	<i>Time-to-market</i>	IS	+	+	+
	<i>Mutual learning on a worldwide scale</i>	IB	+	+	+
	Outcomes of the adoption:		DM, FC	DM, FC	DM, FC

Most salient (2)
 IS: IOS adoption
 DM: Decision making
 ++: Strongly positive
 IB: HRO
 RA: Resource allocation
 +: Positive
 AI: Airline industry
 FC: Full conversion
 -: Negative
 +/ -: Mixed
 (): potential

Figure 61. Examined Factors Influencing PSS Adoption across the Airlines

As described in Section 4.4.5.1, by referring to non-verbal messages and conversation in tone, the most influential variables are identified by ‘majority’ (i.e. 3 of 3 or 2 of 3); based

on this content analysis approach (Neuman, 2003), this study identifies the two most salient factors in each of the TOE contexts in ***bold, italic and dark grey*** type, thereby offering a set of explanatory answers to the second question as follows:

Technological [mixed] context: While all technological factors only influence decision making (DM), *interoperability* and *common platform* are selected as the most influential factors that were relevant in all three cases, as both characteristics best represent the nature of PSS used as a commonly-used airline business IS.

Technology standards, *differentiation in technology* and *middleware development* appear as salient factors that influenced decision making (DM) by two airlines each. In particular, both *differentiation in technology* and *middleware development* were relevant to Air Lynx and Air Libra, because the two firms, both up against their local competitors, strongly intended to provide their regular customers with unique and customised IT services through the middleware, even after the PSS adoption, where technology differentiation would be essential.

Access and adherence to *technology standards* was also an important element to be very positively considered before the decision was made in the two airlines. *Compatibility* and *high quality data* were identified by Air Libra where data discrepancy was a critical issue before PSS; this means there might be an interrelated connection between the two variables in an unpredicted failure of integrity/consistency of data. *New technology development* had no apparent influence on the decision for PSS adoption to be made in any of the three airlines.

Organisational [internal] context: This research finds that all of the organisational factors commonly influence two of the three outcomes in PSS adoption: decision making

and resource allocation (RA). Within the organisation context, *expert training*, *top management support* and *organisational transformation* were perceived to be the key positive drivers to the two PSS adoption phases; the first two factors are supported by most of the IOS adoption-related literature, while the *organisational transformation* factor is relatively understudied. *Strategic partnership*, *global network* and *seamless services* appear to be the influential factors in relation to collaboration practices in international airlines, while addressing *cost in IS operation* is the only factor that a single airline would accomplish by use of the PSS. Given then the factor's rate (i.e. ++/+), *top management support* is understood to be the most powerful factor that leads to a strong commitment, ensures a clear line of internal communication between different units and encourages various internal initiatives (e.g. organisational transformation and alignment) in organisations considering PSS adoption.

Environmental [external] context: All the external factors in the environment context influence decision making and full conversion (FC) across the airlines. Except for *coercive pressure* and *foreign operation from home region*, the rest of the factors are important factors in PSS adoption. Among three isomorphic forces, *coercive pressure* appears to be absent within this cross-case; this is likely because PSS adoption is a commercial initiative where a direct regulatory force would barely have an effect. While *vendor support* is a critical common issue, due to the *vendor's strong commitment to support*, the factor works positively on PSS adoption. As long as three carriers are members of an airline alliance and play in a geographically small country where the air travel market is extremely competitive, both *mimetic forces* and *normative forces* are understood as key variables that influence the adoption across three carriers. *Time-to-market* and *mutual learning on a worldwide scale* are also selected by all three airlines as decisive factors in the environment context.

therefore, this cross-case offers a plausible explanation that *common platform*, *top management support* and *mimetic pressure* are the most salient factors in each context.

7.4.3 What are the predicted impacts of PSS on their business?

Through a unified business value map, Figure 62 presents the common impacts of passenger service systems on business value across Air Lynx, Air Libra and Air Lepus, showing how the predicted strategic benefits and operational benefits differently contribute to the domain of airline business (i.e. airline distribution and passenger services) made by PSS.

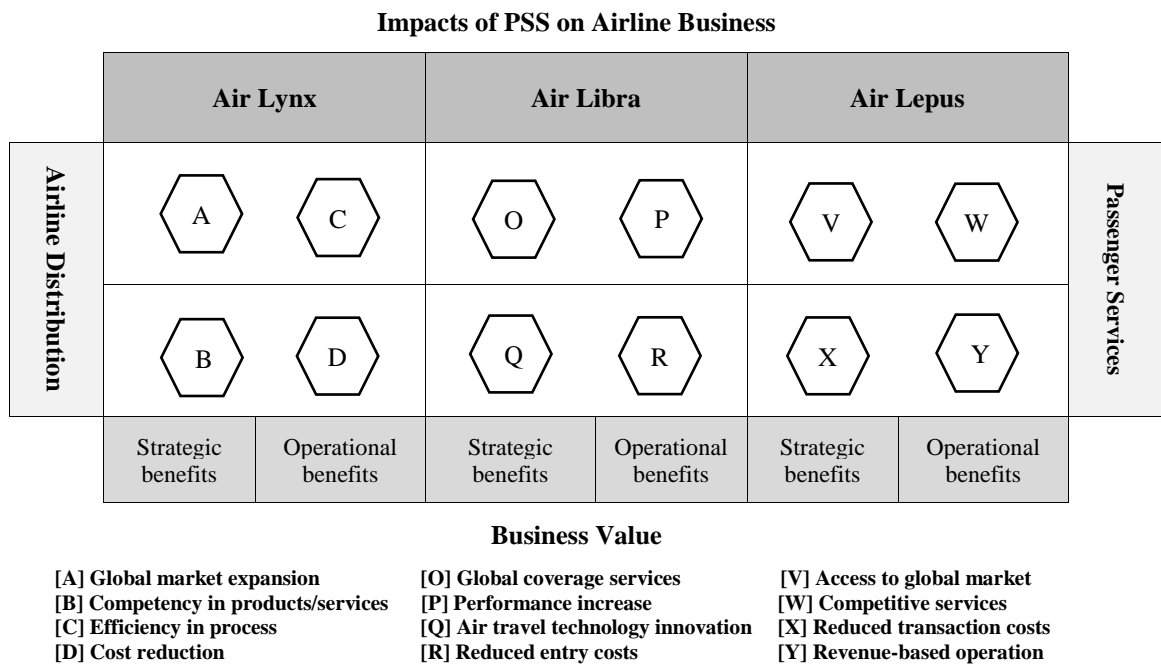


Figure 62. Business Value Map on Airline Business across the Airlines

Similarly, taken as a whole, Table 21 recaps the common PSS adoption factors in a causal relationship between context dimension and adoption dimension, and the key business value at strategic and operational levels that may result from PSS adoption across the three participating airlines in the case study. The influential factors in context dimension are departmentalised according to the types of causes (i.e. drivers or barriers) and business needs in air travel distribution and passenger processing.

Table 21. Common Cause-Effect Elements and Predicted Impacts

Components: Causes		
Key positive drivers (* <i>the most salient</i>)	[Context dimension] Airline business needs]	Negative barriers
<u>Technological context</u> <i>Interoperability</i> <i>Technology standards</i> <i>Differentiation in technology</i> Common platform <i>Middleware development</i> <i>IS personnel staffing</i>	Global network Seamless services Strategic partnership	<u>Technological context</u> <i>Legacy systems</i> <i>New technology development</i>
<u>Organisational context</u> <i>Strategic partnerships</i> Expert training <i>Global network</i> <i>Seamless services</i> Top management support <i>Organisational transformation</i>		<u>Organisational context</u> <i>Cost in IS operation</i> <i>Organisational transformation</i>
<u>Environmental context</u> Mimetic forces <i>Normative forces</i> Vendor support <i>Industry knowledge acquisition</i> <i>Time-to-market</i> <i>Mutual learning on a worldwide scale</i>		n/a
Components: Effects		
[Adoption dimension] Outcomes as PSS adoption		
Decision making Resource allocation Full conversion		
[Value dimension] Impacts on business value		
<u>Strategic benefits</u> Global coverage services Performance increase Global market expansion Competency in products/services Access to global market Competitive services	<u>Operational benefits</u> Air travel technology innovation Reduced entry costs Efficiency in process Cost reduction Reduced transaction costs Revenue-based operation	

Previously, Chapter 3 proposed a TOE-based conceptual research model incorporating the IOS Adoption framework (Robey et al., 2008; Vaidya, 2012; Zhu et al., 2006) and the HRO framework (Banalieva & Dhanaraj, 2013; Rugman & Verbeke, 2008; Wolf et al., 2012). Based on the proposed research model (Figure 11) in Section 3.5 and the examined

adoption factors in Figure 61 in this chapter, Figure 63 now depicts the completed conceptual model showing causal relationships in PSS adoption between the TOE contexts and outcomes of PSS adoption.

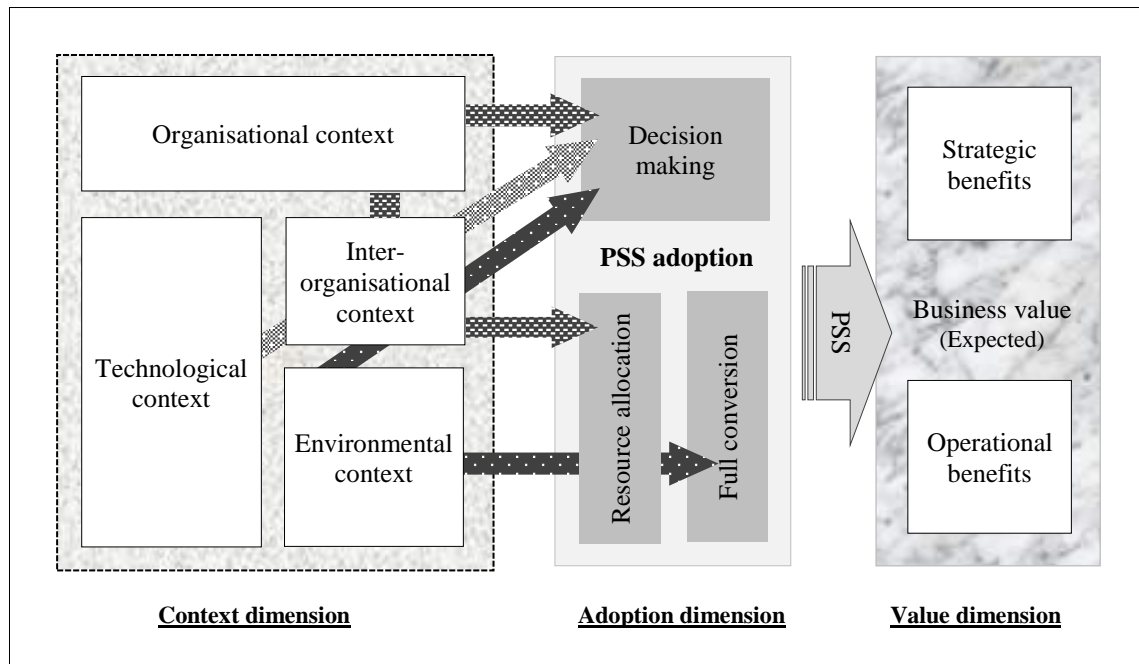


Figure 63. Completed Research Model – PSS Adoption in Airlines

In sum, while internal and external common factors in the technology context influence managers' decision-making regarding PSS adoption, organisational contextual factors, including inter-organisational factors (e.g. strategic partnership) have a decisive effect on internal resource allocation as well as on decision making. In parallel, external environmental factors representing industry/markets structure and stakeholder presence have a vital influence on the firm's decision making, and then on full conversion in subsequent years. This research predicts that the PSS will bring strategic (indirect) benefits due to technological maturity with PSS and relationships with partner airlines and, operational (direct) benefits because of efficiencies in overall airline operation to the three PSS adopters.

7.4.4 Rival explanations and alternative views

Discussions on meaningful rival competing explanations by reviewing rival theory (i.e. “a theory different from the original theory explains the results better” (Yin, 2009, p. 135)) against the underlying literature in IOS adoption and HRO is a key to enriching the understanding of causal relationships in this explanatory case study. In parallel, while the cross-case study findings discussed in the previous sub-sections are confirmatory, this research, “using the comparative structure” (Yin, 2009, p. 188), was able to identify several opposite findings across the three airlines when viewed from alternative perspectives.

7.4.4.1 Rival explanations

One of the main foci of this study is PSS in a common-use structure. Within the common-use IT environment, new technology development and functional differentiation may be restricted to home-region oriented airlines, as multinational service enterprises, that seek their global reach and technology advantage. Theoretical foundations in HRO address that, in order to raise technological advantage and innovative processes, MNEs concentrate not only on development of non-existent services that can be created through technical innovation, but also on differentiated technological achievement by providing customers with unique and competitive IT-assisted skills (Banalieva & Dhanaraj, 2013; Reimann et al., 2010; Lehmann, 2010; Wolf et al., 2012). However, the target airlines adopting a commonly used standard IT system show this study their common strategy to reduce cost in IS operation by retaining the high costs of new technology development and freeing from specific functional customisations on an individual airline level. Similarly, this study also finds that the common-use PSS can impose restrictions on the regional and local/domestic business practices for international airlines in the East Asia. As such, this is the reason Air Lynx and Air Libra, which would be exposed to the PSS common functional environment, decided supplementally to develop middleware

business systems on their own to cater for regional requirements and unique local needs. In the case of Air Lynx, furthermore, given its dual-system operation plan, the Japanese carrier determined to go with PSS only for its international domain of global marketing and passenger processing. Oz (2004, p. 452) addresses this procedure as “glocalisation”, a process where MNEs attempt to do business more globally with generic solutions and simultaneously cater to local needs and regional preference. Glocalisation becomes a critical consideration for the international/global IT systems, as technological challenges, differences in payment mechanisms, different standards and regulations instantly emerge. Likewise, these correspond to a limitation of findings on the impact of HRO, and the phenomena of IOS adoption should be further empirically generalised in terms of a home-region oriented airline’s partnerships. It is a trade-off between the PSS adoption and the expected IS cost reduction as well as local requirements that this study can report as the first rival explanation. These findings from the cross-case analysis should be further studies by future IS research in association with the international business context.

Another finding to be reported is that the different views on mimetic forces (related to decision making in the environment context) between executives and a manager in an organisation were detected during the interviews, showing as a mixed influence factor. The revealed situation can be explained by a firm’s strategic orientation, which is an indicator of the process developed to integrate new information, to coordinate decisions and to assess new projects; it means that the executives and managers in a decision team differ in their strategic orientation (Miles et al., 1978), thereby viewing their external pressures in different ways. This situation resulted in reserving judgement on the direction of influence (i.e. positive or negative), interpreting as a mixed influence. Also, across the airlines adopting the same PSS (i.e. from the same vendor) in the same regional alliance members, there was a different form of isomorphic pressure; normative forces around Air

Lepus that might influence its PSS adoption. On the other hand, in response to pressure from partners, two participants in the airline specifically held different views on the normative force that might influence its decision making. The strategic orientation issue should be discussed further in IS, while one of the few studies on the organisational strategic orientation is Uwizeyemungu and Raymond's (2001) IOS adoption for the service sector.

7.4.4.2 Alternative views

The aforementioned findings in an embedded design also allow this research to discuss alternative views across the three cases and offer complements to existing knowledge in IOS adoption and HRO. This study should notice from Figure 61, that there are multiple causes-and-effects showing dissimilarity in direction/intensity between the carriers.

In terms of the technology context, Air Libra is the only airline for which the technological factors *compatibility* {+}; *high quality data* {++}; and *legacy systems* {+/-} influenced its decision making, while the factor of *technology standards* had no influence on the adoption process. According to the interview with the informants, this study revealed that Air Libra started the adoption project to look for a new RES platform in a bid to replace its legacy RES that was the root of data discrepancy and incompatible technologies, with poor interoperable capability, not seeking common IT platform for the alliance members. Unlike the other two airlines that focused on *common platform* {++}/{++} and *strategic partnership* (as an inter-organisational factor) {+}/{++}, that is why the Korean carrier went through a controversy between the technological improvement of its legacy IT system (even less costly than common platform showing cost in IS operation {-}) and the introduction of the common platform. Also, ALX and ALB developed their own *middleware* IT systems {+}/{+} that would be capable of

handling domestic/regional requirements and existing in-house legacy applications, while ALP introduced an ad-hoc revenue management solution in conjunction with the inventory control module in the central PSS in order to improve revenue generation and optimise seasonal pricing and branded fare pricing.

In the aspect of inter-/organisational context, Air Lynx and Air Libra were concerned about how to reduce *cost in IS operation* {+}/{-}, including transaction and distribution cost, during their adoption stages whereas organisational factors did not influence the Taiwanese airline's adoption because of ALP's strong commitment to the soonest achievement of global expansion by using common IT with the alliance members. However, Air Lynx is the only PSS adopter experiencing a controversial *organisational transformation* {+/-} and subsequent *organisational alignment* {+} in the company that led to top management support in accordance with an internal consensus, in terms of focal IT and business innovation.

From the environment context perspective, Air Lepus is the sole airline across the cases for whom *mimetic pressure* {+/-} showed a mixed potential influence in decision making and full conversion. Because the Taiwanese carrier viewed the alliance partners (residing on the domain of *normative pressure* in this study) as 'potential competitors' within the East Asia market, this research cannot judge as to whether the competitor forces worked in ALP's adoption phase. Also, ALX is a single East Asian airline for which *foreign operations from home region* had a positive influence on its PSS adoption; this is because the Japanese airline was seeking to raise their international market share through code-sharing in a short period time, heavily relying on the domestic route business since its foundation.

Lastly, the explanation of Air Lepus' interviews implicitly offers that the lack of skilled professionals in *legacy technology* worked rather as a positive factor in influencing the adoption of PSS pertaining to resource allocation; alternatively, the airline concentrated on internal *organisational transformation* {+} by maximising their potential talents in IT development by reducing IT labour costs. On the whole, the different influences across the three airlines are identified within the technological context, which is in a combination of the internal and external domains, even though the OrcheStra suite is an 'off-the-shelf' solution showing a similar set of PSS application modules.

7.5 Study Implications

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

7.5.1 Implications for theory

This study has multiple implications for IS research. The first theoretical implication has to do with this IS research as an explanatory case study. Traditionally, most IS case studies on IOS adoption have depended on either exploratory research conducted in new areas of enquiry, where the goal of the study is to discover relevant constructs and build theory, or descriptive research that makes careful observations. IOS adoption in a large-

scale organisation is a complex phenomenon; it is understood as a social interaction with associated technical actions, and various factors are interrelated over time (Kim & Pan, 2006). Unlike exploratory studies, explanatory research for observed events and issues requires strong theoretical and interpretation skills, drawing on intuition, insights, and personal experience (Bhattacharjee, 2012; Yin, 2009). Under this situation where explanatory case studies in particular are relatively rare in IS literature, this explanatory case suggests an example of finding clues to cause-effect relationships in explaining PSS adoption. A feature of this study was also that, in order to build on a solid theoretical foundation, content analysis was carried out by using *a priori* orienting code lists in a deductive method in association with the researcher's industry expertise.

The second theoretical implication relates to IS research through an interdisciplinary lens. Against this background, in the realm of IS and IB, an interdisciplinary approach was arranged to explain why airlines using existing reservation systems adopt PSS within a context of 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 influenced the stages of PSS adoption, 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 (i.e. global expansion), two underlying theories (i.e. TCT and NIT) over the two themes (i.e. IOS adoption and HRO) were tested through the PSS adoption cases in alliance member airlines within the context of technology, organisation and environment. An integrated research model in the form of a causal network was also examined.

The last theoretical implications arise from this being an IS study that presents an original theoretical framework. From a multi-theory perspective, the research contexts in IS and IB include: (i) the application of two dominant theories (i.e. transaction cost theory and neo-institutional theory) in order to systematically explain the adoption of PSS used as a standard platform in airline distribution and passenger processing; (ii) the use of the broader foundations of the TOE framework to complementarily incorporate salient factors that represent influential relationships and organisational interactions in IOS adoption and HRO in airlines; (iii) the provision of PSS impacts on business value combining strategic benefits and operational benefits; and (iv) an embedded case study in multiple contexts with three home-region oriented and allied carriers in East Asia.

This research adds richness to the existing literature by offering a detail understanding in the area of PSS adoption in airlines seeking global reach, examining contextual factors in PSS adoption, predicting PSS impacts on business value and providing guidance and directions for future research.

7.5.2 Implications for collaboration research and practice

Managerial implications cast a long shadow to practitioners and professionals in the airline business, as this IS research dealt with the adoption of an advanced reservation platform. First, this research examined 28 PSS adoption factors (11 in the technological context, nine in the inter-/organisational context and eight the environmental context) to explain causal relationships across the factors and contexts toward the outcomes of adoption. Also, the conceptual model of this study confirms the usability and applicability of the TOE framework that possesses explanatory power in IS phenomena for cross-functional enterprise-level case study research. Next, the empirical findings may also apply to IS research on other forms of firm-level IOS adoption and 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 organisations with a useful executive summary, and theoretical interpretations from the interviews will offer transferable insights and knowledge to comparable practices in airlines. Lastly, IS practitioners may be motivated to conduct additional case studies on different air carriers in the Asia-Pacific region and further afield.

7.5.3 Implications for generalisation of the findings

This research on PSS adoption at the organisational level provides some implications that can be generalised to other contexts. Most of the interview participants were convinced that internal factors within the organisation and inter-organisational factors were more influential than external technical/technological ones in their adopting PSS. These findings indicate that organisational factors influence decision making and resource allocation during the adoption phase and that environmental factors related to the power of competitors also partially have influence upon the full conversion process, because the adoption process in organisations involves a number of managers, individuals and stakeholders (i.e. supporters and opponents of the complex innovation activities). Specifically, from the non-transactional viewpoint (Chatterjee & Ravichandran, 2004), upper management involvement and expert training programmes are two of the most influential drivers amongst all TOE contextual factors. Such findings are compatible with IOS adoption, showing the organisation's positive influences in terms of internal characteristics of organisational structure. Of the other organisational factors related to efficiency-based inter-organisational relationships, strategic partnerships and a global network work as strong elements on the PSS adoption process within the airlines (Chatterjee & Ravichandran, 2004); these findings also confirm the relevance of IOS

adoption research on mutual interactions with global partners and increased interdependence between the trading partner's business.

A different level of decision-making and allocating resources can originate from differences in organisational/national culture (Munkvold, 2005). Focusing on top management support, organisational transformation and organisational alignment among nine tested organisational factors, this research also reveals findings that there is a substantive difference between the three cases in organisational culture, corporate tradition and national culture. The Japanese ALX airline, the Korean ALB airline and the Taiwanese ALP airline show different behaviours and procedures in decision making and resource allocation. Across the cases, top management support worked as more strongly positive ([++], shown in Figure 61.) for ALB and ALP than ALX [+]. Also, while organisational transformation influenced the PSS adoption of ALB [+] and ALP [+], organisational alignment was influential only to ALX [+]. This confirms that high-ranking managers at the upper level of an organisational hierarchy make different types of decisions and control different types of processes (Niederman, Kundu & Salas, 2007; Oz, 2004). More specifically, Martinsons and Davison (2007) claim that Japanese managers emphasise the importance of the team approach and embrace a group mentality by focusing on the aspirations of the group; they are family-orientated and encouraged by open communication within the firm. On the other hand, Korean managers tend to look to their superiors, (i.e. top management) who depend on the dimension of masculinity, for approval before making big decisions such as IS adoption; they are also future-oriented and seek uncertainty avoidance (Kim, Joshi & Lee, 2018; Lee, Yoon & Yoon, 2004). The Taiwanese organisational culture shows a relatively higher power distance, a stronger uncertainty avoidance and a vertical dimension of collectivism (Thatcher &

Foster, 2003). These characteristics are compatible with the extant literature on influence of organisational/national culture of IT system adoption on a firm level.

7.5.4 Messages to the interviewees and top managers in airlines

In addition to the researcher's interest in the phenomenon of PSS adoption, this cross-case study carried out academic work in response to an industry request for a review of the PSS adoption projects that the three East Asian airlines had undertaken in the 2010s. The interview participants from each airline were unanimously convinced that organisational and inter-organisational factors, including top management's support and well-organised training programmes, had been more influential than other contextual factors during the PSS adoption phases. These findings might be evident in the tone of the conversation concerning organisational influence, for instance, "It is a must do!", "Our people welcomed organisational transformation.", and "Yes! We are doing airline services, not doing IT business ..." during the face-to-face interviews. In common, all three airline PSS teams showed a strong commitment to the future-driven task and organisational changes by considering the business value that adopting PSS would bring, being a turning point for more competitive services and better market performance on a global level.

However, the focus of each airline manifested differently across the contexts; for Air Lynx, technological issues were more complex than in the other two cases because, before PSS adoption, ALX managed two separate ARSs for its domestic market and international segment where different forms of passenger data and industry requirements were uniquely manipulated. In the case of Air Libra (ALB), internal technical issues and institutional environment concerns, as antecedent variables, were relatively more influential than in the other two East Asian partners, with ALB looking at solutions to

fixing the old technical troubles and maximising the value of information sharing and knowledge acquisition through PSS. Air Lepus (ALP) carried out its PSS adoption from decision making to full conversion with strong involvement of top management across all business units in order to rapidly access a global market and achieve revenue-based operation using PSS. Nonetheless, this researcher was able to discover that between the regional partners, interdependent activities and mutual communications during the adoption phase, by sharing their own experience as global alliance members, was a great help to understand why and how other airlines adopt PSS strategically and operationally. Such inter-organisation effects should be taken into account for future IT systems adoption as 'best practice' within the region.

It is known that the decision-making process in IT/IS projects can be quite unstructured, because senior managers sometimes glean from unproven methods for collecting information about the IT trends; however, the decisions made by top management affect the entire organisation and have long-standing impact (Oz, 2004). Obviously, top manager support is key to PSS adoption in this case where complexities of external competitive and industry pressures play an important role. Multiple interviewees, regardless of the airline to which they belonged, commonly emphasised the importance of expert training (for trainers and trainees) and organisational transformation. Those activities were encouraged and empowered by the top manager group and, consequently, the organisation successfully conducted the challenging missions toward the full conversion phase. A PSS is a common platform for a commercial airline seeking global reach and strategic partnership in distribution. Normative pressure and competitive pressure among isomorphic forces and vendor support were thus decisive external factors that influenced managerial decision and full conversion; these are likely to be matters of

interest for top managers of other airlines, and possibly high-level managers of other global enterprises.

7.6 Summary of the Chapter

This chapter provided three within-case discussions, followed by an analytic cross-case discussion. Chapter 7 began with the research questions introduced in Chapter 3. The discussion of findings was based on a case-oriented approach at the single firm level (within-case) by presenting causes-effects and contextual patterns, and at the multi-firm level (cross-case) by discussing overall similar results (a literal replication). Each of the sections for a single case pertaining to Air Lynx, Air Libra and Air Lepus represented a unified causal display across three contexts to explain causal influences and factual results, together with a narrative discussion of the findings and complements to the related findings. In response to the research questions, the subsequent cross-case analysis synthetically explained why the three airlines adopted PSS and how their adoption in three stages was influenced by contextual factors, and then predicted how business value would be produced. The chapter also debated in-depth rival explanations and alternative views to the existing body of knowledge in IOS adoption and HRO. The chapter reported theoretical and managerial implications for IS researchers, practitioners and top managers in the airline industry by highlighting the key findings and analytical commentary.

End of Chapter 7

CHAPTER 8: CONCLUSION

8.1 Outline of the Chapter

This chapter sets out the conclusions of this research. Section 8.2 provides an overview of the research demonstrating an original explanatory case study on PSS adoption associated with an original research framework and an appropriate research design. Section 8.3 highlights contributions to knowledge and to the airline business. In addition, Section 8.4 covers limitations of the study, followed by directions for future research and recommendations in Section 8.5. Lastly, this thesis comes to an end with a summary of the chapter and the concluding remarks in Section 8.6.

8.2 Overview of the Research

The purpose of this multi-case research was to explain PSS adoption in airlines at an enterprise level by examining the adoption factors of PSS and unearthing the impacts of PSS on business value in airlines. With a concrete research setting (see Figure 64), generalisable causal explanation was carried out using multiple qualitative data from three case airlines according to the following methods:

1. demonstrating an appropriate research design, drawing on a rigorous literature review on IOS in IS, global expansion in IB, airlines business (airline distribution and passenger services), travel technology innovation, case study research and qualitative data analysis. As a result, this study was conducted with a solid theoretical foundation and a well-suited research methodology incorporating: qualitative explanatory orientation; multi-method technique; embedded multi-case design; deductive content analysis; causal network representation and causal narratives, in an epistemological qualitative positivism (post-positivist) paradigm;

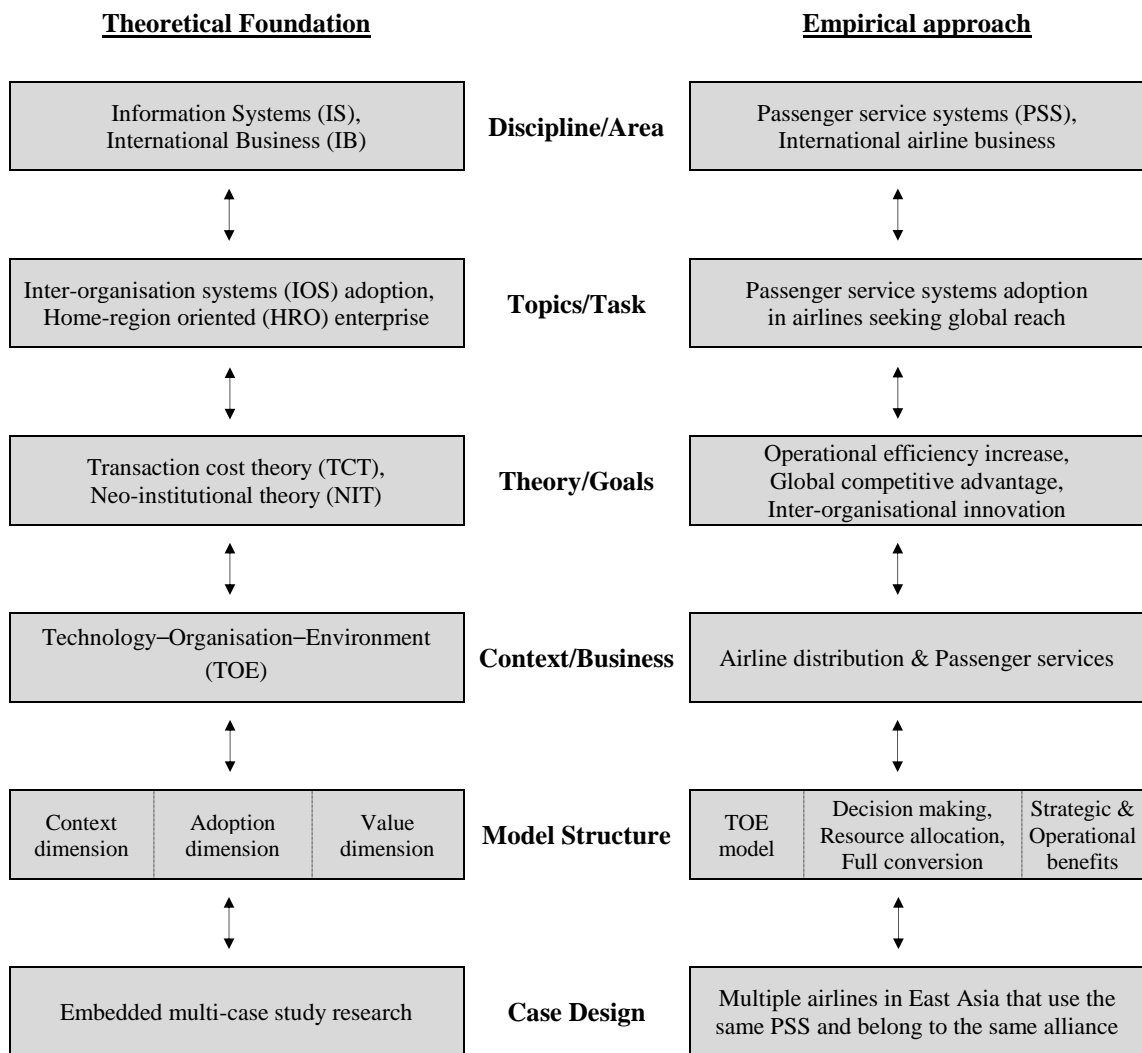


Figure 64. Original Design as Theoretical and Empirical Work

2. pursuing an explanatory case study strategy to answer three how-and-why oriented research questions and testing 28 variables deducted from the preceding literature;
3. relying on two underlying theories from an interdisciplinary viewpoint that enabled this research to commonly cover the adoption of IOS and the phenomenon of HRO, constructing a TOE framework-based research model to clarify the research context in technology, organisation and (institutional) environment;

4. analysing findings within the cases; the cases explained interrelated factors between the context dimension, within TOE contexts, and the adoption dimension, which was conceptualised in three phases—decision making, resource allocation and full conversion—and unrolled the strategic and operational benefits of the PSS business value in the value dimension; and
5. explaining them across the three cases to present similarities and differences in adopting PSS as a common platform in a literal replication design, so that this research could strengthen the generalisability of the variables and the effectiveness of the conceptual model in explaining PSS adoption.

From this cross-case study, there are key empirical findings that other IS research and IOS studies in the airline industry do not present, contributing to a more complete understanding of similarities and differences in the causes and effects of PSS adoption. The original findings are as follows: the reasons why the three home-region oriented East Asian airlines adopted PSS are to (i) develop their global networks through the PSS distribution channel, (ii) provide seamless travel services using industry-wide common use functions, and (iii) establish a strategic relationship with their partners. Among the technological factors, interoperability and a common platform influenced decision making the most. Expert training and top management support were the most critical organisational drivers for decision making and resource allocation while, within the environmental context, mimetic pressure and vendor support were identified as critical influential factors in decision making and full conversion. Wider access to global markets and enhanced competitive services at a strategic level, as well as overall cost reduction at an operational level, are predicted as the key dimensions of business value likely to be derived from PSS. Across the cases, these three common goals and the TOE-based

adoption factors, that have a similar thread in adopting PSS from the IS/IB perspective, are new findings that the extant IS research on the airline business have not addressed.

8.3 Contributions to Knowledge and Industry

In theory and practice, the context and framework of this research are original, pursuing the richness of the interplay amongst diverse influential factors and presenting these grounded in real-world practice. Using a socio-technical approach, a theoretically synthesised research model was incorporated with the TOE framework (Baker, 2012); it was extended to contain a context dimension, an adoption dimension and a value dimension from the IOS perspective in IS (Robey et al., 2008; Vaidya 2012; Zhu et al., 2006) and; HRO through the lens of IB (Banalieva & Dhanaraj, 2013; Rugman & Verbeke, 2008; Wolf et al., 2012), as presented in Chapter 3. Also, the research approach taken to understand the place and adoption of mission-critical IT systems in air travel technology and the production of abundant empirical evidence from the researcher's airline IT industry network enhanced the value of this study and enriched the research model and multi-method data analysis. Therefore, this multi-case study research is able to offer both scholarly contributions and managerial implications as follows.

8.3.1 Theoretical contributions

In terms of academic contribution, this study provides IS academia with an extended TOE-based research model, which is originally designed, in a causal relation across three dimensions of context, adoption and business value; firstly, the context dimension combines technological, inter-/organisational and environmental considerations in the context of IOS adoption, and technological and environmental contexts in accordance with the HRO model; secondly, the adoption dimension includes the conceptualised IS adoption phases, including decision making, resource allocation and full conversion by

drawing on the related IOS adoption literature, and thereby covering diverse meanings and stages of IOS adoption over time across the different firms, not from the perspective of a single focal organisation (Baker, 2012); lastly, the value dimension is designed to deal with both business value in IOS adoption and business performance defined in HRO-related research, looking into strategic and operational benefits (Banalieva & Dhanaraj, 2013; Robey et al., 2008). Leveraging a mix of systematic approaches thus make the conceptual model theoretically original and able to be further used by other IS research. Moreover, in the form of a multi-directional causal display, a series of event-state networks and narrative paragraphs represent in the research how they can enrich a qualitative case study in IS (Myers, 2013). Such a visual logical chain of evidence, hitherto rarely reported in IS literature regarding IOS adoption, might be utilised as a useful tool to conceptualise other research models. In sum, the theoretical contribution comes not only from transforming a static model of IOS adoption factors influencing outcomes to a dynamic model showing the PSS adoption mechanisms by which this takes place, but also from helping to establish a fuller understanding of an IS phenomenon, describing, analysing, predicting and testing theory on a new conceptual model and generalisations about them. It may offer important insights through a complex business world to see: why multinational enterprises adopt a platform-based IOS in a common-use philosophy, and how they produce business value from the adopted IOS together with their partners in particular. The causal explanation tool used in this study may also apply to IS empirical case study research on other forms of firm-level IOS adoption and to different types of IOS adoption in other home-region oriented enterprises.

8.3.2 Managerial contributions

Besides the highlighted theoretical contributions, each of the empirical studies, both within-case and cross-case, makes managerial contributions to the understanding of

specific airlines' PSS adoption in a global alliance environment; the findings also confirm the usefulness of the examined PSS adoption factors and the listed elements of PSS business value addressed by the research participants.

Specifically, in the aspect of PSS adoption, the findings put emphasis on the necessity of interoperability, the potential of a common platform based on industry standards, the importance of organisational commitments, including expert training, top management support and organisational transformation, mimetic pressure, normative forces within the alliance, vendor support related to time-to-market and mutual learning on a worldwide scale. In parallel, the highlighted impacts of PSS on business value in airlines (i.e. mainly in terms of productivity, knowledge, profitability, cost-effectiveness, competitiveness and efficiency) offer managerial contributions for identifying dissimilar types of strategic benefits and operational benefits to similar PSS-related research on home-region oriented air carriers.

Collectively, this work provides managerial implications for business leaders and managers working in large-scale organisations with a potentially useful executive summary, and also theoretical interpretations from the interviews could offer transferable insights and knowledge to comparable practices in airlines. Thereby, this research encourages IS practitioners in the airline IT sector to conduct additional case study work on other international carriers in a geographic region or a regional market.

8.3.3 Summary of the research

To recap, on the whole this explanatory deductive research tested PSS adoption factors with real-world data obtained from multiple airlines in a specific regional market and delivered an explanation on causal relationships in the adoption and expected impacts from PSS on airline business and air travel IT services. Therefore, this empirical case

study was ultimately designed to make a significant contribution to filling a gap in discipline knowledge in the area of airline distribution and passenger services. Its in-depth examination of how technological-organisational-environmental factors should offer IS literature a new approach to empirical research on PSS adoption and IOS adoption more generally. A rich description of why home-region oriented air carriers adopted the PSS used in allied airlines in the particular market also would build a bridge of in-depth understanding regarding a particular type of enterprise IT system adoption between the IS discipline and the international business area. In doing so, this work should help IT/IS practitioners in academia and advanced specialists in the air travel technology area not only to develop more opportunities for designing qualitative case studies on PSS-related issues within the context of IOS adoption and the phenomenon of HRO, but also to fine-tune the research findings in different contexts.

8.4 Limitations of the Study

This explanatory case study is qualitative research in nature. Qualitative research should consider internal validity (i.e. causality) and external validity (i.e. generalisability) in ways of making itself more reliable (Bhattacharjee, 2012). Its unit and level of analysis is a small group of international commercial firms as well as their IT systems adoption at the organisational level in an embedded design; this empirical work and its findings might be exposed to possible methodological constraints, possible limitations of the researchers and unanticipated challenges that emerged during the study, in terms of generalisability, the nature/access of data, the focus of study, the context of the institutional environment and the barrier of language:

1. Methodologically, the fundamental research objective (i.e. the goal of research) of explanatory-type study is to test, explain and compare observed phenomena

(Myers, 2013; Neuman, 2003). With an explanatory multiple-case design, it is appropriate for conducting a series of replicating and extending existing theory and establishing greater external validity (Bhattacharjee, 2012; Myers, 2013); in this respect, theoretical generalisation might be seen as a weak point for this explanatory case research that relies on a small sample, while testing out and comparing theories. Despite careful attention to those potential issues of qualitative case study design, this research should therefore acknowledge that it might contain a weakness in its lack of generalisability.

2. Considering the possible methodological limitations, this study was originally intended to see some of the explanations and expectations/predictions based on the interviews with key informants addressed in Chapter 6–7; all of the respondents from the three air carriers belonged to each of the PSS adoption project office where the unit operated with a few experts in the PSS/RES solutions. In keeping with conventions for expert sampling and reputational case sampling, the in-depth interviews were undertaken²³. Thus, this research should acknowledge that each conversation with two interviewees per company may cause a potential issue of internal/external validity, because perhaps two people in the face-to-face interviews per case was quite few in number to get sufficient evidence. To mitigate this, the use of multitude of other sources, including secondary data was arranged.

²³ As aforementioned in Chapter 4, most mid-size airlines have one or two standing director(s) and fewer than four project managers in the project team in charge of the PSS adoption management. In addition, international airlines have characteristics in taking place frequent or regular personnel shifts between the head-office and overseas regional headquarters or sales/airport branches, and their IT experts also tend to change jobs and career path after critical IT projects. Hence, having one-time interview, in a specific point in time, with multiple individuals responsible for PSS adoption would be highly challenging in practice.

3. The interview was conducted in a room at one sitting, and in addition, the interviewees in a relationship between a subordinate and a superior (not an immediate boss though) could have spoken together before the interview; such a feasible situation might influence one another's reporting, and the respondents could have portrayed a (more) positive view of the PSS adoption scenario than was the case in reality. The researcher's direct probing and one-time conversation in the same space together with the executive and manager level possibly affected outcomes of the discussion by causing confirmation bias as well as social desirability bias and giving a more positive spin to respondents' recollections/experiences. To some extent, the participants' views could be idiographic. These potential issues were also mitigated by using secondary data, including high-level executives' statements in press releases and the like, to corroborate the evidence from the primary data.
4. A series of face-to-face interviews for data collection from the multiple on-site workplaces were conducted with three 'commercial' airlines that are for profit organisations. In the airline sector where there are only a small number of players in an average country, and security is a major concern, air carriers are protective of information at the individual level as well as information security on an organisational level (Benckendorff et al., 2014). This is why all business entity names and employee names remained confidential and disguised throughout the thesis, and only pseudonyms were used under the agreement with the voluntary participants. Therefore, this research could not rule out the possibility of taking biased accounts, to some extent, and speculations as cited by the participants. Also, the retrospective nature of this research might have left room for inaccurate recall and distorted predictions in their description of the events that occurred in

the past and the expected business value during the intensive conversation. However, efforts were taken to reduce this latent threat this probability would be greatly reduced as the interview questions were sent to the airlines three weeks before the interviewer's visit to each on-site.

5. The next limitation relates to HRO in IB, which is one of the recent findings related to the international business studies. While there are multiple studies explaining and supporting the HRO framework from the comprehensive TCT/NIT perspective that "MNEs start as home-regionally oriented and gradually adjust their international expansion toward more distance global locations" over time (Banalieva & Dhanaraj, 2013, p. 91), this view is still being examined by various successive pieces of research. In other words, although there is some empirical evidence for HRO, and most of the international airlines are home-region oriented (Clougherty, 2001; Rugman & Verbeke, 2008), some IB researchers claim that HRO studies should offer a more multifaceted rationale (Wolf et al., 2013). Therefore, the technology- and environmental-specific variables in the home-region oriented service firms, including air transport companies (e.g. differentiation in technology and worldwide learning) that were identified and used in this study may be further developed or modified by other IB research's findings rooted in different general theories.
6. While this project was partially carried out in three separate East Asian countries where different cultural contexts and diverse institutional regulations exist, there were also hidden limitations in considering specific social contexts that might affect the collection of data in this study. Also, as long as English is the second language in common for Japan, Korea and Taiwan, the interviewees—even

though each of them worked in an international airline where English is an industry-standard language—could have felt a difficulty in making the conversion rich in expression. Such potential cultural elements might have an impact on the production/collection of primary data.

8.5 Future Research and Recommendations

The aforementioned implications of the study in Section 7.5 and the identified limitations in Section 8.4 call for an extension to this research; future research is meaningful to achieve academic rigour and make constructs used in a study more reliable and valid (Bhattacharjee, 2012). This section thus discusses guidance and directions for future research as follows:

1. PSS enables international airlines seeking global reach to have a positive impact on the airline business at the strategic level and operational level; however, the scale of reduction in operational costs in the long-term will vary by airline. It is recommended that home-region oriented airlines that are planning to replace their stand-alone ARS consider all of the factors tested here within the technological, organisational and environmental contexts by focusing on PSS interoperable capability, expert training issues, top management support and isomorphic pressures, which are relatively important elements in the adoption of PSS.
2. In accordance with Yin's (2012) advice, in post-positivist research, this case study will require the use of multiple case sites in a different market with replication logic. To refine the research model and elaborate on the causal network used in the within-case and cross-case analyses of this research, future work could employ other multiple case studies with different airlines in the other regions. As such, replication of case study methods can achieve broader generalisability of findings.

3. Saldaña (2013) asserts that causation in today's interconnected world may range from individual (micro-level) issues to inter-group (meso-level) events to organisational (macro-level) phenomena. The TOE framework has been used in many IS studies to explain technology adoption phenomena, but the framework is limited to the analysis of organisational IS adoption; the adoption of IOS occurs at individual and firm levels (Baker, 2012). In adoption research in IS, many scholars select one of the micro-level theoretical frameworks, including the Technology Acceptance Model, the Theory of Planned Behaviour and the Unified Theory of Acceptance. Relying on mainly qualitative data from surveys, these frameworks have been applied to predict the individual user's behaviour over a generic set of ISs (Venkatesh et al., 2013). In other words, through a combination of the strengths of the individual-level framework with the advantage of the TOE framework, theoretical evolution could be achieved—in fact, there are increasing numbers of exploratory IS studies in which such a synthesis in research framework was made—by explaining whether not only how individual PSS adoption influences organisational PSS adoption, but also individual behaviour using PSS affects an airline's business value, including tactical benefits related to an individual's customer service by internal staff.
4. As implicitly stated in Section 1.5 (Scope and Assumptions), the expected business value should be more clearly identified after the adoption stage and financial results have to be gauged in monetary terms if possible; for instance, during the interview with Air Lepus, the comments on the effects of transaction/distribution cost saving was deferred. This remains of interest and importance, because the majority of operational benefits should accompany positive impacts on cost structure in IT/IS operation, transaction cost reduction

and increased efficiency in distribution channels. This should be part of future research in quantifying the effect of PSS implementation.

5. When it comes to research on IOS adoption and the HRO phenomenon, there are additional comprehensive theories, other than TCT and NIT, whose use could be considered including network externality theory, resource-based theory and resource-dependent theory (Vaidya, 2012; Wolf et al., 2012). All of the theories could support the building of a theoretical bridge between the topics of PSS mainly used by alliance airlines and the issues related to HRO in the classic network airlines.
6. The researcher, who had specialised in quantitative study before this doctoral study project, carried out the first qualitative case study research in his research career. Based on the valuable research experiences, any future study should be further well-prepared, allowing to rehearse and time his presentation and possible structured and unstructured questions in quantity, thereby providing more relevant answers as well as richer information and reasonable inferences.

8.6 Summary of the Chapter and Final Remarks

This chapter presented the conclusions of this thesis. This multi-case research study with leading airlines in Japan, Korea and Taiwan explained the adoption of PSS on a firm level. This thesis was based on multiple data collection methods, a multiple coding procedure and an original research design, and the empirical study examined the influential factors in the adoption of PSS and presented the impacts of PSS on business value, thereby making a substantial and meaningful contribution to IS academia and to the airline IT industry.

This thesis has reported an embedded case study that explains the factors that influence PSS adoption by revealing ‘why’ and ‘how’ international airlines adopt PSS, relying on a qualitative positivist paradigm to systematically explain their PSS adoption in a three-stage process. This study was undertaken on the basis of the theoretical foundation of Inter-organisational Systems (IOS) adoption and home-region orientation (HRO) in the context of international business to identify possible factors of IOS adoption and HRO in the extant literature. It explained TOE-contextual causal influences on PSS adoption and then uncovered strategic and operational benefits of business value from PSS. To do this, a multi-case study was carried out, involving three international airlines in Japan, Korea and Taiwan. The key findings across the target airlines explained the common reasons for PSS adoption were to develop their global network, provide seamless travel services, and establish a strategic partnership. Business value from PSS revealed not only wider access to a global market and greater competitive services at a strategic level, but also transaction cost reduction at an operational level, while the size of lowering the operation cost in the long-term would vary by airline.

The airline business has been empowered by IS for the last 50 years. The transformation of airline distribution and passenger service processes will be heavily supported by the PSS that was fully developed only a decade ago. Although this thesis has made a significant contribution to PSS adoption in the IS academia, it covered a limited theme on passenger sales and processing. In a strict sense, this work provided the explanatory research answers merely to ‘why, and how airlines adopt PSS?’, as the researcher necessarily put a limit on the range of the study by narrowing down the search space.

Many international airlines are still in the initial phase of PSS adoption, and some companies in Asia Pacific have entered the post-adoption phase, after routinisation and

infusion, known as the stabilisation duration. Similar studies on PSS might be carried out by more IS scholars accordingly, on the basis of diverse selection criteria and a different angle of research question. These insights from this research would be useful in identifying a spring of interest and discovering a potential topic on one of the integral IT systems in airlines—passenger service systems.

End of Chapter 8

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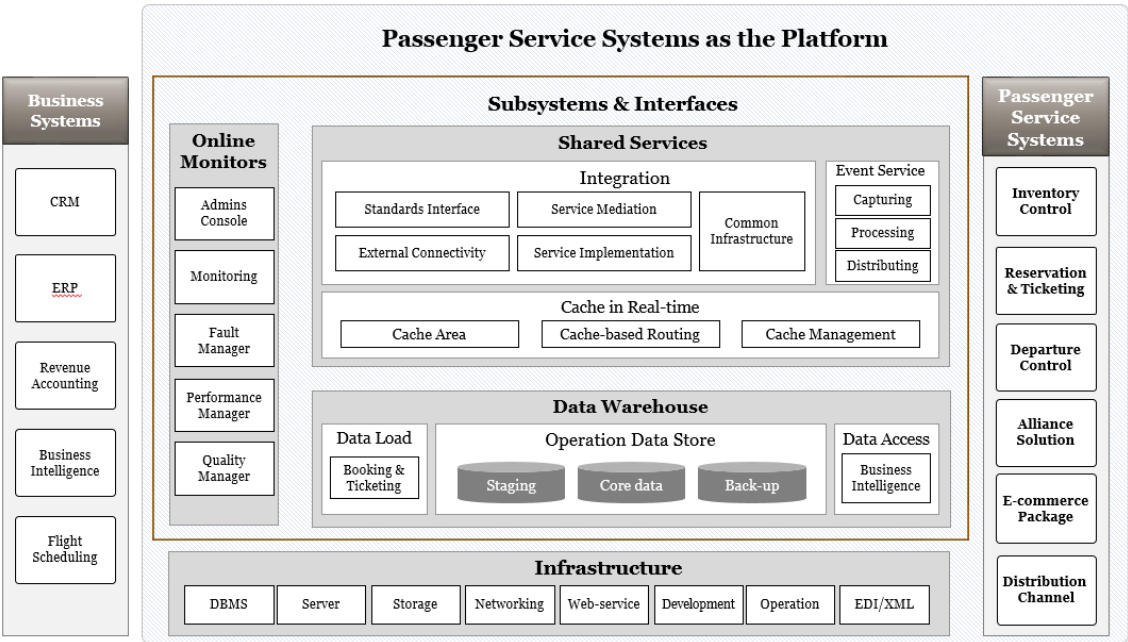
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Appendix A. An Example of Internal Business IS around PSS



Appendix B. PSS and Other IT systems

IS/Feature	PSS	CRM	ERP	SCM
Goal	Air travel data management	Customer service enhancement	Business process improvement	Management of the flows of goods
Feature	Airline specific	Common function	Common function (all levels)	Common function
Location	Front office	Front/Back office	Back office	Front/Back office
Function	Transaction processing	Customer support and management	Human resources and accounting	Materials and products processing
User/Area	Sales/Services	Marketing	Enterprise-wide	Sales/Services
Data sharing	Yes (with airlines)	No	No	Yes (with partners)
Classification	IOS	CRM	ERP	SCM
Usage in airlines	Passenger services	Customers sales	All business units	Cargo business

Appendix C. PSS Adoptions by Region and Alliance

Regions*	Adoption Stage	Number of Airlines by Alliances		
		Alliance A	Alliance B	Alliance C
Asia Pacific & Oceania	Decision made	-	1	1
	Resource allocated	1	1	1
	Widely implemented	4	2	2
Europe	Decision made	-	-	-
	Resource allocated	-	2	-
	Widely implemented	10	6	4
Middle Asia & Africa	Decision made	-	-	-
	Resource allocated	-	1	-
	Widely implemented	2	-	1
North & Central America	Decision made	-	-	-
	Resource allocated	-	-	-
	Widely implemented	1	1	1
South America	Decision made	-	-	-
	Resource allocated	-	-	-
	Widely implemented	1	2	2

* Regions defined by a specific PSS provider (As of September 2017)

Appendix D. Main Differences between RES and PSS

Airline Reservation Systems	Feature	Passenger Service Systems
1960's – 1970's	Development	2000's – 2010's
A single system for an individual airline	Operation	A platform for the airline community
Stand-alone operation Applications coded by developers	Core concept	Shared architecture Applications configured by users
Mainframe + Emulation software	Baseline technology	Open system + Web client
n/a	Optional applications	Alliance solution, Distribution channel, e-commerce package and other value-added services
Command driven Character-based user interface	Front-end display	Menu driven Graphical user interface
Airline (on premise)	Data ownership	Thirty party (outsourced)
Teletype messages over EDI	Data transmission	Web services over XML
Fixed	Cost structure	Variable (pay per use)

Appendix E. Major PSS Products and Providers

Products	Provider (Launched*)	Core components	Major markets	Customers
Altéa	Amadeus (2007)	Reservation & Ticketing Distribution Inventory Departure control	Europe Asia Pacific Middle east South America	71
Sonic	Sabre (2008)	Reservation Departure control Online direct	North America South Asia	62
Horizon	SITA (2014)	Reservation & Ticketing Inventory & Schedule Departure control	Asia Pacific	n/a

* Based on off-the-shelf, full-scale products

Appendix F. Invitation Letter and Interview Questions



Business Information Systems

WY316, Level 3 - WY Building City Campus
Internal Mail D-98, Private Bag 92006
Auckland University of Technology (AUT)
Auckland 1142, New Zealand

Dear interview participants:

First of all, I thank you for accepting an invitation to a face-to-face interview for my research on *factors influencing Passenger Service Systems (PSS) adoption*. Your participation to the interview will significantly contribute to my study that explains the phenomena of PSS adoption in airlines.

As a follow-up action, I would like to provide you with some papers for reference, including **Participant Information Sheet** and **Consent Form** on AUT's letter heading; the former sheet is to give you the necessary understanding for the motivation and procedures of the study, and the latter form is to ensure the key points are understood and then record your consent – the printed template that needs your signature will be offered by me prior to the interview. For your understanding of the study and what will be inquired during the conversation, a copy of **Research Summary** as well as **Interview Question** is also attached as Appendix A and B.

As I already explained through the initial letter of invitation, this academic research is designed to avoid discomfort and conflict of interests in line with AUT's strict ethical standards. The participation is therefore definitely voluntary and entirely at your discretion. Subject to your verbal and written agreement, the interview at your office for about half an hour will be kicked off. The information from conversation will be aggregated and treated by ensuring anonymity and confidentiality, and protecting privacy of the entity and the individual. After the interview, in consideration of your participation, I will present you a small reward; a USD 50 of online gift card.

Last but not least, please email me back the date, time and place of the meeting which is suitable for your schedule. Once again, I thank you for your time considering the participation and look forward to seeing you, hopefully by mid-May.

Yours faithfully,

Don D. H. Lee (李東炫)

PhD Candidate; MBA; MA in Tourism

Department of Business Information Systems

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[Appendix B - Interview Questions] Inter-organisational Systems Adoption in Airlines with the Context of Home-region Orientation: The Case of Passenger Service Systems

This interview sheet comprises two sections; the first part as a series of open interview questions and the second part of seven questions for semi-structured interview. The open-ended questions are to ask for general information about your role and the company where you are with. Also the semi-structured ones are to cover a specific range of topics based on the Technology-Organisation-Environment framework¹ in the adoption and the business value of Passenger Service Systems (PSS), by seeking answers to **why** and **how** types of questions in particular.

Interview Questions

I. Open-ended Questions (less than 10 minutes)

- Could you please briefly introduce your role and organisation using the following pointers?
 - Describe your position, duty and past/current responsibility for PSS adoption
 - Describe your department/unit and the nature of organisation
 - What is the current stage of PSS adoption like?
 - What is the background of adopting PSS in a common platform environment?
 - In which country your company is headquartered?
 - How many regional head offices and in which regions does your company have?
 - Do you think that most network airlines are home-region oriented² to run a business?
 - Do you think the adopted PSS has enabled your company to expand distribution channels across the countries, in comparison to the reservation systems used in the past?

II. Semi-structured Questions (25-30 minutes: 4-5 minutes for each question)

1. According to the literature on *IOS, interoperable functionality and industry standards* might be the key elements that influence IOS adoption at large within *Technological Context*. In the case of your company, explain how two factors affect PSS adoption – for instance, [+] positive influence as driver; [-] negative influence as barrier; [+/-] mixed influence and no specific influence. Explain the reason why? Any technological factors else, and why?

¹ The framework developed by Tornatzky & Fleischer in 1990 provides a widely used theoretical foundation for organisation-level investigations and explains factors that influence the adoption of **Inter-organisation Information Systems (IOS)**.

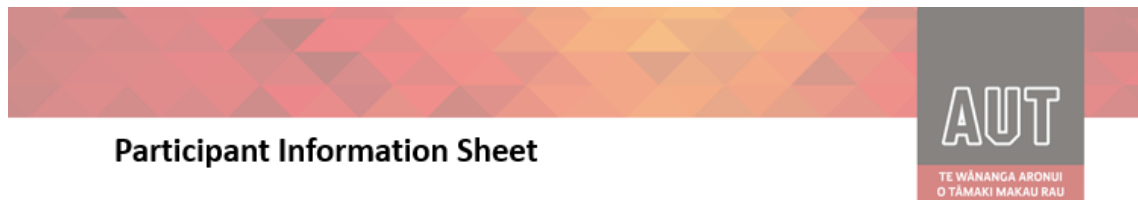
² **Home-region Orientation (HRO)** refers to the propensity of a multinational enterprise such as a network airline to expand within the home-region.

2. According to the literature on *IOS* and *HRO*, *technology development* and *product differentiation* might be the key elements that influence *IOS* adoption at large within *Technological Context*. In the case of your company, explain how two factors affect *PSS* adoption – for instance, [+] positive influence as driver; [-] negative influence as barrier; [+/-] mixed influence and no specific influence. Explain the reason why?
3. According to the literature on *IOS*, *top management support* and *human resources* might be the key elements that influence *IOS* adoption at large within *Organisational Context*. In the case of your company, explain how two factors affect *PSS* adoption – for instance, [+] positive influence as driver; [-] negative influence as barrier; [+/-] mixed influence and no specific influence. Explain the reason why? Any organisational factors else, and why?
4. According to the literature on *IOS*, *coercive pressure* (by industry/suppliers), *mimetic pressure* (by competitors) and *normative pressure* (by partners/customers) might be the key elements that influence *IOS* adoption at large within *Environmental Context*. In the case of your company, explain how three factors affect *PSS* adoption – for instance, [+] positive influence as driver; [-] negative influence as barrier; [+/-] mixed influence and no specific influence. Explain the reason why? Any organisational factors else, and why?
5. According to the literature on *IOS* and *HRO*, *foreign market operation in home country* and *worldwide learning opportunities* might be the key elements that influence *IOS* adoption at large within *Environmental Context*. In the case of your company, explain how two factors affect *PSS* adoption – for instance, [+] positive influence as driver; [-] negative influence as barrier; [+/-] mixed influence and no specific influence. Explain the reason why?
6. According to the literature on *IOS* and *HRO*, *PSS* adoption is expected to increase *strategic benefits* as business value, by *accessing global markets in distribution*, *implementing new business rules* and *developing collaborative practices between stakeholders*. Judging from your *PSS*, explain how come the *PSS* can generate such benefits, together with examples.
7. According to the literature on *IOS* and *HRO*, *PSS* adoption is expected to increase *operational benefits* as business value, by *reducing transaction costs*, *facilitating the seamless exchange of information* and *applying institutional changes in regulation*. Judging from your *PSS*, explain how come the adopted *PSS* has generated such benefits, together with examples.

The interview is finished. Thank you very much for your eager participation!

The first appendix [Appendix A - Research Summary] attached to Invitation Letter before the Interview Questions is not included as a matter of convenience.

Appendix G. Participant Information Sheet



Participant Information Sheet

Date Information Sheet Produced / Revised:

25 November 2015 / 22 April 2016

Project Title

Inter-organisational Systems Adoption in Airlines with the Context of Home-region Orientation: The Case of Passenger Service Systems

An Invitation

I am Don Dong Hyun Lee. I am studying for the degree of Doctorate of Philosophy in Information Systems at Auckland University of Technology (AUT), New Zealand. As the primary researcher I would like to invite you to participate in a face-to-face interview for the data-collection phase of my scientific research, which is an important part of the requirement for my doctoral degree. Your participation is definitely voluntary and entirely at your discretion. This academic case study is designed to avoid conflict of interests. However, in case there are any potential conflict of interest issues, you may withdraw from the interview at any time prior to/during the data collection.

What is the purpose of this research?

The purpose of this research is to explain factors that influence Passenger Service Systems (PSS) adoption at the enterprise level within the context of Inter-organisational Systems and Home-region Orientation. To address the phenomenon of PSS adoption, a series of field-proven frameworks and two underlying theories are employed in a theoretical setting. The empirical findings of this study will contribute to a better understanding of PSS adoption and provide the airlines with transferable knowledge regarding comparable/similar products used in airlines.

How was I identified and why am I being invited to participate in this research?

I was employed in the airline industry, as a specialist in passenger sales and distribution channels, for over 18 years, until 2013. As a result, I was able to build up a wide range of social networks, covering major Asia-based airlines, global alliance bodies and distribution services providers in particular. Based on such an inter-organisational business career, the contact details of potential participants have been primarily identified by me and partially obtained from the stakeholders. As an *elite interview partner*, you are invited according to either of the following criteria:

- a) You are at the senior manager level *assisting decision-making in PSS adoption*; or
- b) You are at the executive level *advising on decision-making in PSS adoption*.

Also, you are selected because you can also hold a conversation in English for the interview. It is predicted that the one-to-one interview will take about half an hour.

What will happen in this research?

Since the primary mode of data collection in this case study is interviews, an interview protocol will be designed to guide the interview process. Questions will be a combination of open-ended and semi-structured forms. First, in line with the form of an unstructured interview, you will be verbally asked multiple general questions. Second, based on a semi-structured questionnaire, specific research questions will be asked by probing further into comments that are especially meaningful or interesting.

For your better understanding of the conceptual terminologies and definitions described in this information sheet, an abstract and interview questions will be provided by email, prior to the interview. With your verbal permission and after consent in writing, the data-collection interview will begin. Conversation, in English, during the interview will be recorded by using a voice recorder.

What are the discomforts and risks?

It is envisaged that there will not be any questions that may cause discomfort or risk. In an interview setting, all questions will be thus prepared to be non-offensive, positive, clear and easy to respond to. The interviewer will maintain a neutral tone and not lead participants in any specific direction.

How will these discomforts and risks be alleviated?

Participation in an interview is absolutely voluntary. Thus, participants will have the freedom to withdraw from the interview at any time, in the event that they find questions offensive or personal.

What are the benefits?

This research will have practical implications for leaders and managers, and will be used as an executive summary for major leading airlines and their alliance bodies as well as PSS providers. The findings will offer transferable knowledge to comparable practices in PSS adoption and implementation. The outcomes of this study will also provide all participant airlines with bench-mark or referential information about potential opportunities for, or challenges against, the adoption of PSS.

How will my privacy be protected?

To assure privacy and confidentiality of both the company and the individual, all names and identities will be disclosed only under pseudonyms. Specifically, in line with your right to information privacy, the collected data for qualitative analysis will be securely stored in the hard drive of a dedicated computer within the premises of AUT. The data and the forms with participants' signatures will be destroyed in a specific period of time, according to the ethical regulations of AUT. Corresponding to confidentiality of your comments, the primary researcher promises not to divulge your identity in any report, paper or public forum. However, due to the small numbers of professionals involved in the adoption/implementation of PSS, there may be a potential limitation of confidentiality in the nature of specialised roles of participants and target system only used in the airline.

What are the costs of participating in this research?

The only cost of participating in the interview is your time – taking about 30 minutes.

What opportunity do I have to consider this invitation?

You will have at least a couple of weeks to consider this invitation. Provisionally, the interview is planned for the first half of 2016.

How do I agree to participate in this research?

By emailing the primary researcher you are indicating your consent to participate in the interview.

Will I receive feedback on the results of this research?

Yes, right after the verbatim transcription of your interview and prior to the analysis of the interview data, you will receive a copy of the transcript as interim feedback; this is to ensure that your responses to each interview question are accurately described in terms of confidentiality and credibility. You are also welcome to email the primary researcher later on if you wish to see a subsequent document, either a final report or a summary of the findings.

What do I do if I have concerns about this research?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, William Wang, wiwang@aut.ac.nz, +64 9 921 9999 Ext. 5048.

Concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTEK, Kate O'Connor, ethics@aut.ac.nz, +64 9 921 9999 Ext. 6038.

Whom do I contact for further information about this research?**Primary Researcher Contact Details:**

Don Dong Hyun Lee, xgp9028@aut.ac.nz

Project Supervisor Contact Details:

Associate Professor, William Yu Chung Wang, wiwang@aut.ac.nz

Approved by the Auckland University of Technology Ethics Committee on *type the date final ethics approval was granted*, AUTEK Reference number *type the reference number*.

Appendix H. Consent Form



Consent Form

For use when interviews are involved.

Project title: *Inter-organisational Systems Adoption in Airlines with the Context of Home-region Orientation: The Case of Passenger Service Systems*

Project Supervisor: *Associate Professor, William Yu Chung Wang*

Researcher: *PhD Candidate, Don Dong Hyun Lee*

- ☐ I have read and understood the information provided about this research project in the Information Sheet dated ____ May, 2016.
- ☐ I have had an opportunity to ask questions and to have them answered verbally as well as in written.
- ☐ I understand that a questionnaire will be taken during the interview that will be audio-recorded and transcribed later.
- ☐ I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.
- ☐ If I withdraw, I understand that all relevant information including audio files and transcripts, or parts thereof, will be destroyed.
- ☐ I agree to take part in this research.
- ☐ I wish to receive a copy of the report from the research (please tick one): Yes ☐ No ☐

Participant's signature:

Participant's name:

Participant's Contact Details (if appropriate):

.....

Date: ____ May, 2016

Approved by the Auckland University of Technology Ethics Committee on type the date on which the final approval was granted AUTEK Reference number type the AUTEK reference number

Note: The Participant should retain a copy of this form.

Appendix I. AUTECH Ethics Approval



AUTECH Secretariat

Auckland University of Technology
D-88, WU406 Level 4 WU Building City Campus
T: +64 9 921 9999 ext. 8316
E: ethics@aut.ac.nz
www.aut.ac.nz/researchethics

26 November 2015

William Wang
Faculty of Business and Law

Dear William

Re Ethics Application: **15/420 Inter-organisational systems adoption in airlines with the context of home-region orientation: The case of passenger service systems.**

Thank you for providing evidence as requested, which satisfies the points raised by the Auckland University of Technology Ethics Committee (AUTECH).

Your ethics application has been approved for three years until 25 November 2018.

As part of the ethics approval process, you are required to submit the following to AUTECH:

- A brief annual progress report using form EA2, which is available online through <http://www.aut.ac.nz/researchethics>. When necessary this form may also be used to request an extension of the approval at least one month prior to its expiry on 25 November 2018;
- A brief report on the status of the project using form EA3, which is available online through <http://www.aut.ac.nz/researchethics>. This report is to be submitted either when the approval expires on 25 November 2018 or on completion of the project.

It is a condition of approval that AUTECH is notified of any adverse events or if the research does not commence. AUTECH approval needs to be sought for any alteration to the research, including any alteration of or addition to any documents that are provided to participants. You are responsible for ensuring that research undertaken under this approval occurs within the parameters outlined in the approved application.

AUTECH grants ethical approval only. If you require management approval from an institution or organisation for your research, then you will need to obtain this. If your research is undertaken within a jurisdiction outside New Zealand, you will need to make the arrangements necessary to meet the legal and ethical requirements that apply there.

To enable us to provide you with efficient service, please use the application number and study title in all correspondence with us. If you have any enquiries about this application, or anything else, please do contact us at ethics@aut.ac.nz.

All the very best with your research,

Kate O'Connor
Executive Secretary
Auckland University of Technology Ethics Committee

Cc: Don Dong Hyn Lee xgp9028@aut.ac.nz, Paul Leong

Appendix J. Profiles of the Interview Participants

In relation to the role and responsibility of each face-to-face interviewee in the PSS project task force, this appendix contains the verbal answers to two enquiries (among five open questions) concerning the short self-introduction.

Airlines	Titles	Questions and Answers
Air Lynx (Japan)	Programme Director (PD)	<p>- Describe your position, duty and past/current responsibility for PSS adoption. <i>I am a programme director in PSS Migration Project, and I still have a responsibility for PSS migration project in the company, leading the project. I have a five-year experience in major IT departments and IT Personnel. (PD)</i></p> <p>- Describe your department/unit and the nature of organisation. <i>My staff work for the IT innovation unit supporting high-technology in the company. (PD)</i></p>
	Deputy Programme Director (DPD)	<p><i>We are IT developers at the IT unit, working as end users and trying to compound the requests and requirements from the user. We transfer their needs to the IT side, and also describe and explain to the users about the restrictions in the functional aspect when we adopt and later operate the PSS functions. So, we are doing a kind of the combined functions. (DPD)</i></p>
	Programme Director (PD)	<p>- Describe your position, duty and past/current responsibility for PSS adoption. <i>As a Programme Director, at the time of PSS adoption stage, I was in charge of the Project Management office and decision-making team. I was responsible for reporting all the project status to management and the related divisions. (PD)</i></p>
Air Libra (Korea)	Deputy Manager (DM)	<p><i>I was a deputy manager role in a business unit. Doing business case on PSS platform and impact study was my main duty. (DM)</i></p> <p>- Describe your department/unit and the nature of organisation. <i>Our task team conducted a day-to-day PM work, including the planning of IT services for customers. This deputy manager and his team worked for my office. We reviewed together all common platform functions, terms & condition, value proposition and something like a high-level assessment. (PD/DM)</i></p>
	Programme Director (PD)	

Airlines	Titles	Questions and Answers
Air Lepus (Taiwan)		<p>- Describe your position, duty and past/current responsibility for PSS adoption as well as your department/unit and the nature of organisation.</p> <p><i>When I joined in the Air Lepus PSS task team, I was a general manager in charge of the PSS technical part. After the adoption stage and data migration, currently I work in Sales Management of Computer Division as a Junior VP. (JVP)</i></p>
	Junior Vice President (JVP)	<p><i>I am a section manager from the IT side responsible for maintaining the original reservation platform. At the beginning of PSS adoption, I was in charge of the legacy system operation supporting the Reservation and Ticketing part. After the few months of the adoption, I was transferred to another section in charge of the Customer Marketing technical part. Of course, the marketing is one of the important teams as PSS users. (SM)</i></p>
	Section Manager (SM)	<p>- Describe your department/unit and the nature of organisation.</p> <p><i>In IT side we work for the Computer Division, and we have four major tasks; we belong to the key organisation in charge of the first line service of the PSS products, including Online Sales, Reservation & Ticketing, Departure Control, and Mobile Application. (JVP/SM)</i></p>

* Apart from the face-to-face interviewees, two voluntary informants from Air Lepus who provided this research with the written answers are excluded in the above introduction.

Appendix K. List of the Researcher's Publications

The conference papers, publications and submissions that have been made in line with this research are:

Conference contributions (Proceedings)

1. Lee, D. D. H., Wang, W. Y. C., & Leong, P. T. M. (2014). A Study of Local Vendors' Views of Planning Global Distribution Systems: Examples from Travel Information Industry in Japan and Korea. *Proceedings of the 25th Australian Conference on Information Systems*, Auckland, New Zealand, December 8–10, 2014. (<https://aut.researchgateway.ac.nz/handle/10292/8026>)
2. Lee, D. D. H., Wang, W., & Leong, P. (2017). A Conceptual Model for Passenger Service Systems Adoption: An Interdisciplinary Perspective. *Proceedings of the IEEE 21st International Conference on Computer Supported Cooperative Work in Design, CSCWD*, Wellington, New Zealand, April 26–28, 2017. (<https://ieeexplore.ieee.org/document/8066743/>)

Journal Articles

1. Lee, D. D. H., Wang, W. Y. C., & Leong, P. T. M. (2015). A Model for Adoption of Common Alliance Platform in Airlines: Inter-organisational Systems and Home-Region Orientation Approach using TOE Framework. *Asia Pacific Journal of Contemporary Education and Communication Technology*, 1(1), 160–166. (https://apiar.org.au/wp-content/uploads/2015/08/APCAR_BRR750_ICT.pdf)
2. Lee, D. D. H., Wang, W., & Leong, P. (2018). An Explanatory Case Study on Passenger Service Systems Adoption: In the Context of Inter-organisational Systems and Home-region Orientation. *Pacific Asia Journal of the Association for Information Systems*. Manuscript accepted submitted for publication October, 2018.
3. Cho, S. J., & Lee, D. H. (2018). Influences of English Language Competence and Learning Intention on the Partner's Self-Esteem and Happiness: The Case of Korean Immigrant Couples in New Zealand. *International Journal of Adult & Continuing Education*, 21(2), 65–88. [the Korean version: Published as a corresponding author]

Submissions

1. Lee, D. D. H., Wang, W., & Leong, P. (2017). Passenger Service System Adoption from Inter-organisational System and Home-region Orientation Perspective: Explanatory Case Research on a Japanese Airline. *Aviation Management Society of Korea*. Manuscript submitted for publication. [the Korean version]