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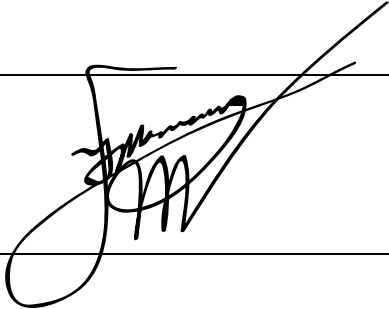
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Abstract (Provide an abstract of the mini-dissertation. An abstract is a short summary of the contents covered in the item.)	Based on the on-going involvement at Aircraft Sales Central (Pty) Ltd and previous projects done there, an opportunity has arisen to conduct a final year student project for the completion of the requirements of an Industrial Engineering degree. This document provides an overview of the planning of the project and outlines the project aim, project scope, deliverables and a project plan for this project opportunity. The planned project consists of conducting a process and information system design, modelling, redesign, and prototype testing for a new and innovative information system developed for Aircraft Sales Central (Pty) Ltd.
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Process and information system design for
Aircraft Sales Central's aviation
information system

by

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Submitted in partial fulfilment of the requirements for the
degree of

BACHELORS OF INDUSTRIAL ENGINEERING

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EXECUTIVE SUMMARY

Based on the on-going involvement at Aircraft Sales Central (Pty) Ltd and previous projects done there, an opportunity has arisen to conduct a final year student project for the completion of the requirements of an Industrial Engineering degree. This project opportunity involves the following core aspects:

- Information system design which include:
 - System planning and analysis
 - Process modelling
 - Business process redesign
 - Logical testing on prototype/wireframe design

This document provides an overview of the literature that was reviewed and investigated up to this point in the project and outlines the project aim, project scope, deliverables and a detailed section on the development of the solution approach along with the selected solution approach for this project opportunity. The document also provides the information system design in line with the deliverables defined in the initial phases of the document.

The final project is divided into four phases as follows:

- Phase 1 – Project Planning
- Phase 2 – Literature Review
- Phase 3 – Design and/or Problem Solving
- Phase 4 – Completion of Final Report

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CHAPTER 1

1.1. INTRODUCTION AND BACKGROUND

1.1.1. COMPANY INTRODUCTION AND BACKGROUND

1.1.1.1. BACKGROUND

Aircraft Sales Central is a new company that is centred around an internet based information system that will facilitate the aircraft sale process and related activities. Various stakeholders and investors are involved and currently developing this project. This system is about to start development at one of Aircraft Sales Central's strategic partners. The estimated launch date will be during 2013.

1.1.1.2. THE OPPORTUNITY IN THE INDUSTRY

To aptly understand the opportunity that Aircraft Sales Central is looking to capitalize on, it is important to understand the industry. More specifically it is important to grasp the basic workings of the South African aviation industry.

In terms of sales, a potential buyer can look to purchase either a new or used aircraft. Strict aviation regulations on safety and maintenance have made used aircraft a very popular and viable choice for most buyers. Currently the used aircraft sale market is about three times larger than the new aircraft sale market. This gap is partly attributable to the inability of the current sales companies to earn commission on the sale of new aircraft and thus lack the motivation to sell the concept of a new aircraft.

Companies conducting aircraft sales often do all the work to source buyers, organize viewings, inspections, setting up contracts and facilitating the negotiation process. Even after this process they often times they lose their hard earned commissions to another sales person who can offer a slightly better deal having done no real work to make the sale happen.

Regulations regarding commissions for the sale of aircraft are almost non-existent. Sole mandates are unheard of in the sale of aircraft unlike the well-established regulations and the commonplace of mandates and agents in the real estate industry. Sales companies often lose sales commissions as a result of sales being "stolen" from them after they have done all the hard work making it extremely difficult for honest and ethical sales people and companies to function in this industry.

Owners are reluctant to sign mandates for the sale of their aircraft as this minimizes the aircraft's exposure to potential buyers. Unlike in the real estate industry, the aircraft industry is not constrained geographically so buyers can be sourced from literally anywhere. A single sales company very rarely has access to such a wide range of potential buyers. The flip side of this situation is that sales companies try to sell the stock that they

have to the buyers that they have. This often causes buyers to buy the "wrong aircraft for the use that they intended.

Aircraft owners are often too busy or lack the expertise to conduct aircraft sales effectively. They are often unsure of the correct steps to take regarding Civil Aviation Authority processes, regulations and logging their change of ownership registrations and radio license applications.

1.1.1.3. AIRCRAFT SALES CENTRAL BUSINESS METHOD

To illustrate the workings of the system Aircraft Sales Central is developing, the following figure should be used in conjunction with the explanation that follows the figure.

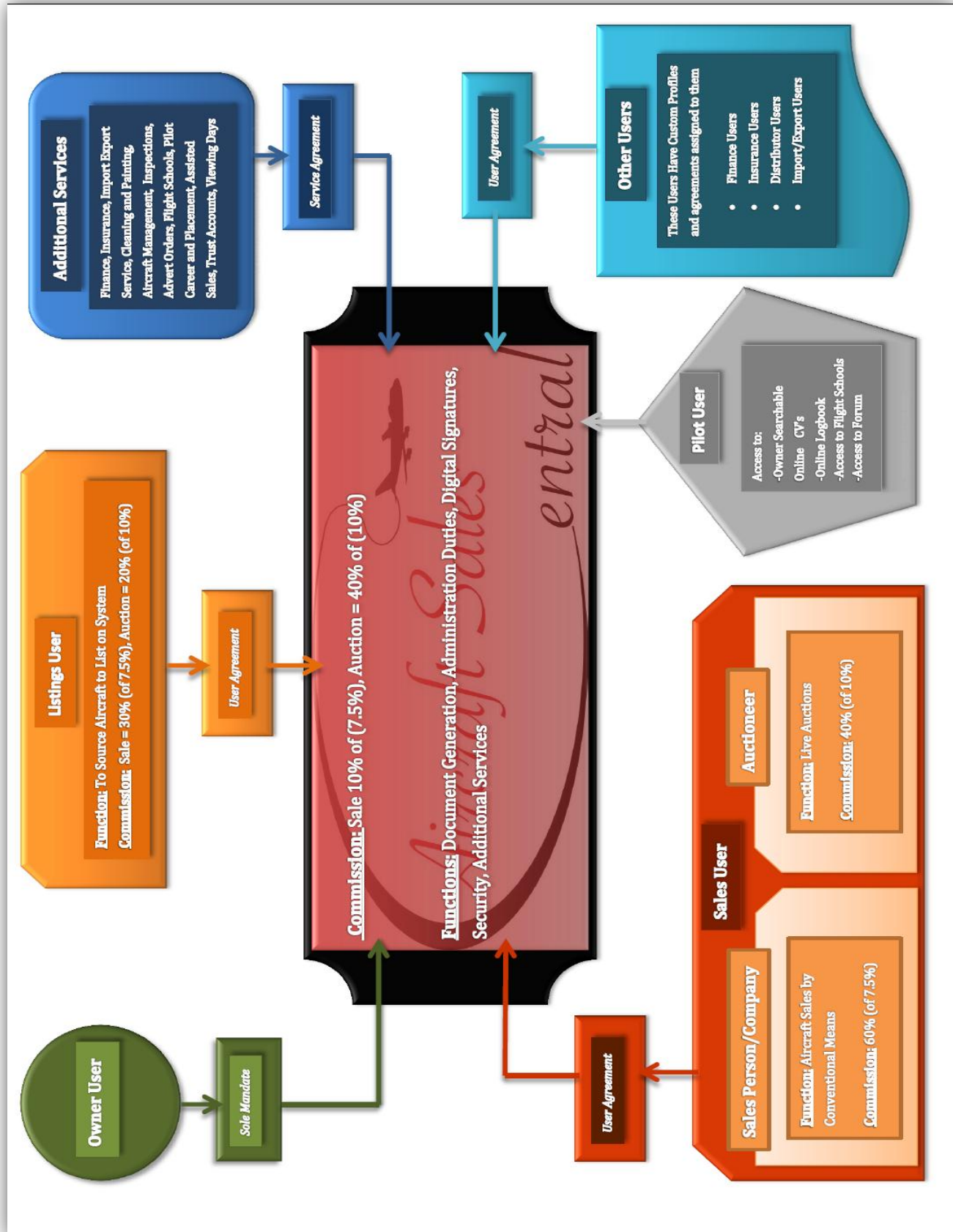


Figure 1 - ASC Business Method

The objective that is central to the company is that of providing efficiency as well as safety to the sales persons who form part of the aircraft sales process. Thus the company will not, as its main focus, render its core services to the public but rather to the companies that interact with the public. The system will aim to centralise the information of aircraft that are for sale together with the information of the owner and buyer. It will use the information from a database to compile the legal documents and registration documents in order to make the process of buying an aircraft possible "by the click of a button".

USERS EXPLAINED

OWNER USER

The Role of the Owner User is very limited in the system. The owner is basically responsible for maintaining his own profile, viewing offers made for his aircraft and signing the sale agreement upon acceptance of an offer. The owner can opt to list the aircraft himself, in which case he will receive the commission due to the Listing User (explained below).

The Owner User is bound by a Sole Mandate that is signed with Aircraft Sales Central. This sole mandate gives all the Sales Users in the system the right to sell the aircraft and the opportunity to earn commission on the sale.

LISTING USER

The role of the Listings User consists of; sourcing aircraft owners who want to sell their aircraft, Listing the Owner's aircraft on the ASC system with all the correct information and getting these owners to sign a mandate with ASC.

In return these listing users will be guaranteed earnings of 30% of the commission upon the successful sale of the aircraft that he/she listed.

Listing Users will typically be Pilots, Aircraft Maintenance Personnel, Sales Companies or anyone actively involved in the industry. These users will be motivated to find Owners who will list their aircraft because of the guaranteed income they can generate from their share of the commission of those aircraft upon its sale.

SALES USER

The role of the Sales User is to sell aircraft on the ASC system. These Sales Users will typically be existing sales companies or persons.

Sales Users earn 60% of the commission upon a successful sale of an aircraft. If the Sales User also listed the aircraft as a Listings User he/she would receive 90% of the commission.

The main reason Sales Users would want to be part of the system is the added security they receive through the mandate against 'lost sales'*. The system can track which Sales User introduced which buyer to the owner making sure that the deserving Sales User always gets his hard earned commission.

Another reason why sales companies would join the system is that they will have access to a wide range of aircraft that can only be sold as Users on the system due to the mandate on the aircraft. This provides sales companies with a bigger piece of the pie. Additionally, these sales users will also have the opportunity to sell brand new aircraft that were previously sold under sole distributorship.

PILOT USER

The Pilot Users are provided a free service where they can create an electronic logbook, create an online CV, access flight schools and a forum for discussions. The electronic logbook can be set to automatically update their online CV.

The Pilot User's online CV will be searchable by all the Owner Users on the system. These owners can search these pilots according to the specific ratings, hours, licenses, etc. to find the perfect Pilot for their enterprise or newly acquired aircraft.

The main reason behind providing this free service to pilots is for marketing purposes. The South-African aviation industry, as with the global aviation industry, is mostly governed by the word-of-mouth. Allowing these pilots to be part of the system will activate this word-of-mouth providing valuable marketing for Aircraft Sales Central.

THE BUYER USER

The Buyer User will typically be sourced by a Sales User. These are interested parties who would like to purchase an aircraft contained on the system. These users will have access to additional services and relevant aircraft information.

ADDITIONAL SERVICES

The Additional or Ad-Hoc Services includes all companies that provide services to aircraft, aircraft owners, aircraft buyers and pilots. These companies will want to be part of the ASC system because of the promise of more clients and business that they will receive.

These companies will not have to pay any fees to be part of the system. They will only have to pay a small commission to ASC upon each successful transaction making it truly risk free for these companies to join. These small commission will be balanced out by the increase in business that these users will likely experience.

These companies will be tied to Aircraft Sales Central through various service agreements. These agreements include the condition that these companies must sell their products and services at the same or lower final price than they do outside of the system.

SYSTEM EXPLAINED

The concept works around a Listing User that sources an aircraft together with its Owner who then enters into a sole mandate to sell the aircraft with Aircraft Sales Central. This mandate will protect the Listing User as well as the Sales User since they will be entitled to their shares of the commission through a contract between them and Aircraft Sales Central. In other words, when a Listing User lists an aircraft he/she will receive a share of the commission regardless of who sells the aircraft.

Aircraft Owners seldom give sole mandates to sell since they fear that their aircraft will not gain the maximum exposure if it is advertised by only one sales company. This leaves all the companies vulnerable to "theft of sales" by other sales companies and thus inhibits the advertising of aircraft. By giving the Aircraft Sales Central the sole mandate the Owner in effect gives a mandate to all the sales companies that are listed with Aircraft Sales Central as Sales Users and enables Aircraft Sales Central to regulate the sale of the aircraft to ensure that there are no risks to the Listing Users and Sales Users. This will allow these users to spend more time and freedom in advertising and less time on protecting their sales.

Through the Additional Services provided to the Sales Users, Owner Users and buyers it will also enable sales to occur faster, more professionally and more efficiently. The concept will thus provide trust to all the parties to the aircraft sale process and by adding services such as agent training and qualification levels the buyers will also be able to trust Sales Users that associate with Aircraft Sales Central and that have been through the relevant courses.

1.1.2. PROBLEM STATEMENT

As mentioned before, the system is starting its development at one of Aircraft Sales Central's strategic partners. There is a need for a complete requirements analysis and information system design for this system to be developed and programmed.

An information system, such as the one Aircraft Sales Central proposes, needs to have a comprehensive requirements analysis and information system design to be developed in the most efficient and cost effective way and to have a product that does what it was intended to do.

1.1.3. PROJECT AIM

This project aims to increase the effectiveness and efficiency of the Aircraft Sales Central concept and to design an information system according to the following objectives:

- Constructing and then analysing business process models for the key aspects of the system
- Conducting a thorough requirements analysis for the system
- Undertaking an information system design
- To bridge the gap between the concept and the developer's understanding and implementation of the concept

1.1.4. PROJECT SCOPE

The development of a system, such as the Aircraft Sales Central system, requires the development of the initial concept to a maturity level from which definite requirements and specifications can be derived. Once the concept reaches maturity it requires system initiation, system analysis, system design, final system development and system implementation.

For this project the scope will only consist of the following aspects

- Bringing the concept to a level where definite requirements and specifications can be derived
- System Initiation
- System Analysis
- System Design
- System Testing
- Constant communication and integration of the system design to the strategic partners developing the system

Therefore the final development and implementation will not be included in this project. One of Aircraft Sales Central's strategic partners will lead the development and implementation of the system.

1.1.5. DELIVERABLES

The deliverables required for this project are summarised below:

- Project proposal consisting of all the project planning
- Interim project report consisting of a comprehensive literature review
- Final report document and presentation for semester 1
- Final specification of requirements
- Information system design
- Final Process model
- Logical testing on prototype/wireframe design
- Final report and presentation for final year project

CHAPTER 2

This chapter begins with an overview of the sources that have added and will add the most value to this project. These sources have not only led to an understanding and development of information system design methodologies, these sources have led to a deeper understanding and design of the Aircraft Sales Central concept and the requirements of the system to be developed.

The second part of this chapter reviews the three most common information system designs from the literature discussed in the first part of the chapter.

2.1. LITERATURE REVIEW

2.1.1. AIRCRAFT SALES CENTRAL SYSTEM REVIEW

The initial stages of the literature review will focus on Aircraft Sales Central as a system concept. This investigation will highlight how information was gathered and reviewed in the context of the existing model. This includes initial requirements gathering for the Aircraft Sales Central system request.

Gary B. Shelly and Harry J. Rosenblatt suggest that “To obtain more information about a systems request, you might perform initial fact finding by studying organization charts, performing interviews, reviewing current documentation, observing operations, and surveying users. If the systems request is approved, more intensive fact-finding will continue during the systems analysis phase.” (Shelly and Rosenblatt, 2012: 67). The Aircraft Sales Central system is a brand new concept and business which means that there is very little in the way of previous operations, users, and documentation about the system to be developed. This means that this has to be investigated or created.

The first step in gathering the initial requirements and the idea behind the system was to conduct systematic interviews of current stakeholders. Percy Alfred Jarvis van Staden, Director and innovator of the Aircraft Sales Central system, was a key source of information about the system and provided a wealth of information to assist in understanding the functionalities that was envisioned for the Aircraft Sales Central System. Van Staden will also act as my personal mentor for this project and his insights are, and will be invaluable to this project (Van Staden, 2011).

Armand van Emmenis, Director at ICOM-IT (Van Emmenis, 2012), and Emile Engelbrecht, Director at Ver-Tex Solutions (Engelbrecht, 2012), will be heading the IT development using the results of this project. Emmenis and Engelbrecht provided invaluable insights into the technical aspects of the proposed system and will support this project on a consultancy basis, therefore, playing a key role in the development of this information system design.

Unfortunately there was little documentation to review regarding the Aircraft Sales Central system which means that part of the outcomes of this project will be to develop sufficient documentation for the system.

2.1.2. AIRCRAFT SALES CENTRAL BUSINESS MODEL REVIEW

Alexander Osterwalder and Yves Pigneur defines a business model as a description of “the rationale of how an organization creates, delivers, and captures value” (Osterwalder and Pigneur, 2010: 14). This section of the literature review will focus on how information was obtained on the business model of the Aircraft Sales Central system. It is important to understand the business model behind a concept to be able to successfully incorporate it into the design of an information system. Without this understanding, the final information system will fail to fulfil the requirements of the users making use of the information system.

As before, interviews were used to obtain most of the information in this section due to the lack of previous operations, users, and documentation about the system to be developed. In the interviews conducted to understand the business model that will have to be built into the information system requested by Aircraft Sales Central, the information provided by the following people played a key role in the information system design:

- Jacques Fisher from Dynamco provided his valuable insight to the workings of the financial side of the system and gave an important business perspective that needs to be developed into the inner workings of the system (Fisher, 2012).
- Philipus Jan Minnaar, First Officer at Star Air Cargo, provided information and experiences related to pilots that will be vital to developing the Pilot User component of the Aircraft Sales Central system (Minnaar, 2011).
- Peter Griffith, Cessna Aircraft Company’s regional vice president of sales in Europe, Middle East and Africa, provided valuable insight in the international new sales market. This information will be vital to the development of the functionality of the Manufacturing User and Sales User components in the system (Griffith, 2011).
- Pieter Els, director of Merchant West Mpumalanga, gave useful insights into the workings of financial institutions involving aircraft sales. This information will be essential to the development of the Finance User component and the aircraft sales process in the system (Els, 2011).
- David Le Roux, the new business consultant at the Aircraft Finance Corporation and the Aircraft Insurance Corporation, has provided valuable insights into the inner workings and processes regarding insurance in the aviation industry and the financing of aircraft. This information will be valuable in developing the aircraft sales process and the components of the Pilot User, Sales User, Buyer User, Finance User and the Insurance User.
- Paul Leaker, managing director of Aircraft Assessing Company, has provided insights into aircraft assessments which can be used by financial institutions, insurance providers, buyers, and sellers for the valuation of aircraft. From this interview, it was decided to include aircraft assessing into the Aircraft Sales Central system (Leaker, 2011)

- Wayne Wilson, Sales Manager at SA Flyer, gave his insights in advertising in the aviation industry. This information will prove to be valuable in developing the Advert User component in the system (Wilson, 2011).
- Willie Bodenstein, special projects coordinator at African Pilot magazine, has also provided valuable insights into advertising aircraft and aviation related activities which is vital to the development of the Advert User component of the system (Bodenstein, 2011).
- Kelly Gouws, Owner of Comet Aviation Supplies, provided useful information regarding aviation supplies which form a part of the system (Gouws, 2011).
- Shaun Lombard-Chibnall, director at Atwood Aircraft Electrical CC, provided valuable information regarding maintenance and refurbishments on aircraft which will form part of the Aircraft Sales Central's system (Lombard-Chibnall, 2012).
- Aubrey Roux, area sales manager at ATR Training and OPS, provided valuable information into pilot training that will be valuable in developing the Pilot User component of the system (Roux, 2012).
- Cisca de Lange, regional sales director at Blackhawk, provided insights into aircraft improvements and refurbishments which will form part of the Aircraft Sales Central system (de Lange, 2011).
- Ricky Goncalves, director of Superior Aeroworx, gave his valuable insights into aircraft maintenance which will form a large part of the Aircraft Sales Central system (Goncalves, 2012).
- Percy van Staden is also a director at Status Aviation. Status Aviation has been extensively involved in aircraft sales, flight training and heliport developments. Percy's experience in these fields is what led to the innovation in the Aircraft Sales Central system. (Van Staden, 2011)

There are certain functionalities in the Aircraft Sales Central business model that require legal processes such as the mandates that are needed to have an aircraft listed on the system. These functionalities have many legal aspects that need to be considered. Percy Van Staden Sr., director at the law firm JVS Incorporated, gave his insights into the legal requirements and complications that can be found in the information system to be developed. Since the system will provide contracts, finance, insurance, transactions and personal information his inputs will prove a vital part of the development of the system (van Staden, 2012). Furthermore, a book, *Business Law* along with the legislation referenced in the book, has provided valuable insights into contract law, law of purchase and sale and insurance law which all form part of the internal workings of the Aircraft Sales Central system. The importance of this legislation required careful analysis and design to incorporate the correct procedures into the information system design and ultimately the Aircraft Sales Central system (Nagel Et Al, 2007). Another book, *Navigating Information Literacy*, has provided insights into the intellectual property rights, patents and trademarks and copyrights. This was useful in protecting confidential information regarding this project and the Aircraft Sales Central system during discussions and interviews with third parties (Bothma et al., 2008).

The internet contains a wealth of information on almost every subject imaginable. The problem encountered with using internet sources is that the sources are often unreliable and unreferenced. Therefore much care was taken in selecting sources and information from the internet to assist in the development of the project. The internet did, however, provide an essential tool with which to conduct market research and investigations into the possible usage of the system and provided a platform to conduct further research into areas of improvement or expansion in the system. The Avdex register, for example, contains statistical information about the amount of aircraft bought and sold in South Africa every year. It provides up to date information which was used to calculate the potential number of users that could use the Aircraft Sales Central System to determine the types of capacities that the system will encounter once implemented (Avdex, 2012). The FAA website, along with electronic communication through their online portal, provided information about the potential number of international customers that would use the Aircraft Sales Central system and the workings of the sales process in the United States of America (FAA, 2012). The Avcom website provided valuable market information from posts and popular topics in the blog (Avcom, 2011)

2.1.3. INFORMATION SYSTEM DESIGN REVIEW

Gary B. Shelly Harry J. Rosenblatt defined an information system by defining the words, information and system separately with the following, “A system is a set of related components that produces specific result” and “Information is data that has been transformed into output that is valuable to users” (Shelly and Rosenblatt, 2012). From this we can deduce that an information system is a set of related components that transforms data into an output that is valuable to users.

Unlike in the case of the Aircraft Sales Central system, there is an ample amount of literature discussing and describing methodologies and tools that can be implemented to do an information system design. An investigation into the existing literature provided a wealth of sources that would assist in the information system design of Aircraft Sales Central. These sources include the following books:

- *System Analysis and Design for the Global Enterprise, 7th Edition* - This book has proven to be the most valuable resource for tools, techniques and methodologies in information systems design. The book provides a step by step methodical approach to developing a system that minimizes cost and post implementation complications (Bentley and Whitten, 2007).
- *System Analysis and Design, 9th Edition* - This book proved to be a useful source of information regarding agile information system development methodologies and general approaches to information system design (Shelly and Rosenblatt, 2012).
- *System Analysis and Design, 8th Edition* - This book gave valuable insights into methodologies and techniques that could be used in the development of an information system (Kendall and Kendall, 2011).
- *Operations and Supply Chain Management, 12th Edition* - This book, although not directly related to information systems design, has provided valuable insights into project management which has greatly increased the efficiency of all activities and time management techniques used in the project and its development (Jacobs, Chase and Aquilano, 2009).
- *Information Systems Development Methodologies, Techniques and Tools, 4th Edition* - This book provided further valuable information on certain tools and techniques that could be used in the development of this information system (Avison and Fitzgerald, 2006).
- *Entrepreneurship From Creativity to Innovation* - This book has proven to be a useful resource in solving problems that require creativity and innovation in this project. The book teaches techniques for improving and accessing creative methods of problem solving in one’s mind. The insights received from this book will continue to assist in the problem solving techniques used to address problems in this project (Lumsdaine and Binks, 2007).

*THE BOOKS HAVE BEEN LISTED ABOVE TO PROVIDE A SUMMARY OF THE LITERATURE USED DURING THIS PROJECT. THE SPECIFIC TOOLS, TECHNIQUES, METHODOLOGIES, AND INSIGHTS ARE DISCUSSED IN THE REST OF THE DOCUMENT, PARTICULARLY IN SECTION 2.2.

Published Journals were also investigated and have given insight into the methodologies which provide the best results. It also raised the question whether structured methodologies are the best approach to information system design. The Journal of Management Information Systems provided details on developing a system that instils trust. This is an important factor as users of the system will have to conduct transactions, store personal information and sign contracts digitally. Therefore user trust in the system is of utmost importance (Lim et al., 2006). The Int Standard Journal of 2001 provides a review of information system development methodologies which provided valuable insights into the different methodology styles for creating information systems. This journal was particularly useful in developing the methodology of the solution approach (Rowan, 2001).

Furthermore, previous projects that were added to the University of Pretoria Repository were also studied to establish whether a similar information system design was conducted. A previous project for an Information System for Equipment Management and Consumable Inventory Control for ACTOM (Pty) Ltd was studied for its applications of system information design which provided valuable insights into tools and techniques that could be applicable in the development of this project (Naidu, 2011).

Personal interviews, consultations and discussions with key players and experts form the largest part of this literature study. From the meetings that have been conducted with these people valuable information that is essential to the successful development of this project has been gained. Armand van Emmenis, managing director of ICOM-IT services, provided valuable insights into information system design. He provided many tested tools, techniques and methodologies for effective information system design. The Aircraft Sales Central system will be coded at ICOM-IT once the information system design is completed; therefore, it is important to keep the lines of communication open with the developers at ICOM-IT to ensure a successful implementation of the information system (Van Emmenis, 2012). Emile Engelbrecht, IT director at Ver-Tex Solutions, also provided further insights into information system design. He provided his own methodologies and tools for developing systems and provided some advice as to the inner workings of the Aircraft Sales Central system to be developed. (Engelbrecht, 2012). As mentioned before, van Emmenis and Engelbrecht have consultancy roles for this project to provide advice and assistance where possible to ensure the successful delivery of the information system design.

2.2. DEVELOPMENT OF THE SOLUTION APPROACH FROM LITERATURE

The approach used to develop the information system design methodology for the development of the Aircraft Sales Central system is described in the section below. After an extensive literature study outlined in section 2.1, and a series of brainstorming sessions with Armand van Emmenis, Director at ICOM-IT (Van Emmenis, 2012), and Emile Engelbrecht, IT director at Ver-Tex Solutions (Engelbrecht, 2012), the approaches outlined in this section have been identified as the most common approaches to conducting an information system design. There are many other possible approaches to conducting an information system design, including, the elimination of a structured methodology. A structured methodology would work best in the case of the Aircraft Sales Central system due to the fact that the system implementation and physical development is done by a third party. This necessitates clear communication through in-depth documentation to ensure that functional requirements are translated into the final system.

2.2.1. APPROACH A

The first approach entails using a comprehensive visual framework to develop the information system as described in the book 'Systems Analysis and Design for the Global Enterprise' (Bentley and Whitten, 2007).

According to (Bentley and Whitten, 2007) this method of information system design consists of two core parts namely:

- Analysing business requirements of the system
- Designing information systems that fulfil those business requirements.

According to (Bentley and Whitten, 2007) information systems can be viewed from various perspectives, including:

- The players in the information system
- The business drivers influencing the information system
- The technology drivers used by the information system
- The process used to develop the information system.

The above parts describe a general methodology that is described in further detail below:

SYSTEM INITIATION

According to 'Systems Analysis and Design for the Global Enterprise' the "System initiation establishes the project scope, goals, schedule, and budget required to solve the problem or opportunity represented by the project." (Bentley and Whitten, 2007: 32).

IDENTIFY THE PROBLEM

This part consists of finding and identifying the problem. Often times the problem, or in this case the opportunity, is difficult to detect and define. The opportunity for this project has been defined in the terms described in the introductory section of System Initiation above. The definition of this problem can be found in section 1-3 of this report.

SYSTEM ANALYSIS

(Bentley and Whitten, 2007: 32) states that “system analysis is intended to provide the project team with a more thorough understanding of the problems and the needs that triggered the project.” and “the system analysis requires working with system users to clearly define business requirements and expectations for any new system that is to be purchased or developed.”

(Bentley and Whitten, 2007: 167-197) suggests the following phases be used in a systems analysis

- Scope definition phase
- Problem analysis phase
- Requirements analysis phase
- Logical design phase
- Decision analysis phase

ANALYZE AND UNDERSTAND THE PROBLEM

The business drivers described above influence the time constraints, budgetary constraints and the team available for the project. System analysis is therefore largely dependent on the business drivers described above. These constraints help describe the problem requirements further.

According to (Bentley and Whitten, 2007: 207) this includes rigorous requirements gathering to ensure complete understanding of the problem.

IDENTIFY SOLUTION REQUIREMENTS AND EXPECTATIONS

This step necessitates the further investigation into the exact expectations of the system deliverables and the requirements needed in the development of the solution. This further investigation often leads to a case where the project scope or aim needs to be revised in order to satisfy the project outcomes.

SYSTEM DESIGN

(Bentley and Whitten, 2007: 33) defines system design as follows “system design (is) the specification or construction of a technical, computer-based solution for the business requirements identified in a system analysis.”

IDENTIFY ALTERNATIVE SOLUTIONS AND CHOOSE THE BEST COURSE OF ACTION

With complex problems come complex solutions and with complex solutions come many alternative solutions. This is why it is so important to sift through all the possible solutions to the problems that the project imposes and to choose the most suitable course of action by implementing the best possible solution.

DESIGN THE CHOSEN SOLUTION

Once the best course of action and solutions have been determined they must be designed into a meticulous plan as part of the complete system design. According to (Bentley and Whitten, 2007: 33) “Once a technical alternative is chosen and approved, the system design phase develops the technical blueprints and specifications required to implement the final solution.”

SYSTEM IMPLEMENTATION

The scope of this project does not include the detailed implementation of the system as this will be done by one of Aircraft Sales Central’s strategic partners. The development of this project will, however, be inextricably linked to the system implementation and thus must be considered for the comprehensiveness of the project.

(Bentley and Whitten, 2007: 33) defines system implementation as “the construction, installation, testing, and delivery of a system into production”.

IMPLEMENT THE CHOSEN SOLUTION

The implementation phase is done once the information system has concluded its development. In this phase the complete information system is installed at the required premises or domain in which it is required. This can include installation, training, and maintenance. A solid implementation plan is required to achieve all the outcomes of the project. Without successful implementation the project can become a worthless endeavour.

EVALUATE THE RESULTS

The true measure of the success of the information system is the results obtained from the evaluation. The performance indicators need to be done before any testing can take place. It can thus be argued that successful design of relevant performance indicators is one of the most important aspects of the evaluation process.

2.2.2. APPROACH B

Approach B is similar to approach A in that it uses a similar general methodology of system planning, system analysis, system design, and system implementation. The key difference in these methodologies lies in the fact that this approach considers more business aspects related to the system and less information system design techniques. There is also a phase discussing system support and security which will not be discussed here as it does not form part of the scope of this project. Approach B is directly derived from the methodology described in the book 'System Analysis and Design, 9th Edition' (Shelly and Rosenblatt, 2012).

SYSTEM PLANNING

"The purpose of this phase is to perform a preliminary investigation to evaluate an IT-related business opportunity or problem." (Shelly and Rosenblatt, 2012: 23).

ANALYSING THE BUSINESS CASE

A business case is the motivation for a particular project. During the business case analysis the feasibility of the potential project is analysed. The analysis also determines whether there is a true need for a particular project and whether the outcomes of the planned project are in line with the goals and vision of the company.

According to (Shelly and Rosenblatt, 2012: 73-81) the steps that can be taken for a business case analysis are as follows:

1. Understand the Problem or Opportunity
2. Define the Project Scope and Constraints
3. Perform Fact-Finding
4. Analyse Project Usability, Cost, Benefit, and Schedule Data
5. Evaluate Feasibility
6. Present Results and Recommendations to Management

MANAGING SYSTEMS PROJECTS

It is essential to follow an effective project management philosophy to attain success in an information system design project. Effective project management needs to be applied during the entire project life cycle.

(Shelly and Rosenblatt, 2012: 102-124) suggests that the following tools and techniques can be applied during a project to enhance the effectiveness of the project management:

- Work breakdown structure
- Critical path calculations
- Gantt charts

- PERT/CPM charts
- Task pattern identification
- Network diagram
- Risk management

SYSTEM ANALYSIS

“The purpose of the systems analysis phase is to build a logical model of the new system” (Shelly and Rosenblatt, 2012: 23).

REQUIRMENTS MODELLING

Requirements’ modelling is all about fact finding. According to (Shelly and Rosenblatt, 2012: 142) information can be gathered around the “outputs, inputs, processes, performance, and security” of the project. It is important to collect as much information as possible from as many players as possible in order to have a complete set of requirements.

DATA, PROCESS, AND OBJECT MODELLING

Data and process modelling can be viewed as “how to represent graphically system data and processes using traditional structured analysis techniques” (Shelly and Rosenblatt, 2012: 142).

According to (Shelly and Rosenblatt, 2012: 149-153) different modelling tools and techniques that can be used are as follows:

- Functional decomposition diagrams
- Business process modelling
- Data flow diagrams
- Unified modelling languages
- Use case diagrams
- Sequence diagrams
- Activity diagrams
- Object modelling using all the above

SYSTEM DESIGN

“The purpose of the systems design phase is to create a physical model that will satisfy all documented requirements for the system” (Shelly and Rosenblatt, 2012: 24).

USER INTERFACE DESIGN

The user interface is what users of the system will see when they use the system. User interface design is therefore absolutely essential to the success of this project and any information system design project.

(Shelly and Rosenblatt, 2012: 341-342) offers some principles for effective user interface design:

- Understand the business
- Maximize graphical effectiveness
- Think like a user
- Use models and prototypes
- Focus on usability
- Invite feedback
- Document everything
- Employ fool proof input designs
- Create effective output designs

DATA DESIGN

Data design consists of structuring the way information is stored and accessed on a system. “A data structure is a framework for organizing, storing, and managing data” (Shelly and Rosenblatt, 2012: 390)

(Shelly and Rosenblatt, 2012: 405-425) recommends using entity relationship diagrams to structure the information database of the information system.

SYSTEMS IMPLEMENTATION

“Managing systems implementation involves application development, testing, documentation, training, data conversion, system changeover, and post-implementation evaluation of the results” (Shelly and Rosenblatt, 2012: 506) pg 506

DIFFERENT METHODS OF ACHIEVING APPROACH B

STRUCTURED ANALYSIS

“Structured analysis uses a series of phases, called the systems development life cycle (SDLC), to plan, analyze, design, implement, and support an information system” (Shelly and Rosenblatt, 2012: 22).

OBJECT ORIENTED ANALYSIS

“object oriented analysis combines data and the processes that act on the data into things called objects” (Shelly and Rosenblatt, 2012: 24). These objects have functions, properties and attributes all encapsulated into one single entity that is linked to other entities in the system.

AGILE/ADAPTIVE ANALYSIS

“Agile methods ... attempt to develop a system incrementally, by building a series of prototypes and constantly adjusting them to user requirements” (Shelly and Rosenblatt, 2012: 25).

“Agile, or adaptive, methods are very flexible and efficient in dealing with change... However, some potential problems exist. For example, team members need a high level of technical and interpersonal skills. Also, a lack of structure and documentation can introduce risk factors” (Shelly and Rosenblatt, 2012: 148).

2.2.3. APPROACH C

(Kendall and Kendall, 2011) provides a basic framework for developing information systems. This framework places more emphasis on the foundations of a information system design by focussing on the information and requirements gathering and the decision making processes. Within the recommended framework are a multitude of tools and techniques that can be used which are summarised in the sections below:

INFORMATION REQUIREMENTS ANALYSIS

Information requirements analysis consists of collecting information regarding the proposed project.

(Kendall and Kendall, 2011: 103-145) suggests the following approaches to information gathering:

- Interviews
- Joint application design
- Surveying people
- Sampling
- Investigation
- Observations

THE ANALYSIS PROCESS

This process consists of analysing the information collected from the requirements analysis and converting into a graphical or narrative depiction of the processes involved in the proposed system.

(Kendall and Kendall, 2011: 103-145) suggests the following approaches to the analysis process:

- Data flow approach – using data flow diagrams
- Developing a data dictionary to complement the data flow diagrams
- Develop process specification and structured decisions using
 - Structured English
 - Decision tables
 - Decision trees
- Object oriented system analysis using UML

THE ESSENTIALS OF DESIGN

The essentials of design refer to the actual design of the functionality and interface of the information system. (Kendall and Kendall, 2011) suggests the following division of tasks in designing an information system:

- Designing effective output which include these objectives:
 - Designing output to serve the intended purpose.
 - Designing output to fit the user.
 - Delivering the appropriate quantity of output.
 - Making sure the output is where it is needed.
 - Providing the output on time.
 - Choosing the right output method.
- Designing effective input with an emphasis on good form design
- Designing Databases using entity relationship diagrams
- Human-computer interaction design including user interface design

QUALITY ASSURANCE AND IMPLEMENTATION

“In developing products and services, quality assurance is any systematic process of checking to see whether a product or service being developed is meeting specified requirements” (Search Software Quality, 2007).

(Kendall and Kendall, 2011: 329-550) recommends the following approach to ensure quality:

- Designing accurate data entry procedures using the following guidelines:
 - creating meaningful coding for data
 - designing efficient data capture approaches
 - assuring complete and effective data capture
 - assuring data quality through validation.
- Securing total quality assurance by designing systems and software with a top-down, modular approach
- Documenting software with appropriate tools
- Testing, maintaining, and auditing software.

2.3. CONCLUSION

A literature study can never truly be complete until the project has reached its conclusion. There will always be new problems and challenges within a project that necessitate further research and investigation. Therefore, this literature study, and the sources in it, will continue to grow and expand as this information system matures in its development. These developments may also change aspects of the solution approach described in the next section.

CHAPTER 3

3.1. SOLUTION APPROACH

After an extensive study and analysis of business methods, data, requirements and specified outcomes and an intensive study into available literature as described in the sections preceding this one, it has been established that the following solution approach would be the best course of action in developing the Aircraft Sales Central information system:

After consultation with Armand van Emmenis, Director at ICOM-IT (Van Emmenis, 2012) and Emile Engelbrecht, Director at Vertex-IT (Engelbrecht, 2012), it was decided that the solution approaches outlined in the previous section each contain aspects that will enhance the information system design for the unique needs of the Aircraft Sales Central system. The following solution is, therefore, a combination of information, tools and techniques obtained from the sources in the literature study and Approach A, Approach B, and Approach C.

The solution approach can be divided into four phases namely:

3.1.1. SYSTEM PLANNING

The following activities need to be conducted as part of system planning:

INFORMATION AND REQUIREMENTS GATHERING:

Activity	Motivation and Sources
Interviews	Interviews were discussed in detail in (Bentley and Whitten, 2007), the basis literature of 'Approach A'. (Bentley and Whitten, 2007) summarised the importance of interviews as a tool of information gathering in the following: "The personal interview is generally recognized as the most important fact-finding technique".
Investigation into existing information	"A good analyst always knows to get facts first from existing documentation rather than from people" (Bentley and Whitten, 2007). The reason for this is information gained from people is often biased and can be unreliable.
Observation of current or future work environment	'Approach C' recommends using observations for information gathering. "Observing the physical environment where decision makers work also reveals much about their human information requirements" (Kendall and Kendall, 2011).
Defining the Project Scope and Constraints	Another important activity included in this solution approach is one suggested by (Shelly and Rosenblatt, 2012) and used in 'Approach B'. It is

	extremely important to distinctly define the project scope and all constraints associated with the project to avoid project creep as discussed by (Shelly and Rosenblatt, 2012: 74) "Projects with very general scope definitions are at risk of expanding gradually, without specific authorization, in a process called project creep".
Compiling Results and Recommendations	The compilation of all the results and recommendations is an activity that is directly influenced by the requirements set out by the University of Pretoria and the Engineering and Built Environment faculty.
Work breakdown structure	"a work breakdown structure (WBS) is a hierarchical decomposition of the project into phases, activities and tasks" (Bentley and Whitten, 2007). A work breakdown structure is often considered as part of project management. Work breakdown structures are, however, in the opinion of this author, an significant enough technique to be considered in its own right.
Implementation of project management techniques	Project management is vitally important in any project. Without project management much inefficiency can result in the implementation of the solution approach of a project. 'Approach A' places a large emphasis on project management techniques. "project management is necessary to ensure that the project meets the deadline, is developed within an acceptable budget, and fulfils customer expectations and specifications" (Bentley and Whitten, 2007: 121).

Table 1 - Information and Requirements Gathering

3.1.2 SYSTEM ANALYSIS

The following activities need to be conducted as part of system analysis:

Activity	Motivation and Sources
Use Case Modelling	"A use case represents the steps in a specific business function or process" (Shelly and Rosenblatt, 2012). It is important to define all the business functions and processes in basic steps in order to gain a fundamental understanding of all processes involved in a business model in terms of information design. 'Approach B' places emphasis on the utilization of use cases for information system design.
Business Process Modelling	Business process modelling is the next logical step after use case modelling. All the business functions and processes modelled by the use case diagrams are now developed in further detail in the business process models

Table 2 - System Analysis

3.1.3. SYSTEM DESIGN

The following activities need to be conducted as part of system design:

Activity	Motivation and Sources
Data Modelling and Database Design using Entity Relationship	(Bentley and Whitten, 2007: 271) defines an entity relationship diagram as “a model utilizing several notations to depict data in terms of the entities and relationships described by the data”. The Aircraft Sales Central system will be constructed around a central database of all the information and data used in the system. It is therefore of paramount importance to use a tool that can effectively model all entities within the database for effective database design.
Form Design	Information and details will be a constant input into the Aircraft Sales Central system. Therefore, it is important to design forms that will maximize the efficiency of the information received and will be of the least inconvenience to the end user. (Kendall and Kendall, 2011: 371) Emphasises the importance of good form design by stating that “The systems analyst should be capable of designing a complete and useful form. Unnecessary forms that waste an organization’s resources should be eliminated”.
User Interface Design using a wireframe prototype	Users interact with the system through the user interface. It is therefore of vital importance to determine whether the processes defined are conducive to an interface design that will increase the ease of use for the end user. If this is not the case, a business process redesign should be used. Prototyping allows a platform to determine whether the user interface is easy and logical to use. Prototyping, defined by (Lumsdaine and Binks, 2007: 55), is “a technique for quickly building a functioning but incomplete model of the information system using rapid application development tools”.

Table 3 - System Design

3.1.4. SYSTEM IMPLEMENTATION

The following activities need to be conducted as part of system implementation:

Activity	Motivation and Sources
Evaluation of project aim and deliverables versus the end result	In order to consolidate the project and determine whether the information system design was successful it should be determined whether the actual outcomes of the project are in line with the project aim and deliverables defined in the beginning of this document.
Hand over all deliverables from system planning, analysis and design to the development team for coding and final implementation.	This is the final step in the solution approach. The complete information system design will be handed over to the development team to commence the actual coding and implementation of the system.

Table 4 - System Implementation

CHAPTER 4

4. INFORMATION SYSTEM DESIGN

4.1. SYSTEM PLANNING AND DATA GATHERING

4.1.1. SOLUTION PROJECT PLANNING

Before the commencement of the planned deliverables for the information system design, certain project management techniques were implemented to ensure the successful delivery of the information system design according to the deliverables set out in the preceding sections of this document. This included a breakdown of all the deliverables into tasks in a work breakdown structure and the project timeline in the form of a Gantt chart.

4.1.1.1. WORK BREAKDOWN STRUCTURE

The work breakdown structure serves to break down all the deliverables set out in the preceding sections of this document into tasks of work that need to be completed. The work breakdown structure for the information system design is depicted on the following page:

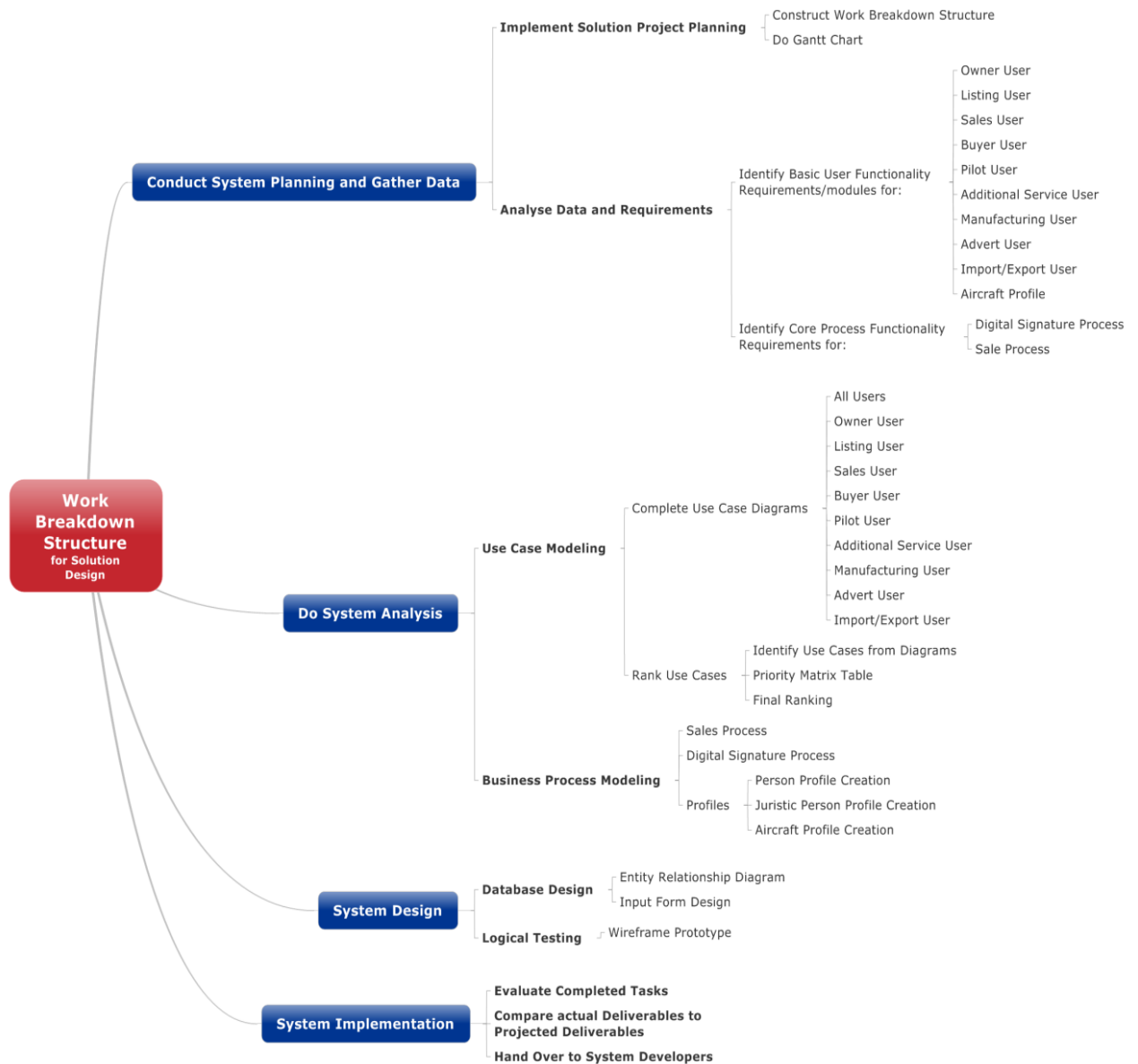


Figure 2 - Work Breakdown Structure

4.1.1.2. GANTT CHART

The project timeline is directly derived from the work breakdown structure depicted on the previous page. These tasks have been assigned certain due dates and were given certain periods of time for completion as follows:

Task	Start	Due
Conduct System Planning and Gather Data	2012/04/10	2012/06/27
• Implement Solution Project Planning	2012/06/18	2012/06/27
○ Construct Work Breakdown Structure	2012/06/18	2012/06/21
○ Do Gantt Chart	2012/06/22	2012/06/27
Analyse Data Requirements	2012/04/10	2012/05/03
• Identify Basic User Functionality Requirements/modules for:	2012/04/10	2012/04/25
○ Owner User	2012/04/10	2012/04/11
○ Listing User	2012/04/12	2012/04/13
○ Sales User	2012/04/11	2012/04/12
○ Buyer User	2012/04/12	2012/04/12
○ Pilot User	2012/04/13	2012/04/14
○ Additional Service User	2012/04/16	2012/04/17
○ Manufacturing User	2012/04/17	2012/04/18
○ Advert User	2012/04/19	2012/04/20
○ Import/Export User	2012/04/19	2012/04/20
○ Aircraft Profile	2012/04/23	2012/04/25
• Identify Core Process Functionality Requirements for:	2012/04/25	2012/05/03
○ Digital Signature Process	2012/04/25	2012/04/27
○ Sale Process	2012/04/28	2012/05/03
Further Interviews For Requirements Gathering	2012/05/08	2012/05/30
Do System Analysis	2012/06/01	2012/08/06
• Use Case Modelling	2012/06/01	2012/07/09
○ Complete Use Case Diagrams	2012/06/01	2012/07/03
▪ All Users	2012/06/01	2012/06/05
▪ Owner User	2012/06/06	2012/06/08
▪ Listing User	2012/06/11	2012/06/13
▪ Sales User	2012/06/14	2012/06/18
▪ Buyer User	2012/06/19	2012/06/20
▪ Pilot User	2012/06/21	2012/06/22
▪ Additional Service User	2012/06/25	2012/06/27
▪ Manufacturing User	2012/06/28	2012/06/29

▪ Advert User ▪ Import/Export User ○ Rank Use Cases ▪ Identify Use Cases from Diagrams ▪ Priority Matrix Table ▪ Final Ranking • Business Process Modelling ○ Sales Process ○ Digital Signature Process ○ Profiles ▪ Person Profile Creation ▪ Juristic Person Profile Creation ▪ Aircraft Profile Creation	2012/06/30	2012/07/03
	2012/07/03	2012/07/03
	2012/07/04	2012/07/09
	2012/07/04	2012/07/04
	2012/07/05	2012/07/06
	2012/07/09	2012/07/09
	2012/07/09	2012/08/06
	2012/07/09	2012/07/18
	2012/07/19	2012/07/24
	2012/07/24	2012/08/06
	2012/07/24	2012/07/28
	2012/07/30	2012/08/01
	2012/08/02	2012/08/06
System Design	2012/08/06	2012/09/01
• Database Design ○ Entity Relationship Diagram ○ Input Form Design • Logical Testing ○ Wireframe Prototype	2012/08/06	2012/08/18
	2012/08/06	2012/08/14
	2012/08/15	2012/08/18
	2012/08/20	2012/09/01
	2012/08/20	2012/09/01
System Implementation	2012/09/01	2012/10/30
• Evaluate Completed Tasks Initial • Compare actual Deliverables to Projected Deliverables • Refinement of Document and Project • Evaluate Completed Tasks Final • Hand Over to System Developers	2012/09/01	2012/09/05
	2012/09/03	2012/09/06
	2012/09/20	2012/10/01
	2012/10/01	2012/10/06
	2012/10/25	2012/10/30

Table 5 - Information System Design Schedule

The Gantt chart for these charts is depicted on the following two pages:



Figure 3 - Gantt Chart Part 1

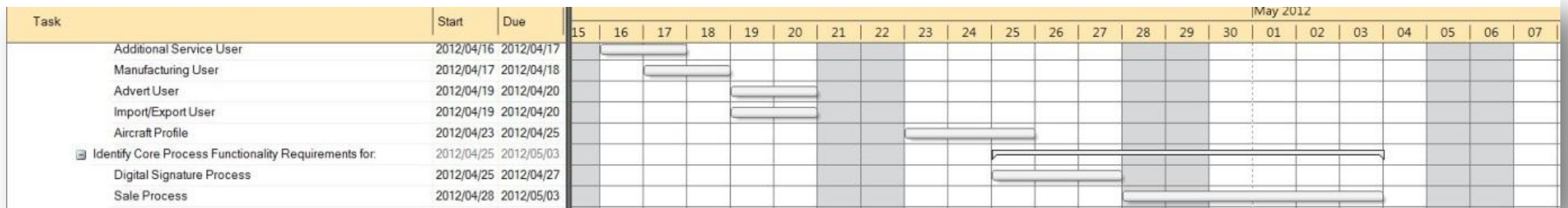


Figure 4 - Gantt Chart Part 2

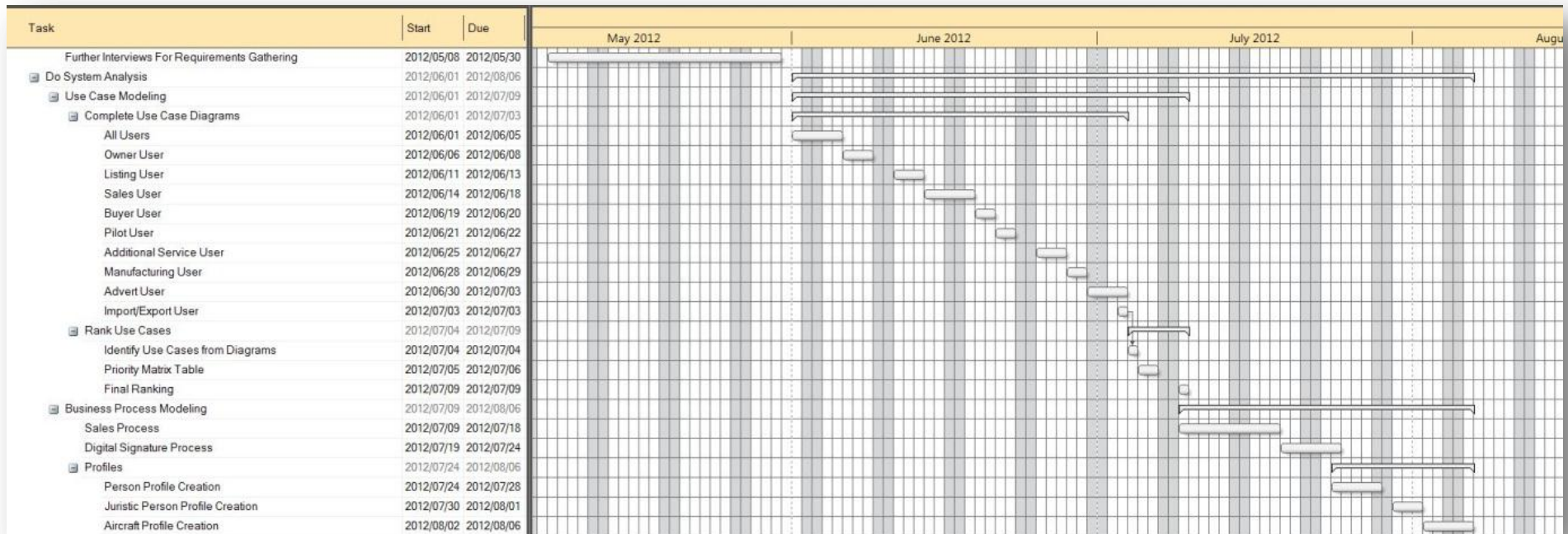


Figure 6 - Gantt Chart Part 3

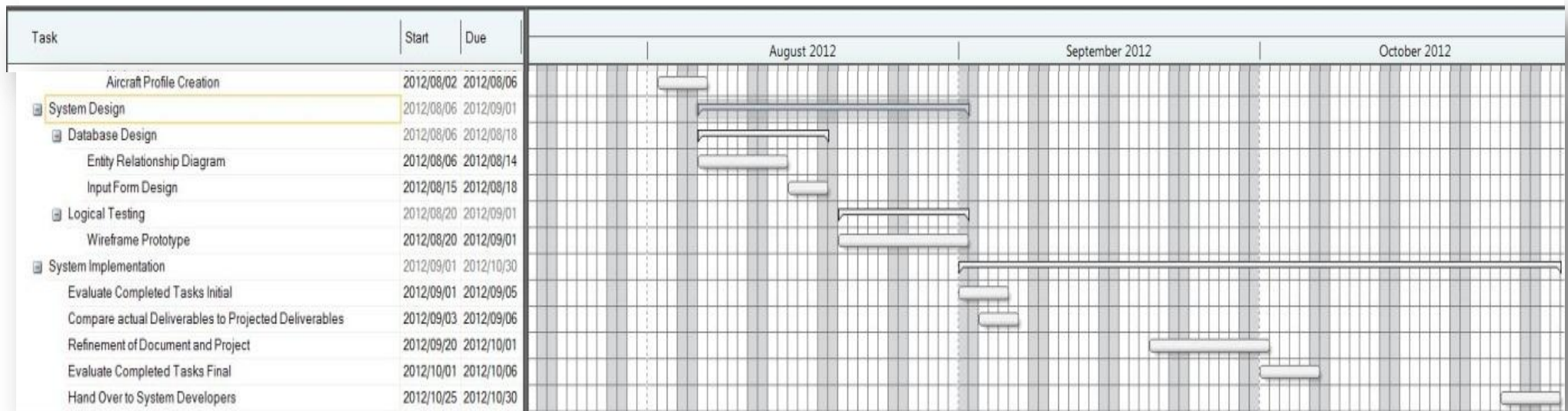


Figure 5 - Gantt Chart Part 4

4.1.1.3. RISK ASSESSMENT

One of the methods used to identify key risks in the system development phase consists of a brainstorming approach to identify risks and assign probability and consequence values to these risks. This enables easy prioritisation for developing risk contingencies. It should be noted that these risks were identified in conjunction with the Aircraft Sales Central team for the entire project. This was done to ensure that the information system design provides the correct information for the system development team to mitigate potential risks during the system development phase following this information system design as a preventative measure. The following tables, along with the key, show the top risks associated with different areas within the development of the Aircraft Sales Central system:

KEY

Assigned Probability	Defined	Assigned Consequence	Defined
1	Highly Unlikely	1	Catastrophic
2	Unlikely	2	Material Impact
3	Uncertain	3	Noticeable Impact
4	Probable	4	Minor Loss
5	Highly Likely	5	Indifferent

Table 6 - Risk Assessment Key

SYSTEMS DEVELOPMENT

#	Risk	Assigned Probability	Assigned Consequence	Risk Value
1	Cash investors defaults, second investor not acquired within 2 months	3	4	12
2	Digital signature not approved	3	3	9
3	Database Error (design)	3	3	9
4	Concept duplicated by competitor (result of disclosure)	2	4	8
5	Head Programmer pulls out after December	2	3	6
6	System delayed System Developer short (1-2 months)	3	2	6
7	System delayed System Developer medium (3-5)	2	3	6
8	Website Aesthetics Design Delay (short)	3	2	6
9	Website Aesthetics Design Delay (long)	2	3	6
10	No Cash Investors	2	3	6
11	Web domain not available	3	2	6
12	Additional programmer incompetent	2	3	6
13	Additional programmer backs out	2	3	6

14	System Development company insolvent - requests payment	1	4	4
15	System Source code lost/damaged	1	4	4
16	System Source code stolen	1	4	4
17	System delayed ICOM long (6+)	1	3.5	3.5

Table 7 - System Development Risk Assessment

We can see from table 7 that there are potential risks associated with the system development phase including database design errors and development delays. These risks may be mitigated by concluding a thorough information system design to speed up the actual development phase and by including an entity relationship diagram to ensure a working database design.

TESTING

#	Risk	Assigned Probability	Assigned Consequence	Risk Value
1	Backdoor Security Error	2.5	3	7.5
2	Database Query Error	3	2	6
3	Agreement Population Error	3	2	6
4	Agreement Transfer Error	2	3	6
5	System Does not fulfil all requirements (many)	2	3	6
6	Website Logic not intuitive	3	2	6
7	Uploading Error	2	2	4
8	Agreement Verification check system Error	2	2	4
9	Secure Protocol Error	2	2	4
10	System Does not fulfil all requirements (few)	4	1	4
11	Database linking error	2	2	4
12	front end error	2	2	4

Table 8 - Testing Risk Assessment

During the system testing phase it becomes clear how errors during the system development phase have an even larger impact on the entire Aircraft Sales Central project. These risks include database query errors, Agreement transfer and population errors, unfulfilled system requirements, Website logic problems, verification check errors, and database linking errors. These risks can also be mitigated to an extent through a proper information system design.

SYSTEM LAUNCH AND BEYOND

#	Risk	Assigned Probability	Assigned Consequence	Risk Value
1	Global recession	3	4	12
2	Data Lost	2	5	10
3	Data stolen	2	5	10
4	Direct Competition	3	3	9
5	Finance organization dissatisfies a client and tarnishes the company's name	3	3	9
6	Insurance organization dissatisfies a client and tarnishes the company's name	3	3	9
7	System Does not fulfil all our requirements (few)	3	2.5	7.5
8	Database Query Error	2	3.5	7
9	Agreement Population Error	2	3.5	7

10	Website Aesthetics not up to standards	2	3.5	7
11	Backdoor Security Error	1.5	4.5	6.75
12	System crashes short	3	2	6
13	System crashes long	2	3	6
14	Users circumvent commission through delayed sale (after mandate)	3	2	6
15	System Source code lost/damaged	1	5	5
16	System Source code stolen	1	5	5
17	Ad-Hoc service organization dissatisfies a client and tarnishes the company's name	3	1.5	4.5
18	Agreement Transfer Error	1	4.5	4.5
19	System Does not fulfil all our requirements (many)	1	4.5	4.5
20	ASC offices Internet down (long)	2	2	4
21	Additional programmer backs out	2	2	4
22	Developer/Host Insolvent	2	2	4
23	Uploading Error	1	3.5	3.5
24	Agreement Verification check system Error	1	3.5	3.5
25	Secure Protocol Error	1	3.5	3.5
26	Database linking error	1	3.5	3.5
27	Front end error	1	3.5	3.5

Table 9 - System Launch and Beyond Risk Assessment

Once again we can see that risks stemming from errors in the systems development phase appear quite frequently in the top risks identified. These risks include database query errors, unfulfilled system requirements, agreement population and transfer errors, system crashes, verification errors, and database linking errors. This again highlights the importance of the database design through the use of an entity relationship diagram. It also highlights the importance of an information system design before the system development commences.

4.1.2. DATA AND REQUIREMENTS ANALYSIS

The following section gives a high level summary of the results of the Information and Requirements Gathering as described in section 3.1.1. The data leading to the results described in this section were collected from interviews, a thorough investigation into current information available, observations of the current and future working environments, and a study of current literature as described in chapter 2.

The results of the data analysis will be represented in this section as requirements analysis that will be summarised at a high level. Lower level requirements have been identified but these requirements have been identified in excessive detail and have been omitted from this report for simplicity.

4.1.2.1. BASIC USER FUNCTIONALITY REQUIREMENTS/MODULES

The following basic user functionality requirements/modules have been identified:

OWNER USER

- Profile administration module
- available viewing dates module
- Viewing date tracking module
- Extend mandate
- Search module (potential pilots)
- Aircraft profile tracking
- Aircraft profile creation module
- Freeze linked aircraft profile
- Access to documentation and media
- Communication module (ASC)
- Interface module (linked Sales User, Listing User, and Buyer User)
- Insurance application
- Contract generation
- Contract Customization

SALES USER

- Profile administration module
- Access to aircraft database with limited information
- Access to linked aircraft profile information
- Linking profile to aircraft profile (commitment to sell)
- Access to user documentation and media
- Communication module (ASC)
- Buyer review module
- Advert order module
- Access to Linked aircraft viewing information
- Interface module (linked Sales User, Listing User, and Buyer User)

LISTING USER

- Profile administration module
- Aircraft profile creation
- Owner profile creation
- Linked owner profile administration
- Access to documentation and media
- Communication module (ASC)

BUYER USER

- Profile administration module
- Access to sales user and aircraft information through unique ID
- Access to information from sales user profiles
- Access to documentation and media
- Communication module (ASC)
- Access to Sale Process
- Finance application module
- Insurance application module
- Contract generation module
- Contract Customization

PILOT USER

- Profile administration module
- Access to documentation and media
- Online logbook module
- Online CV module
- Access to flight schools
- Communication module (ASC)
- Insurance application module

ADDITIONAL SERVICE USER GENERAL TEMPLATE

- Profile administration module
- Administration of products
- Product attributes administration module
- Contract generation module
- Contract Customization

MANUFACTURING USER

- Profile administration module
- Administration of forms and product information
- Product administration module
- Product attributes administration module
- Sale Contract generation module
- Submission module (custom sale contract)

FINANCE USER

- Profile administration module
- Application variables administration module
- Access to applications portal
- Communication with applicants
- Contract generation module
- Submission module (custom sale contract)

INSURANCE USER

- Profile administration module
- Application variables administration module
- Applications portal module
- Communication with applicants
- Contract generation module
- Submission module (custom sale contract)

IMPORT/EXPORT USER

- Profile administration module
- Application variables administration module
- Communication module (applicants)
- Contract generation module
- Submission module (custom sale contract)
- Applications portal module

ADVERT USER

- Uses standard additional services user template plus the following modules:
 - Administration of standard advertisement prices and sizes
 - Access to inbox of advertisement applications for download (inbox module)

AIRCRAFT PROFILE

- Profile administration module
- Available viewing date module
- Freeze profile
- Extend mandate
- Escrow account module
- Communication module (ASC)
- Blue book valuations module

4.1.2.2. CORE PROCESS FUNCTIONALITY REQUIREMENTS

The following core process functionality requirements have been identified:

DIGITAL SIGNATURE PROCESS

- Linking of natural person for rights to sign for juristic person
- Digital signature account creation module
- Signature and document encryption protocol module
- All users access to digital signature for generated accounts

SALE PROCESS

- Insurance Application module
- Finance Application module
- Submission of documents module (radio license and registration documents)
- Digital signature process
- Sale process ID generation module
- Viewing process module
- Offer phase (contract process) module
- Access to digital signature process
- Contract encryption module
- Additional service integration

4.2. SYSTEM ANALYSIS

4.2.1. USE CASE MODELLING

4.2.1.1. USE CASE DIAGRAMS

The use case diagrams illustrated in this section were grouped according to users and included local dependency use cases in the same diagrams as per the suggestion of Armand van Emmenis, developer and managing director at ICOM-IT (Van Emmenis, 2012).

ALL USERS

The following use case diagram applies to all the users in the Aircraft Sales Central system except for the administrators and support staff who have backend access to the system. This use case diagram was made to reduce repetition in the diagrams.

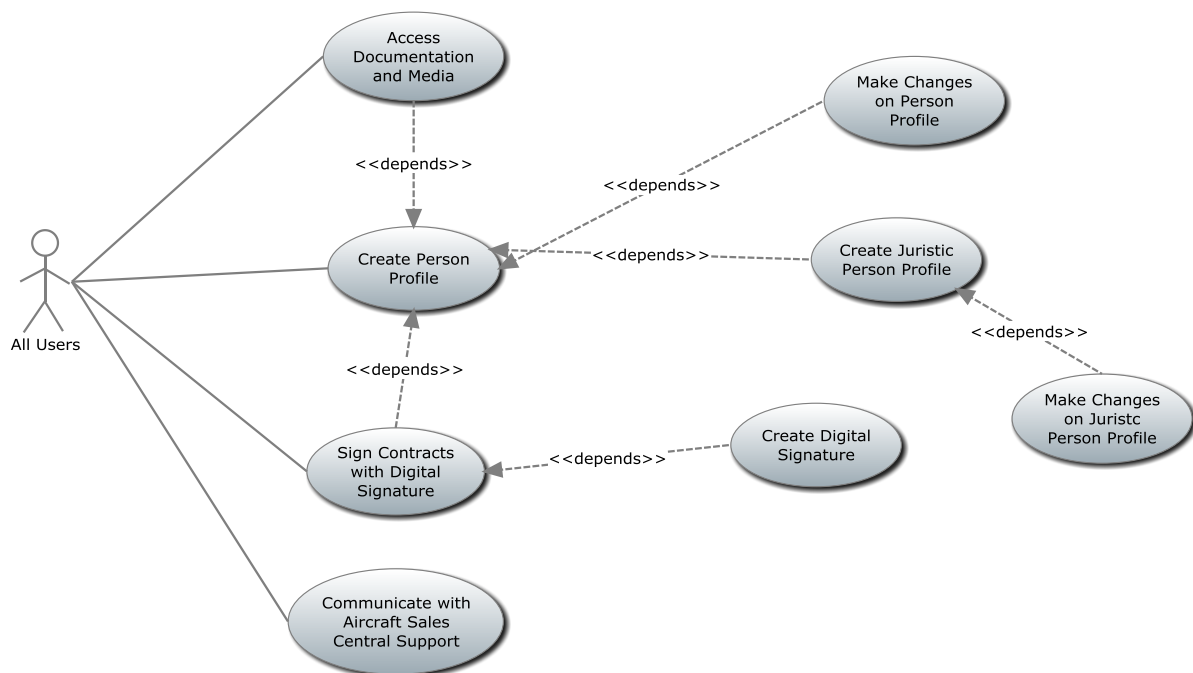


Figure 7 - All Users Use Case Diagram

OWNER USER

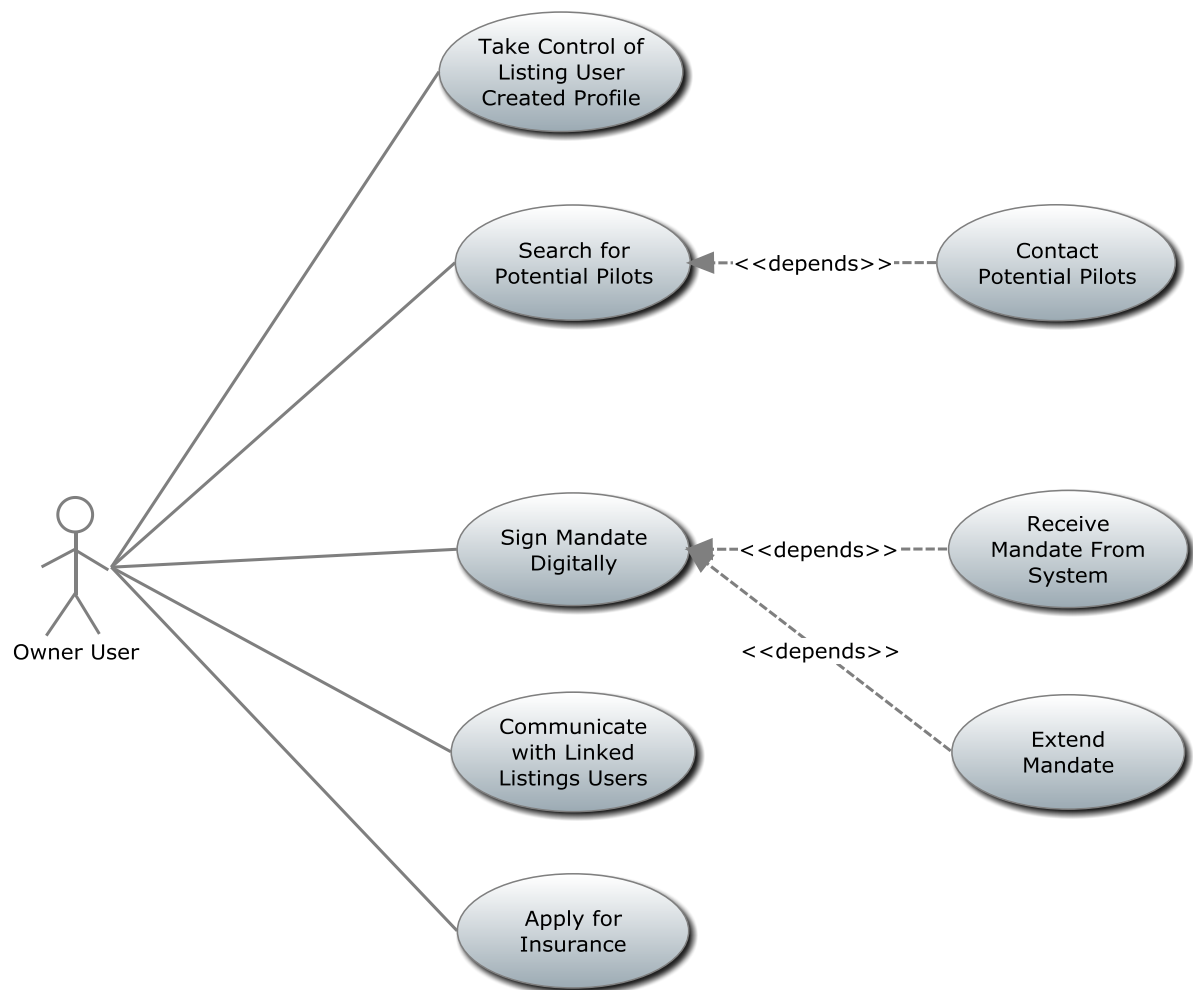


Figure 8 - Owner User Use Case Diagram

LISTING USER

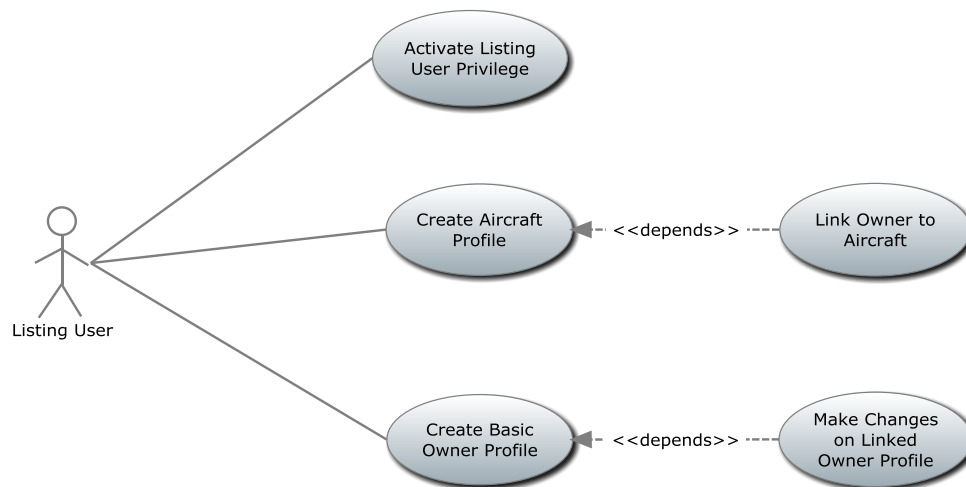


Figure 9 - Listing User Use Case Diagram

OWNER/LISTING USER

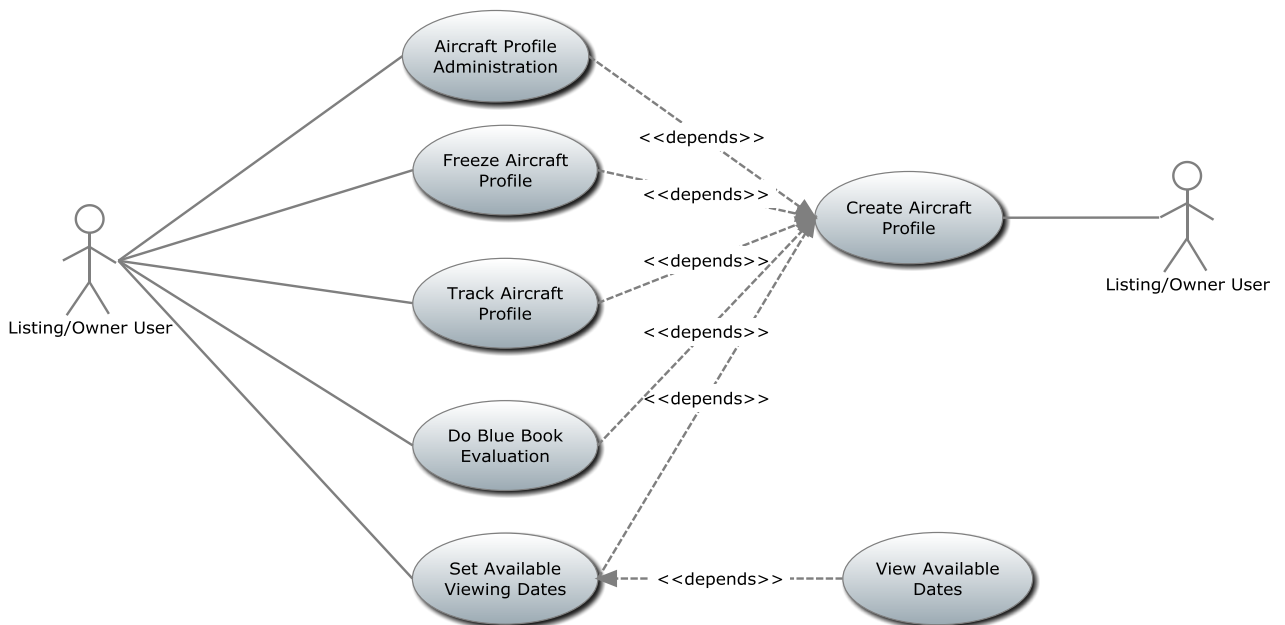


Figure 10 - Owner/Listing User Use Case Diagram

SALES USER

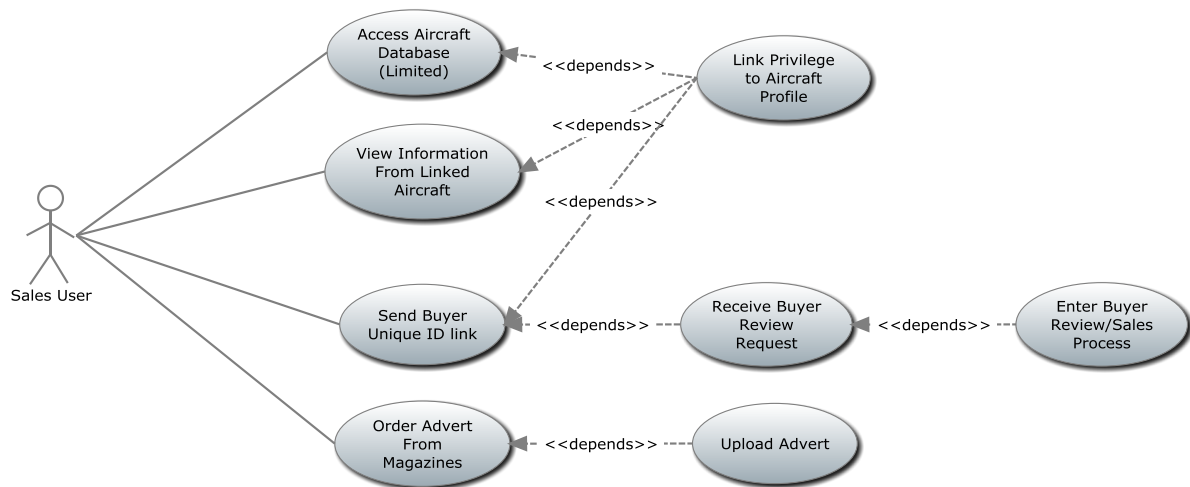


Figure 11 - Sales User Use Case Diagram

All use cases depend on activation of Sales User privilege

BUYER USER

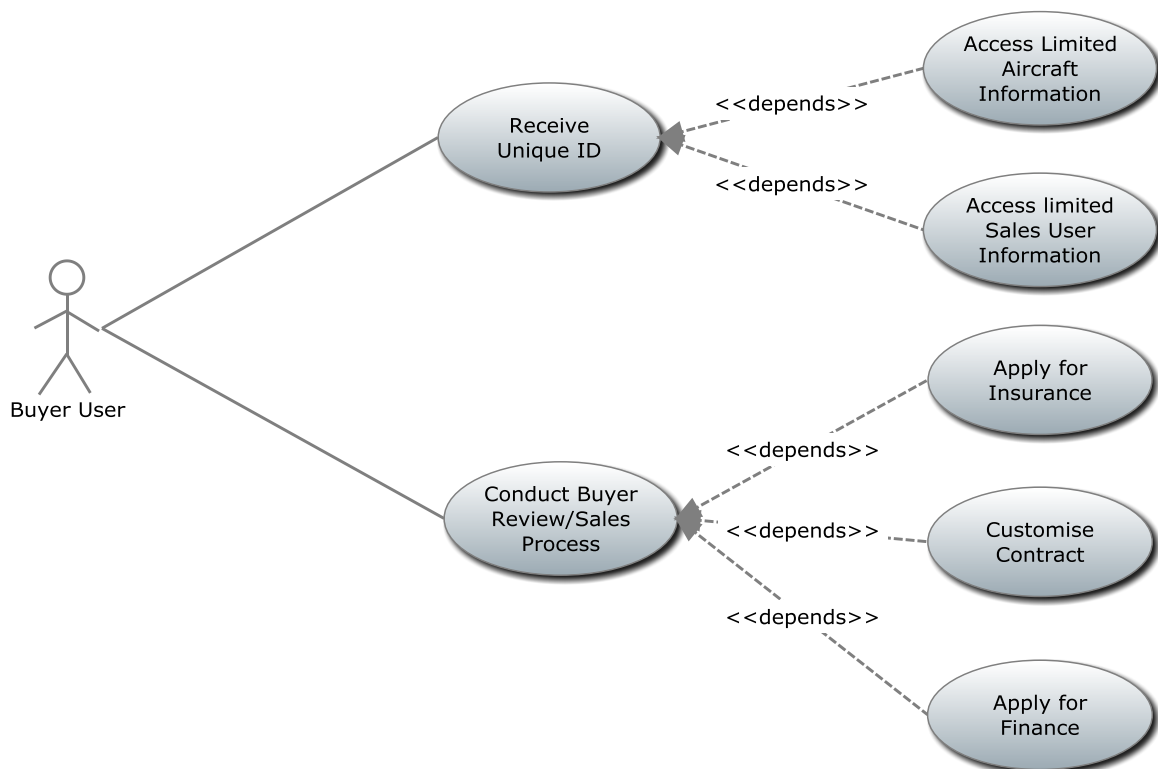


Figure 12 - Buyer User Use Case Diagram

PILOT USER

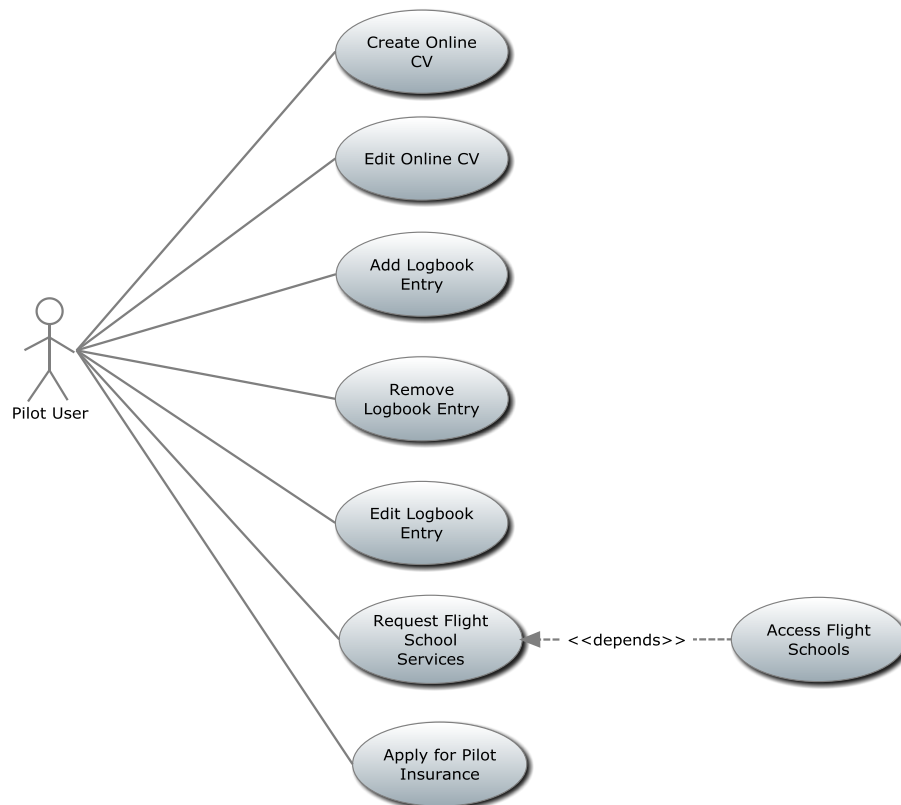


Figure 13 - Pilot User Use Case Diagram

ADDITIONAL SERVICES USER

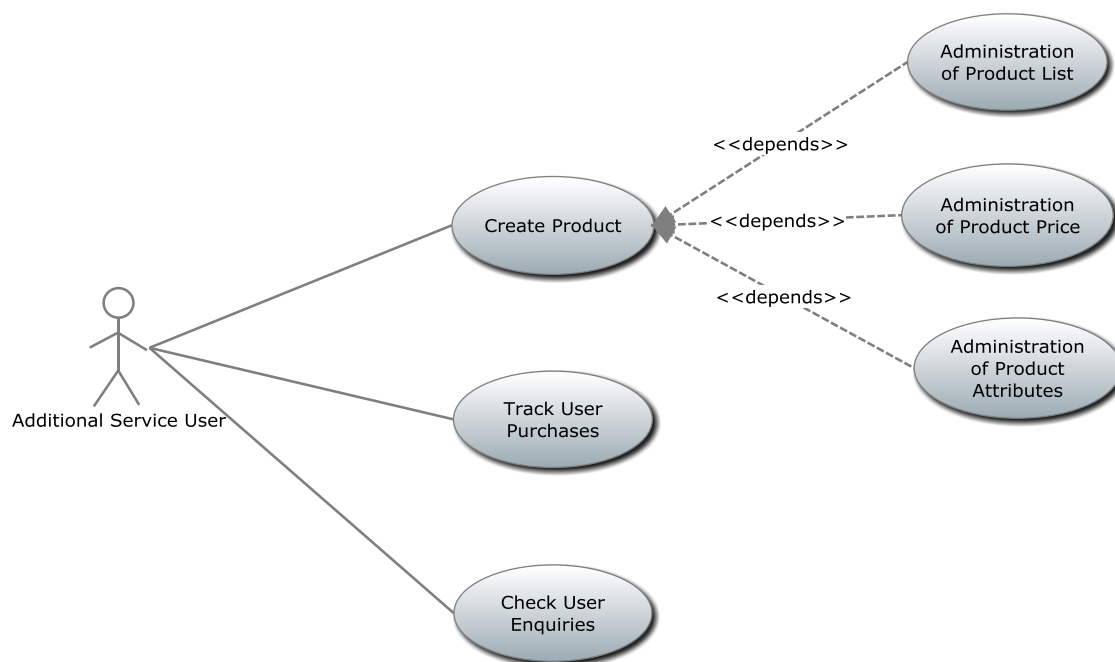


Figure 14 - Additional Service User Use Case Diagram

MANUFACTURING USER

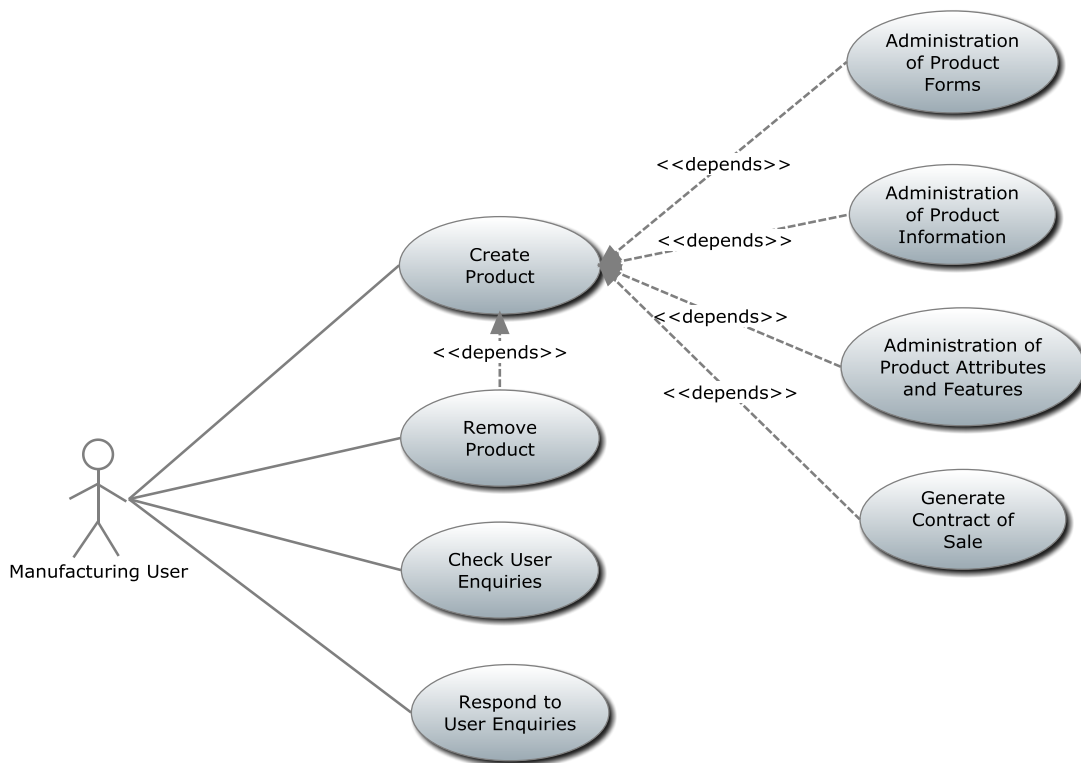


Figure 15 - Manufacturing User Use Case Diagram

FINANCE/INSURANCE USER

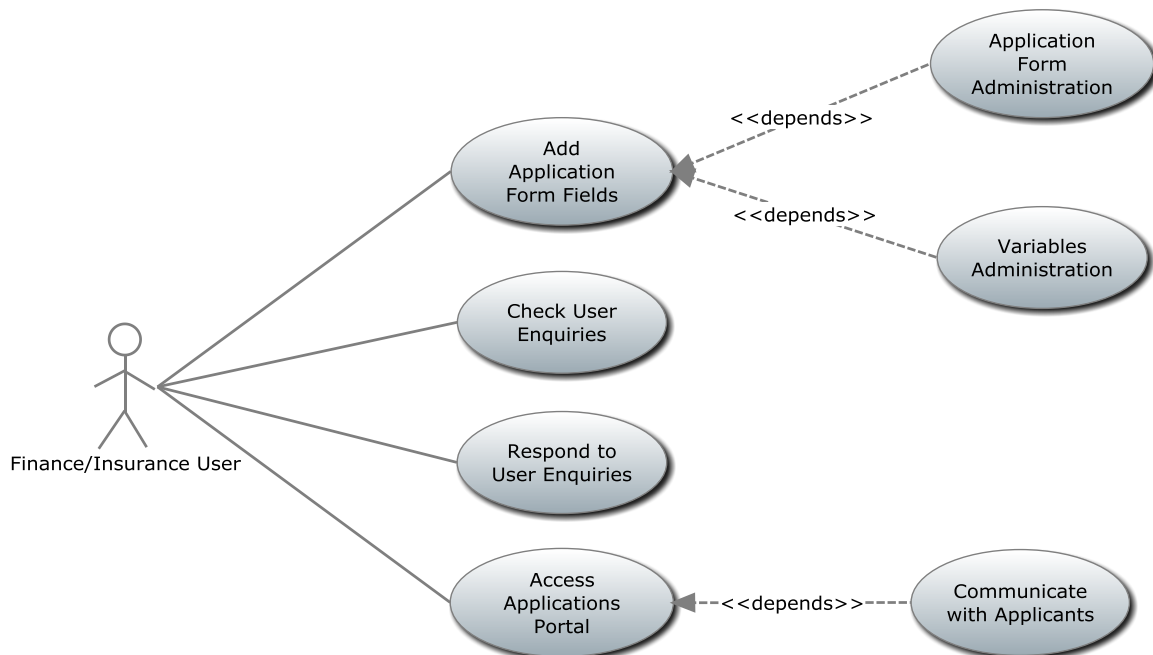


Figure 16 - Finance/Insurance User Use Case Diagram

ADVERT USER

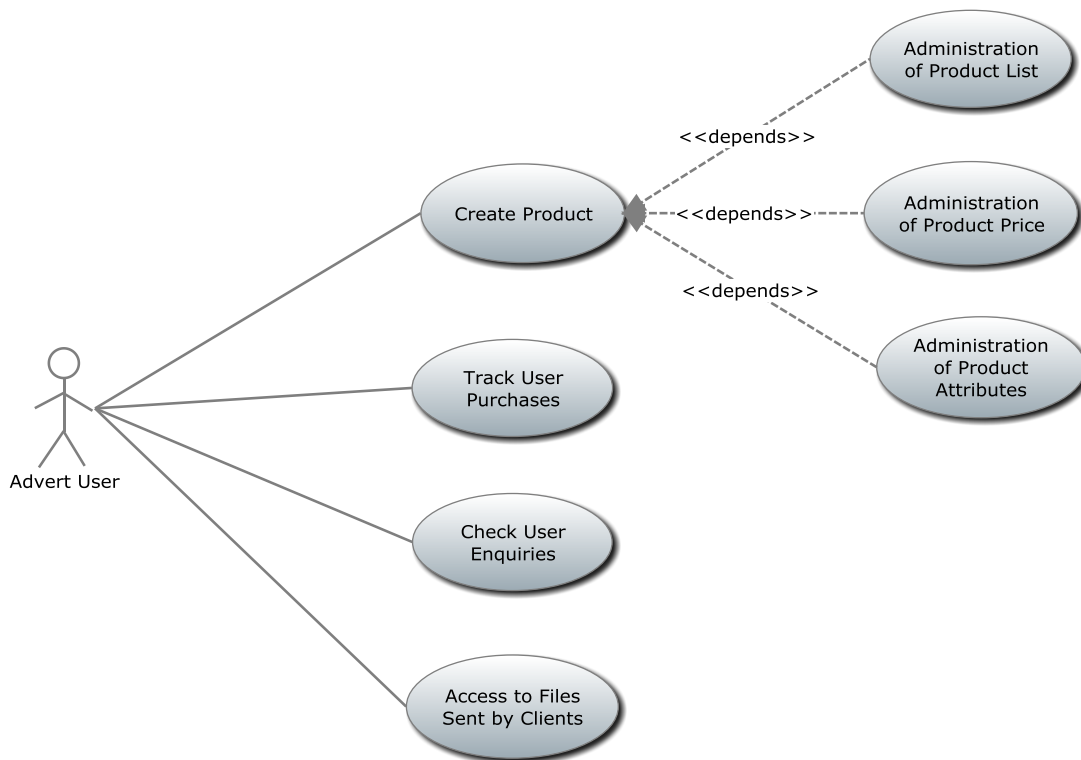


Figure 17 - Advert User Use Case Diagram

IMPORT/EXPORT USER

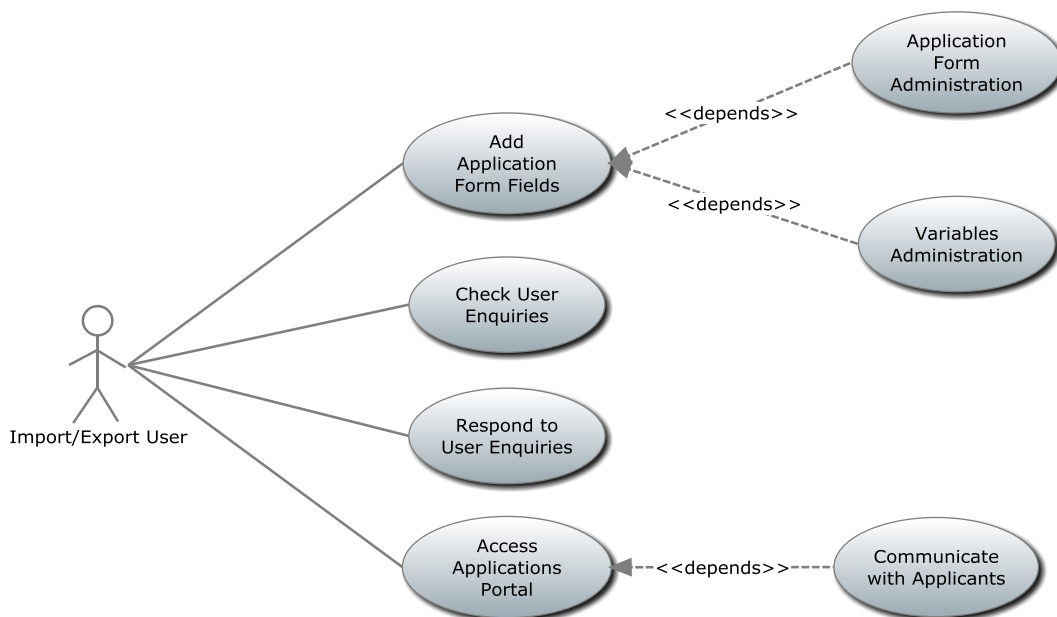


Figure 18 - Import/Export User Use Case Diagram

4.2.1.2. USE CASE RANKINGS

The use cases identified and illustrated in the previous section are prioritised in this section to provide a guideline for the system developers to develop a schedule and build cycle for the system development. These use cases are rated according to certain criteria and given a total score. The total score is then used as a guide to determine the priority and the order of the build cycle for the different use cases.

The ranking criteria used are as follows:

1. Significant impact on the architectural design
2. Easy to implement but contains significant functionality
3. Includes risky, time-crucial, or complex functions
4. Involves significant research or new or risky technology
5. Includes primary business functions
6. Will increase revenue or decrease costs

(Bentley and Whitten, 2007: 261)

Use Case Name	Ranking Criteria, 1 to 5						Total Score	Priority	Build Cycle
	1	2	3	4	5	6			
Create Person Profile	3	4	3	3	5	5	23	high	1
Create Juristic Person Profile	3	4	3	3	5	5	23	high	2
Create Aircraft Profile	3	4	3	3	5	5	23	high	3
Create Digital Signature	3	2	4	3	5	4	21	high	4
Buyer Review/Sales Process	3	2	3	4	5	4	21	high	6
Sign Contracts with Digital Signature	3	2	3	4	4	4	20	high	5
Generate Contract of Sale (Manufacturing)	3	3	3	3	4	4	20	high	7
Sign Mandate Digitally	2	2	3	4	4	4	19	med	8
Extend Mandate	2	4	3	3	3	3	18	med	9
Access Aircraft Database (Limited)	3	1	3	3	5	3	18	med	10
Send Buyer Unique ID Link	2	3	3	2	4	4	18	med	11
Conduct Buyer Review/Sales Process (Buyer)	3	2	2	3	5	3	18	med	12
Receive Mandate From System	2	3	2	3	3	4	17	med	13
Apply for Insurance	3	2	2	3	3	4	17	med	14
Create Basic Owner Profile	2	3	3	3	3	3	17	med	15

Receive Unique ID (Buyer)	2	3	3	3	3	3	17	med	16
Apply for Finance (Buyer)	3	2	3	2	4	3	17	med	17
Set Available Viewing Dates	2	2	3	3	3	3	16	med	18
View Information from Linked Aircraft	2	2	2	2	4	4	16	med	19
Receive Buyer Review Request	1	2	3	2	4	4	16	med	20
Access Limited Aircraft Information (Buyer)	3	2	2	2	4	3	16	med	21
Access Limited Sales User Information (Buyer)	3	2	2	2	4	3	16	med	22
Create Product	2	2	2	2	4	4	16	med	23
Administration of Product Attributes and Features (Manufacturing, Advert)	3	2	2	2	4	3	16	med	24
Track User Purchases (Advert)	3	2	3	3	3	2	16	med	25
Communicate with Aircraft Sales Central Support	3	3	2	2	3	2	15	med	26
Activate Listing User Privilege	2	3	2	2	2	4	15	med	27
Link Owner to Aircraft	1	2	2	2	5	3	15	med	28
Link Privilege (Sales) to Aircraft Profile	2	3	2	2	3	3	15	med	29
Apply for Insurance(Buyer)	2	2	2	2	4	3	15	med	30
Customise Contract	2	2	3	3	3	2	15	med	31
Apply for Pilot Insurance	3	2	2	2	3	3	15	med	32
Administration of Product List	2	2	2	2	4	3	15	med	33
Administration of Product Price	2	2	2	2	4	3	15	med	34
Administration of Product Attributes	2	2	2	2	4	3	15	med	35
Remove Product (Manufacturing)	3	2	2	2	4	2	15	med	36
Respond to User Enquiries	2	2	2	2	4	3	15	med	37
Administration of Product Forms (Manufacturing)	2	2	2	2	4	3	15	med	38
Administration of Product Information (Manufacturing)	2	2	2	2	4	3	15	med	39
Access Applications Portal	2	2	3	2	3	3	15	med	40
Administration of Product List	3	2	2	2	3	3	15	med	41

(Advert)									
Make Changes on Person Profile	2	3	2	2	3	2	14	low	42
Make Changes on Juristic Person Profile	2	3	2	2	3	2	14	low	43
Aircraft Profile Administration	1	2	2	2	4	3	14	low	44
View Available Dates	1	2	2	2	3	4	14	low	45
Upload Advert (Sales)	2	3	2	2	2	3	14	low	46
Add Logbook Entry	3	3	2	2	3	1	14	low	47
Track User Purchases	3	2	2	3	3	1	14	low	48
Add Application Form Fields (F/I, I/E)	2	2	2	2	3	3	14	low	49
Application Form Administration (F/I, I/E)	2	2	2	2	3	3	14	low	50
Variables Administration (F/I, I/E)	2	2	2	2	3	3	14	low	51
Administration of Product Price (Advert)	2	2	2	2	3	3	14	low	52
Search for Potential Pilots	2	3	2	2	3	1	13	low	53
Make Changes on Linked Owner Profile	2	2	2	2	3	2	13	low	54
Track Aircraft Profile	2	2	2	2	3	2	13	low	55
Create Online CV	2	3	2	2	3	1	13	low	56
Edit Online CV	2	3	2	2	3	1	13	low	57
Remove Logbook Entry	2	3	2	2	3	1	13	low	58
Edit Logbook Entry	2	3	2	2	3	1	13	low	59
Access to Files Sent by Clients (Advert)	3	2	2	2	2	2	13	low	60
Communicate with Linked Listings Users	2	2	2	2	2	2	12	low	61
Freeze Aircraft Profile	1	2	2	2	3	2	12	low	62
Do Blue Book Evaluation	2	2	2	3	2	1	12	low	63
Take Control of Listing User Created Profile	2	2	2	2	2	1	11	low	64
Request Flight School Services	2	3	2	1	2	1	11	low	65
Check User Enquiries	2	2	1	2	2	2	11	low	66
Communicate With Applicants	1	3	1	2	2	2	11	low	67
Access Documentation and Media	1	2	1	1	3	2	10	low	68

Contact Potential Pilots	1	2	1	1	3	1	9	low	69
Access Flight Schools	1	2	1	1	2	1	8	low	70

Table 10 - Use Case Rankings

Profile creation ranks highest in in the above table in terms of priority. Therefore the system development team should build these functionalities before commencing development on any other system functionalities.

4.2.2. BUSINESS PROCESS MODELLING

This section details the exact processes occurring for the main functions within the Aircraft Sales Central system. Following the results from the use case ranking section above, the sale Process, the Profile creation processes and the digital signature processes are highlighted here as these processes had the highest priority in the rankings.

SALES PROCESS

The sales process placed 6th in the build cycle rankings in the use case ranking section. This process is one of the most complex processes in the Aircraft Sales Central system and contains the core business functions of the Aircraft Sales Central business model. The successful development of this process, therefore, is one of the most important aspects to realise a successful system and business.

The start of the Sales Process is depicted on the following page:

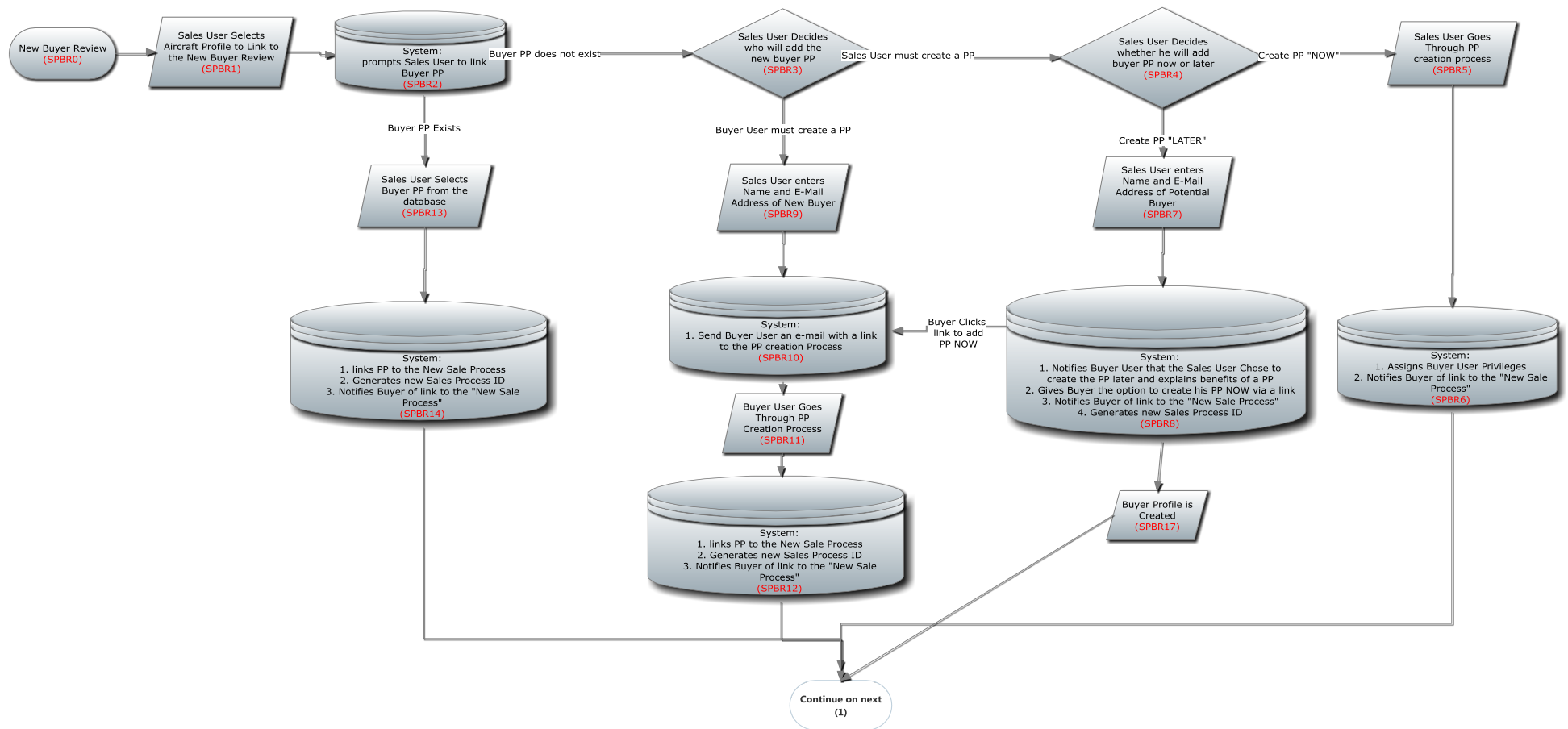


Figure 19 - Sales Process Part 1

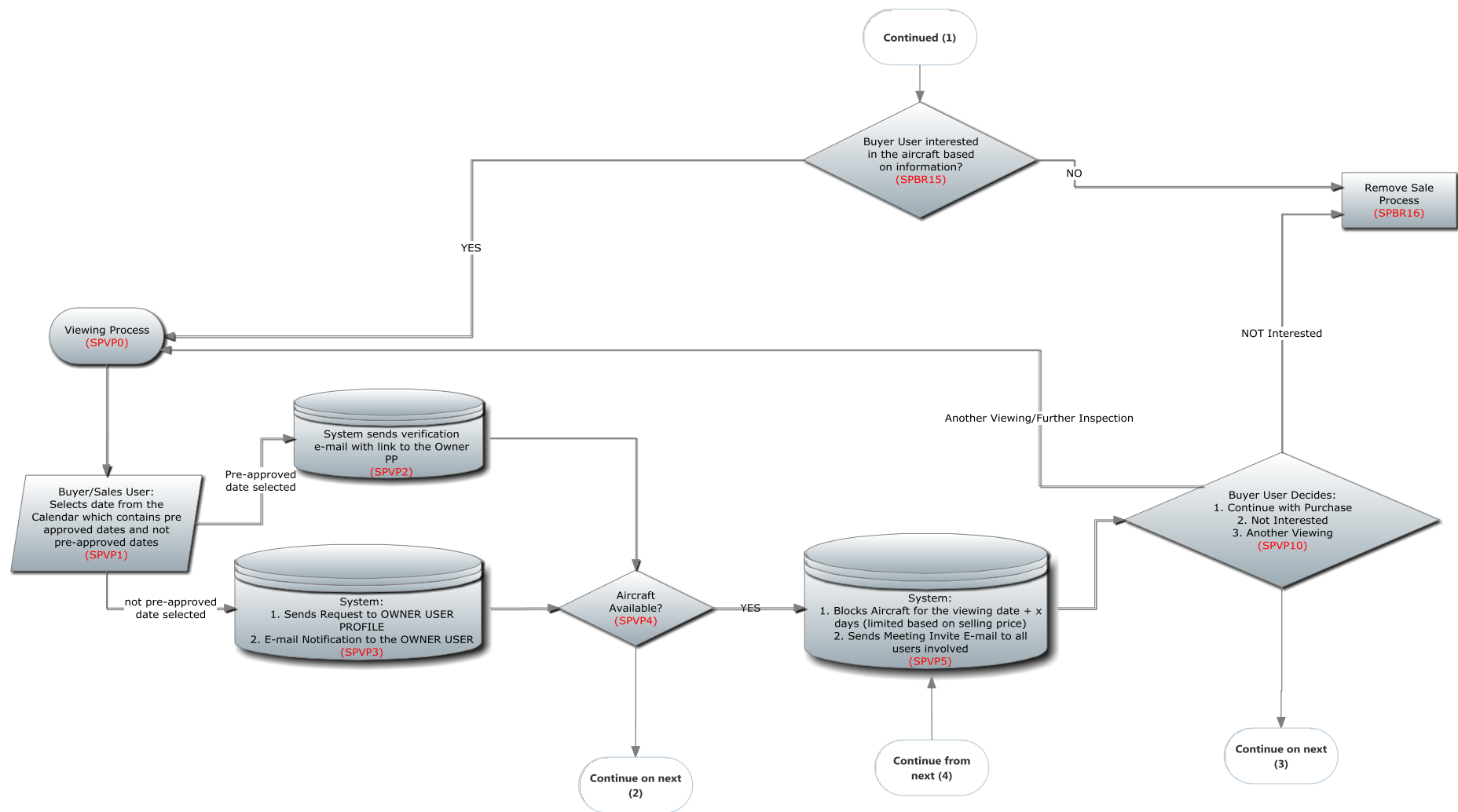


Figure 20 - Sales Process Part 2

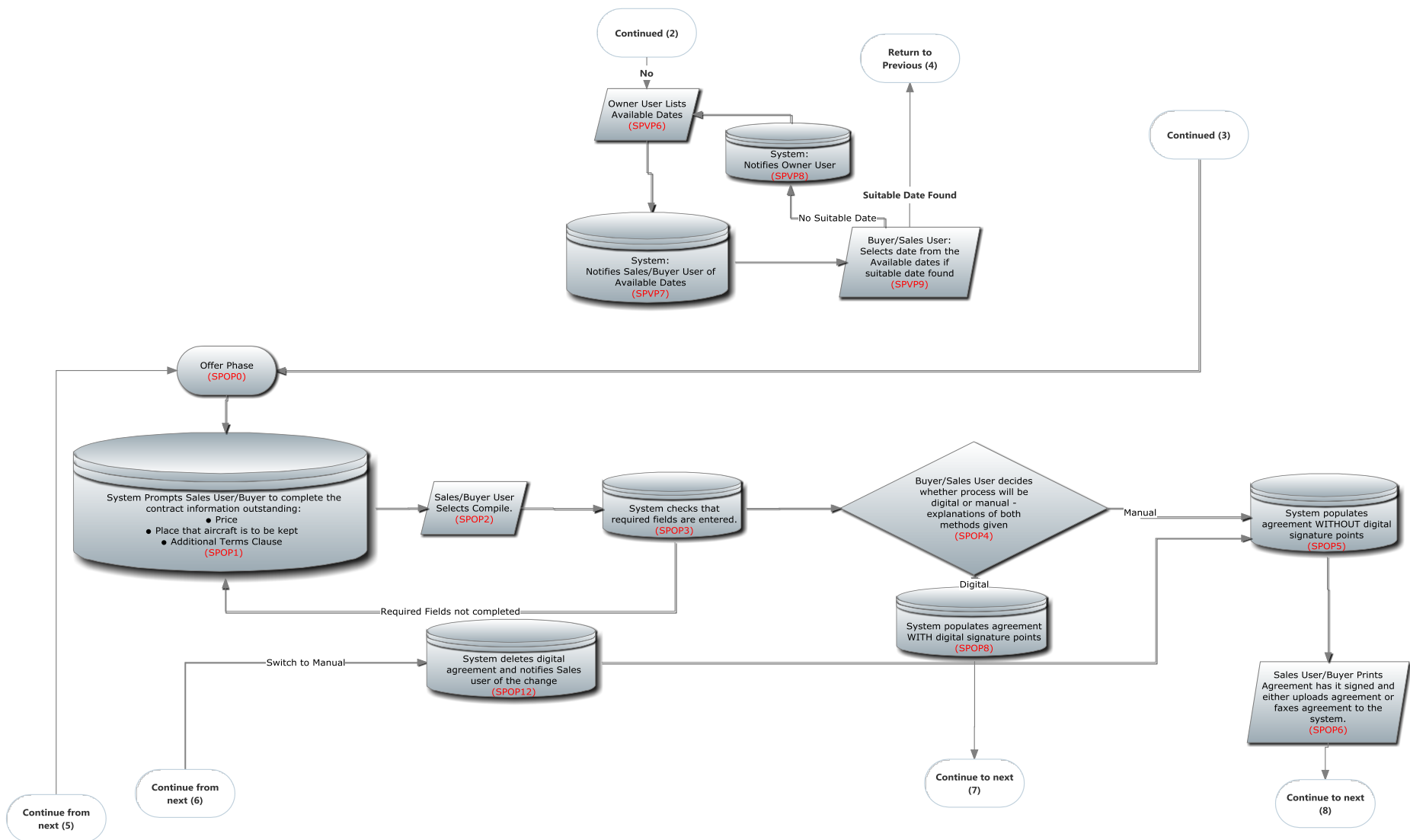


Figure 21 - Sales Process Part 3

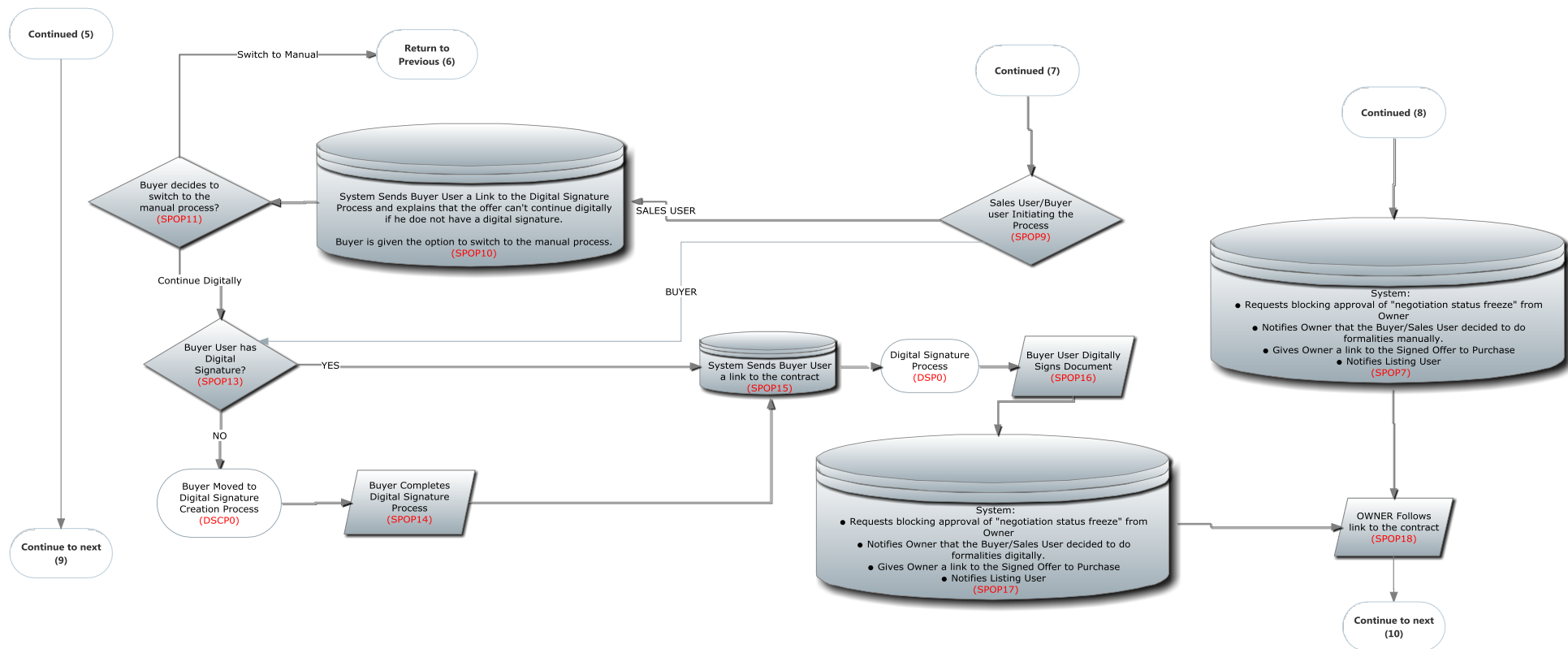


Figure 22 - Sales Process Part 4

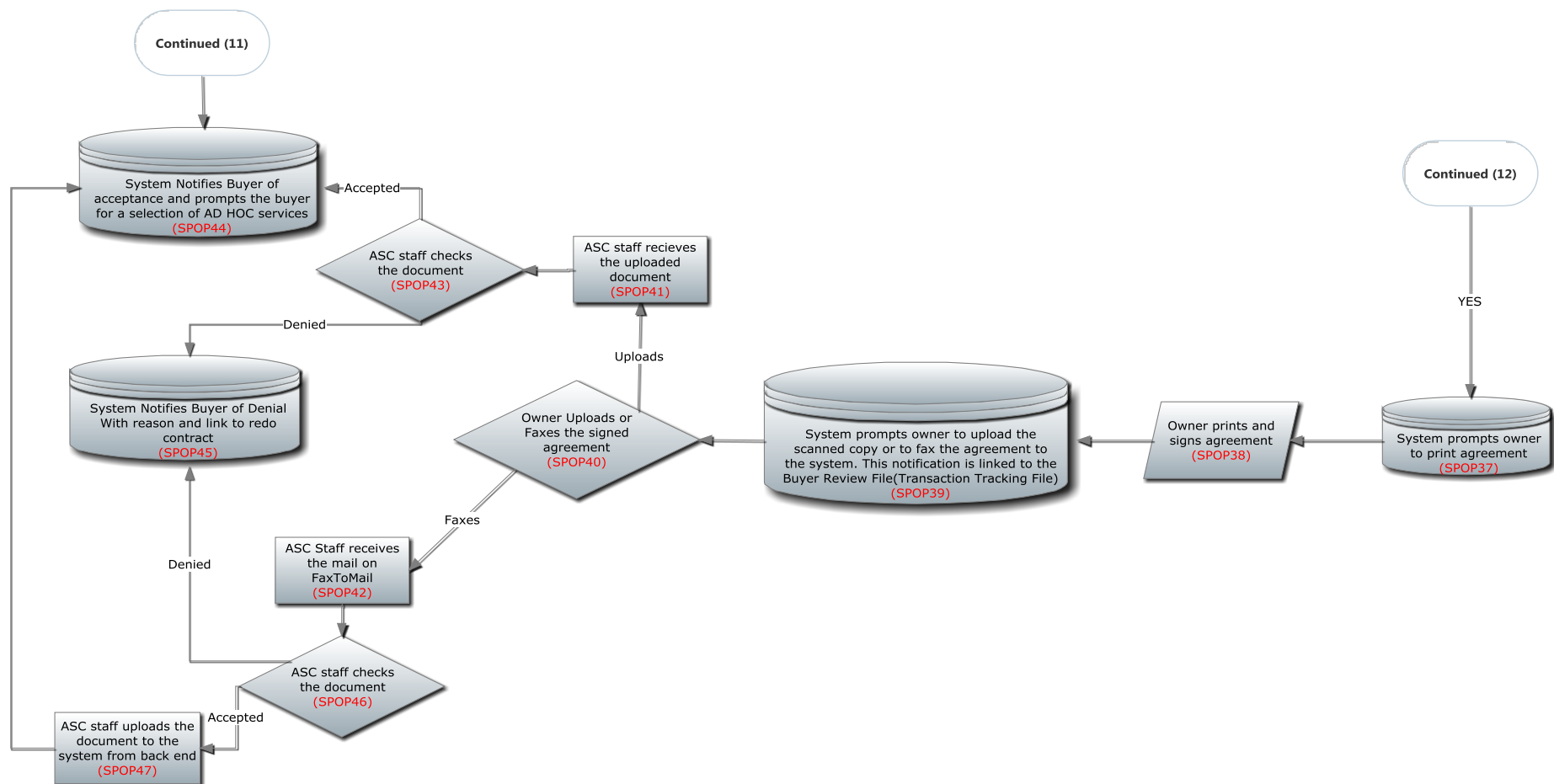


Figure 24 - Sales Process Part 6

PERSON PROFILE CREATION

Profile creation ranked highest in the use case ranking section. The creation of a person profile is the starting point for any user wanting to make use of the Aircraft Sales Central system and is therefore one of the most important processes that need to be built into the system. Without a person profile no interaction with the system may take place. The start of the Person Profile Creation process is depicted below:

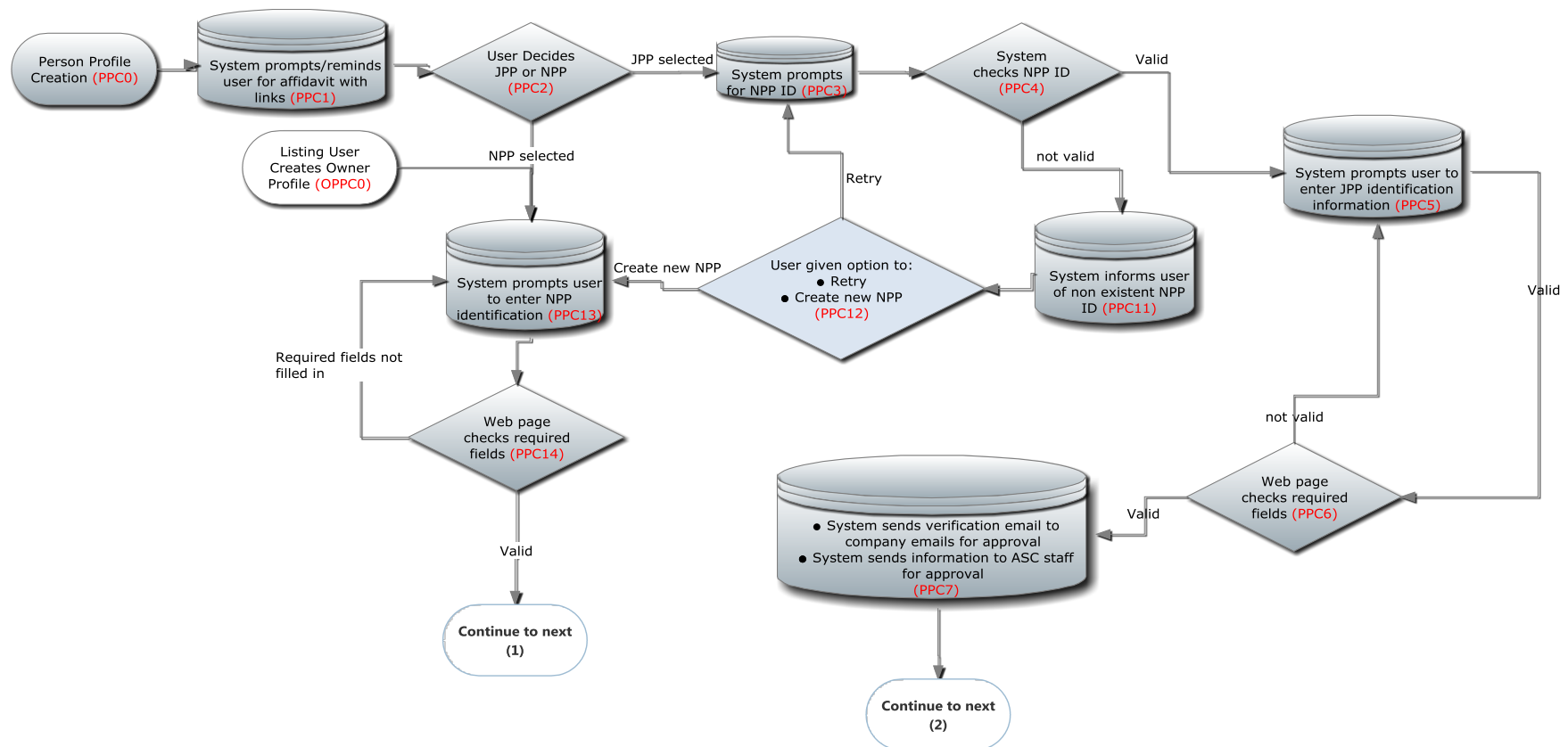


Figure 25 - Person Profile Creation Part 1

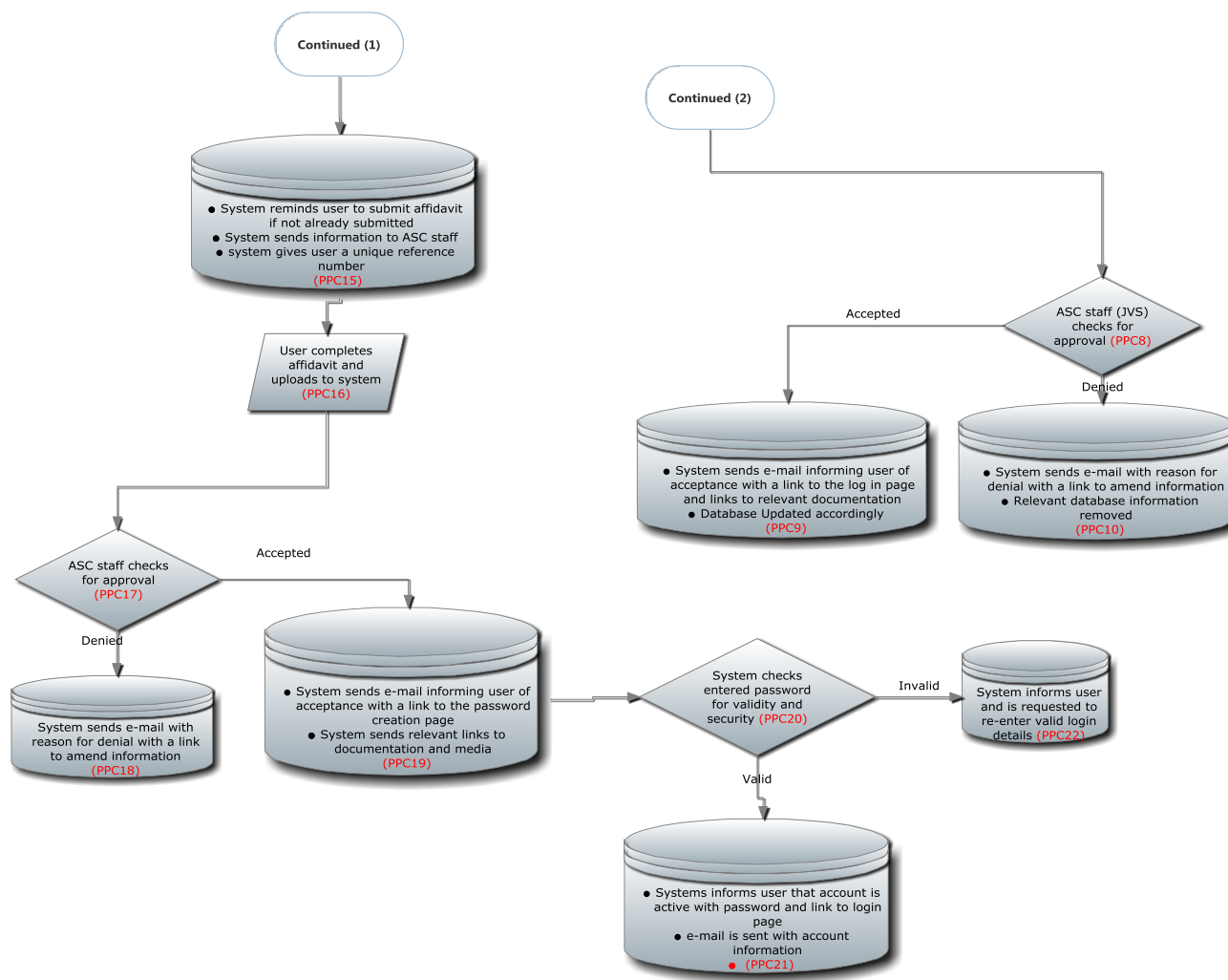


Figure 26 - Person Profile Creation Part 2

AIRCRAFT PROFILE CREATION

As before, profile creation ranked highest in the use case ranking section. Since aircraft sales form the backbone of the system and the Aircraft Sales Central business model it is of paramount importance that the system development team focus a high level of resources to the development of the Aircraft Profile Creation process. The start of the Aircraft Profile Creation process is depicted below:

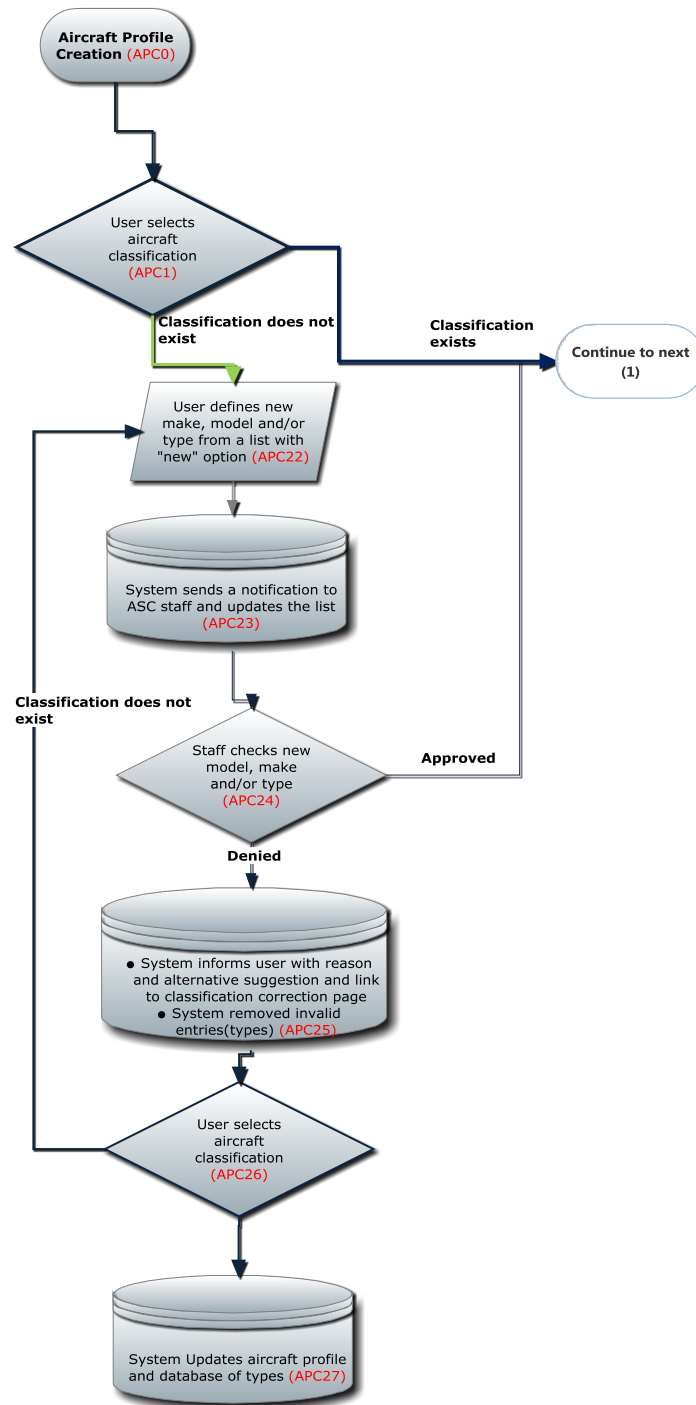


Figure 27 - Aircraft Profile Creation Part 1

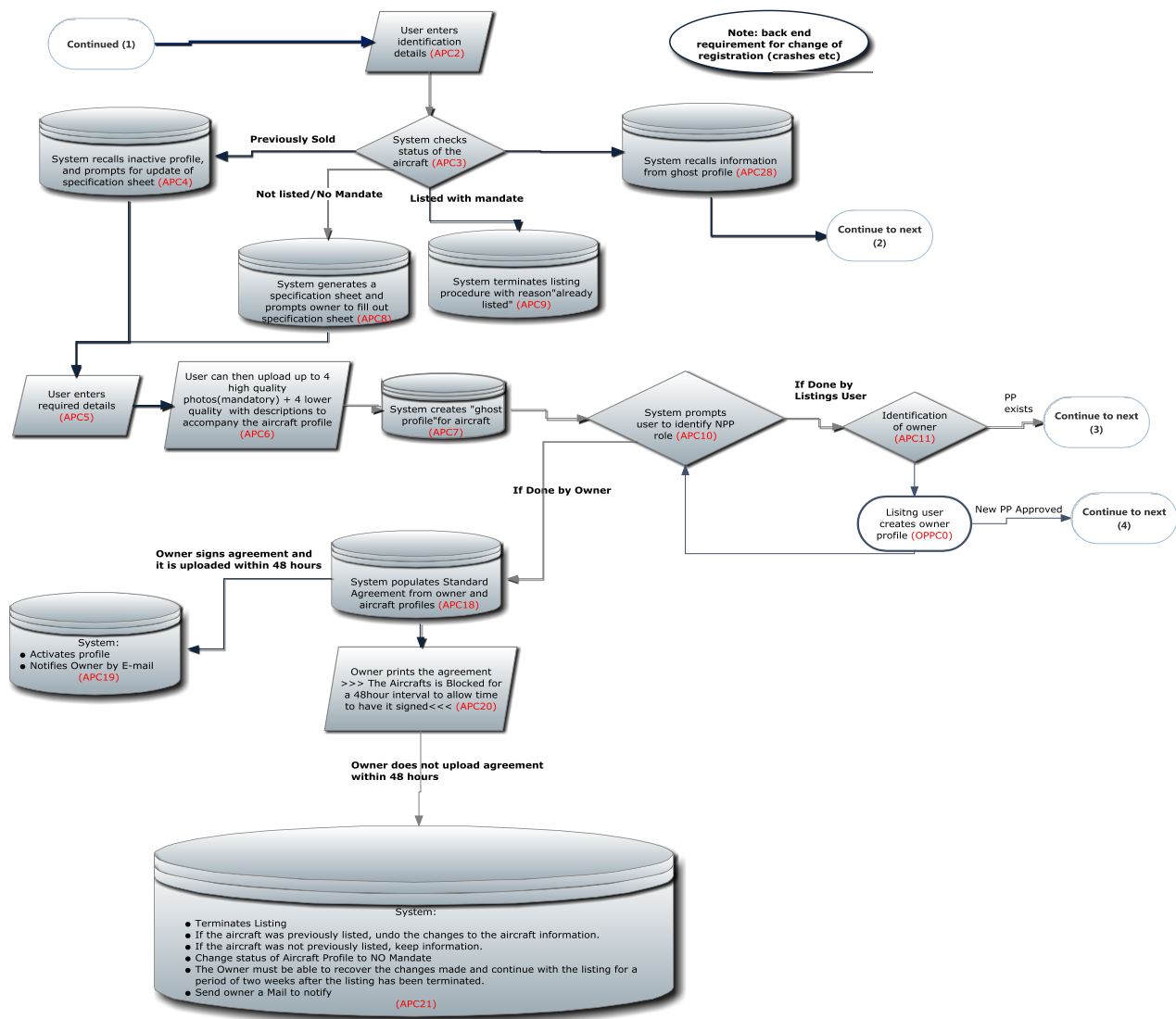


Figure 28 - Person Profile Creation Part 2

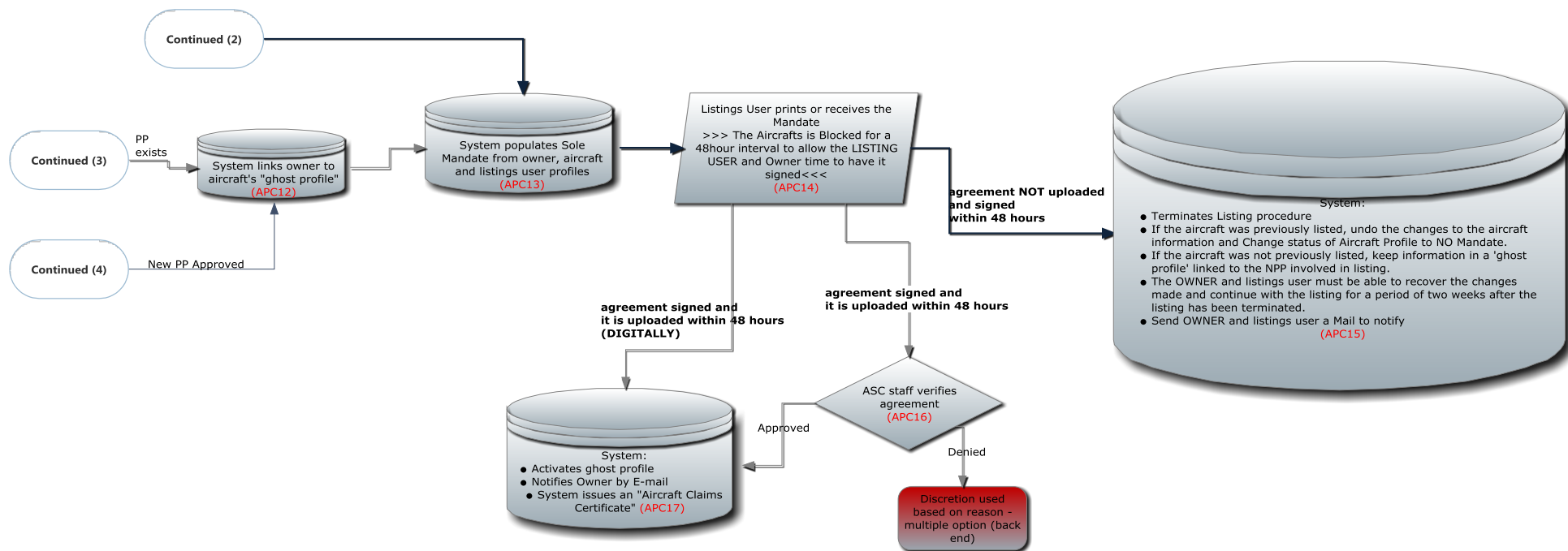


Figure 29 - Person Profile Creation Part 3

DIGITAL SIGNATURE CREATION PROCESS

The digital signature creation process ranked 4th, in terms of build cycle, in the use case ranking section. Digital signatures form an essential part of the Aircraft Sales Central system as they will be used to sign all agreements and purchases within the system. It is therefore fundamental to the business model that each user can successfully create a working digital signature. The system development team should ensure that this is possible. The start of the Digital Signature Creation process is depicted below:

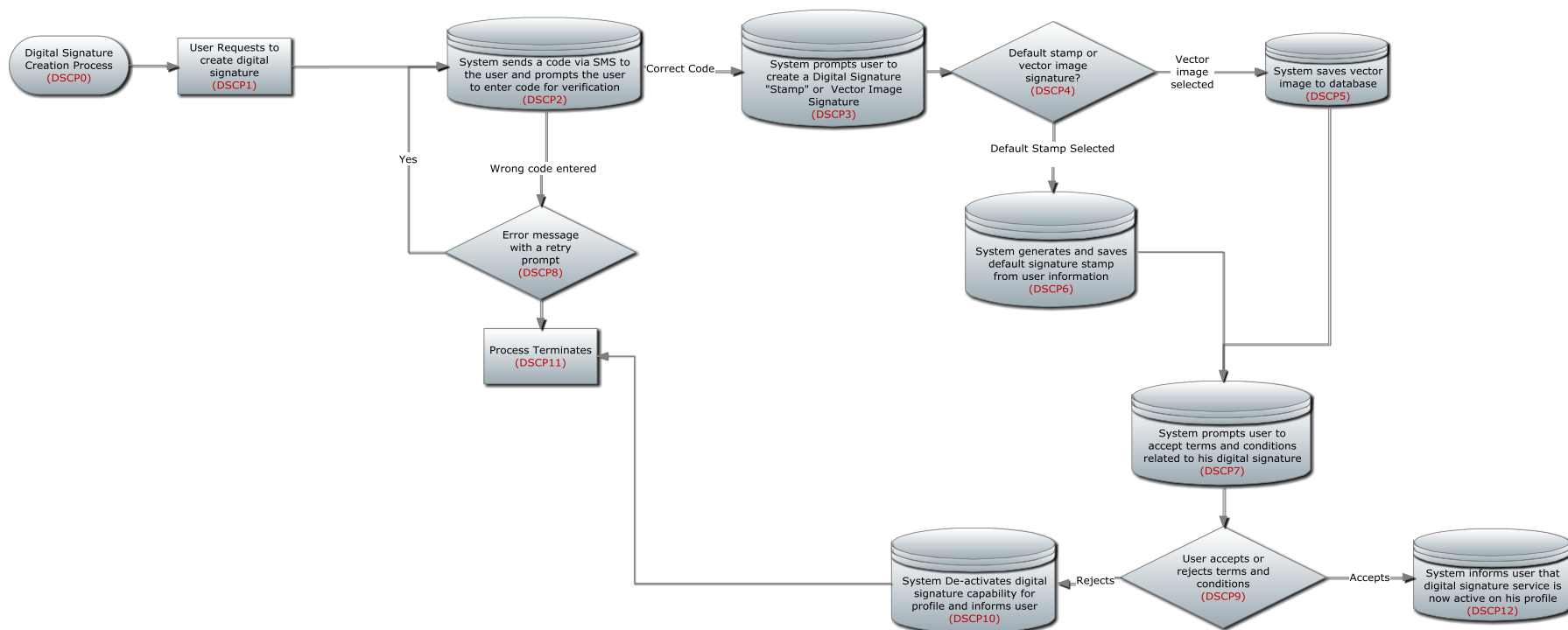


Figure 30 - Digital Signature Creation Process

DIGITAL SIGNATURE PROCESS

The digital signature process is an essential part of the Aircraft Sales Central system. As mentioned before, it forms part of the fundamental business model as each user needs to digitally sign agreements and contracts of sale in the system. This process is still under construction and will be delivered as part of the final project document. The incomplete model is shown below:

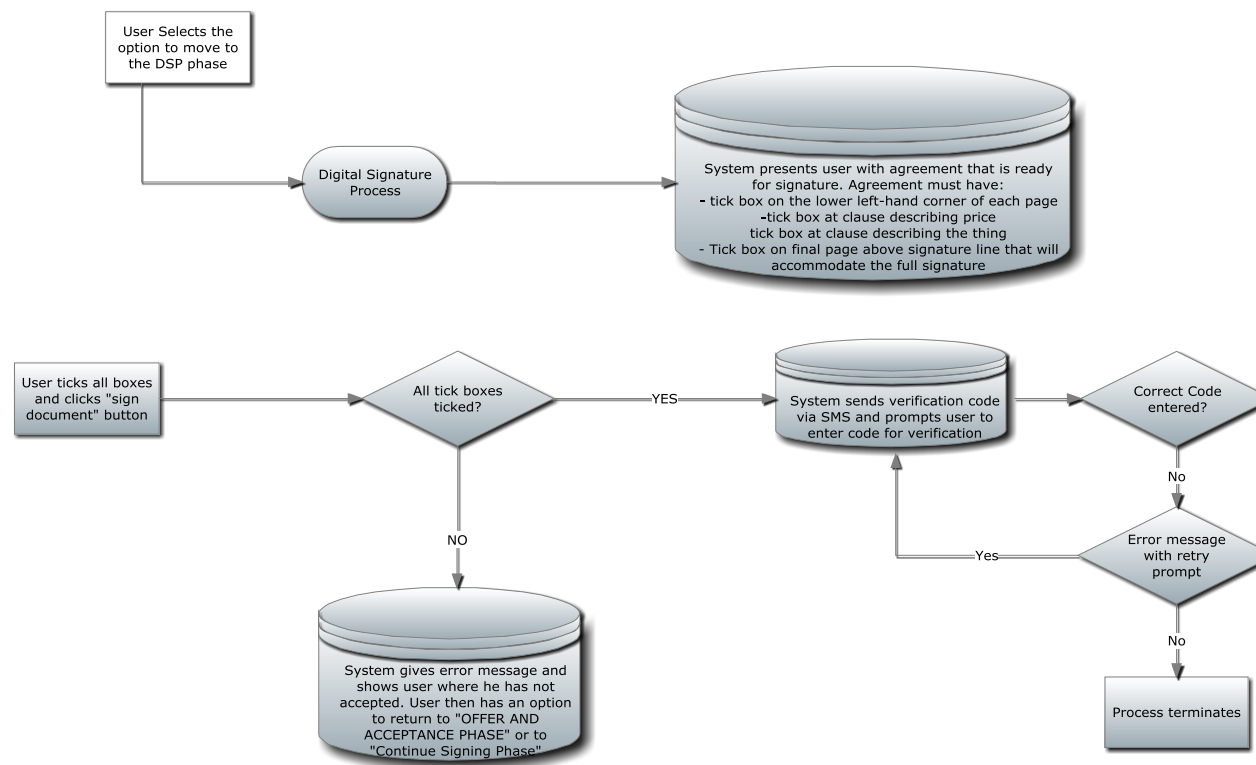


Figure 31 - Digital Signature Process

LISTING USER PRIVILEGE CREATION

Although the activation of the listing user privilege did not rank highest in the use case build cycle, the listing user privilege creation process is depicted here to illustrate the common process steps involved in activating privileges.

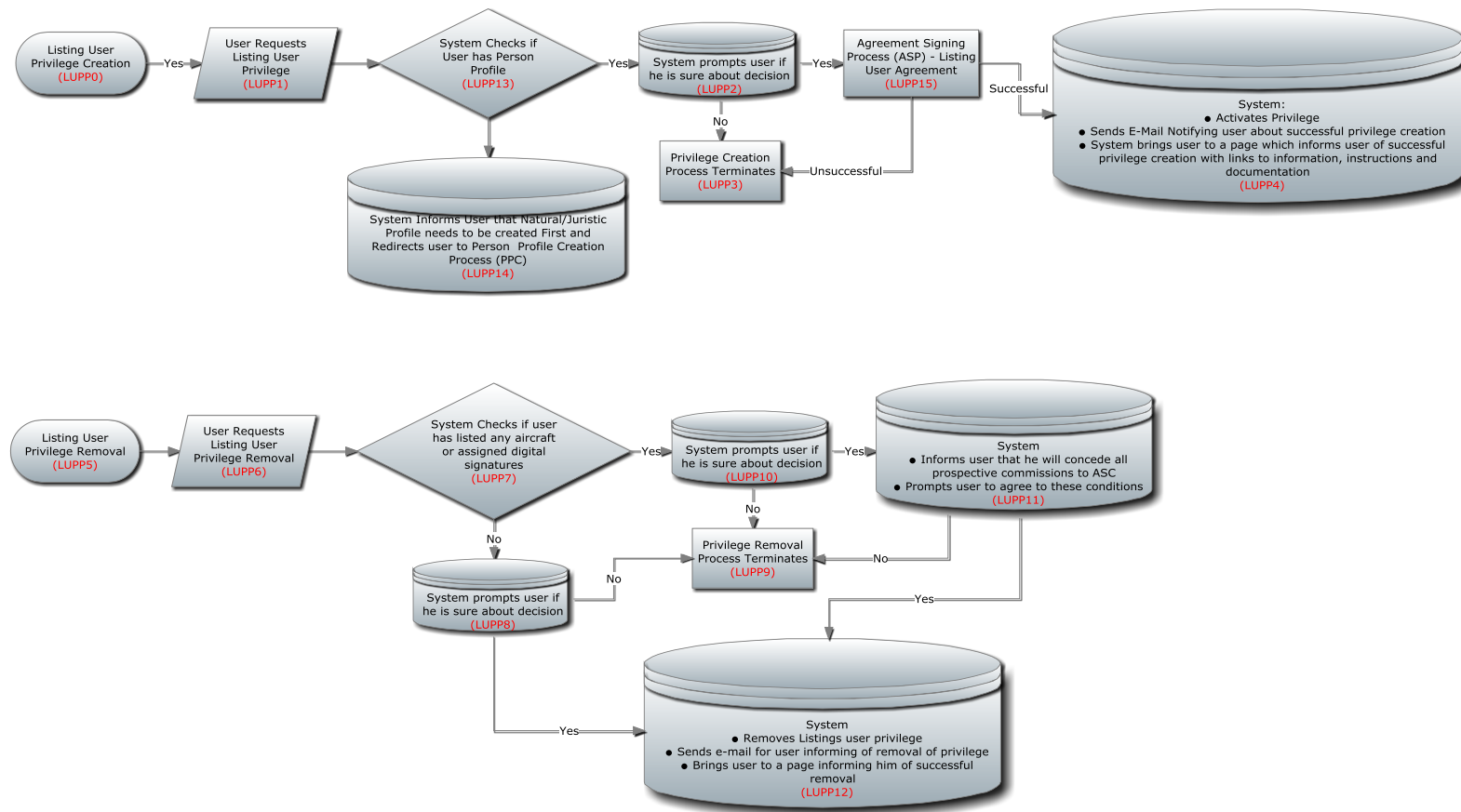


Figure 32 - Listing User Privilege Creation

OWNER PRIVILEGE CREATION

The owner privilege creation process is depicted here to provide another example of the typical process steps involved in activating a user privilege. The other privilege creation processes have been created but will not form part of this document.

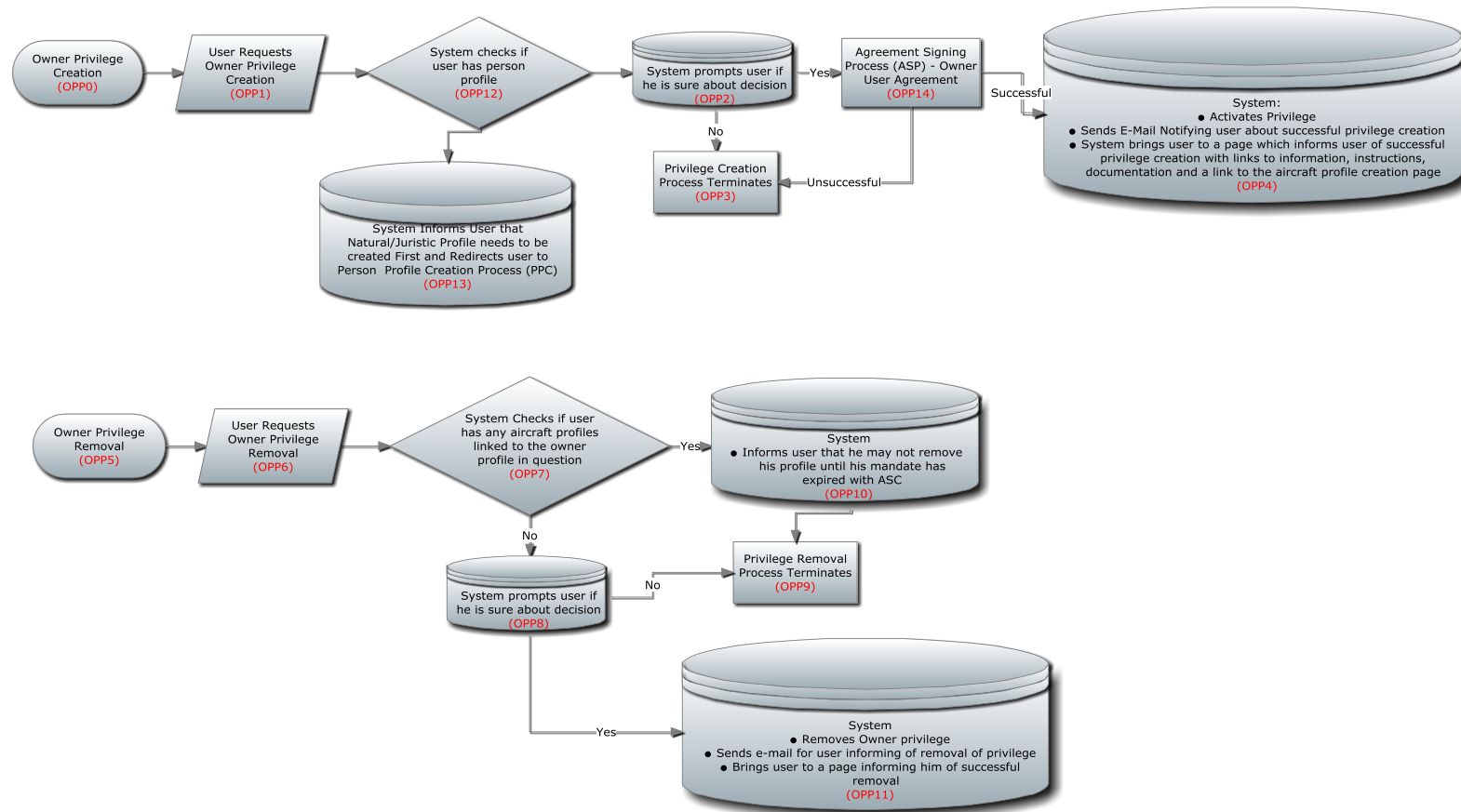


Figure 33 - Owner Privilege Creation

OTHER PROCESSES

Numerous other processes have been mapped but due to document length they have been left out of this document, these processes include:

- Sales User Privilege Process
- Buyer User Privilege Process
- Pilot User Privilege Process
- Administration of Profiles Process
- General Communication Process
- Blue Book Valuation Process
- Pilot Logbook Processes
- Aircraft Finance and Insurance Application Processes
- Pilot Insurance Application Process

4.3. SYSTEM DESIGN

4.3.1. DATABASE DESIGN USING AN ENTITY RELATIONSHIP DIAGRAM

Gary B. Shelly and Harry J. Rosenblatt define an entity relationship diagram as “a model that shows the logical relationships and interaction among system entities. An ERD provides an overall view of the system and a blueprint for creating the physical data structures.” (Shelly and Rosenblatt, 2012: 406).

Entity relationship diagrams provide the blueprint for the design of information systems and is arguably the most important aspect of an information system design. The entity relationship diagram for the Aircraft Sales Central system is depicted on the next page. Unfortunately the Entity Relationship Diagram is rather complex and due to space restrictions it was not possible to prevent connector lines from crossing as should be the case with entity relationship diagrams:

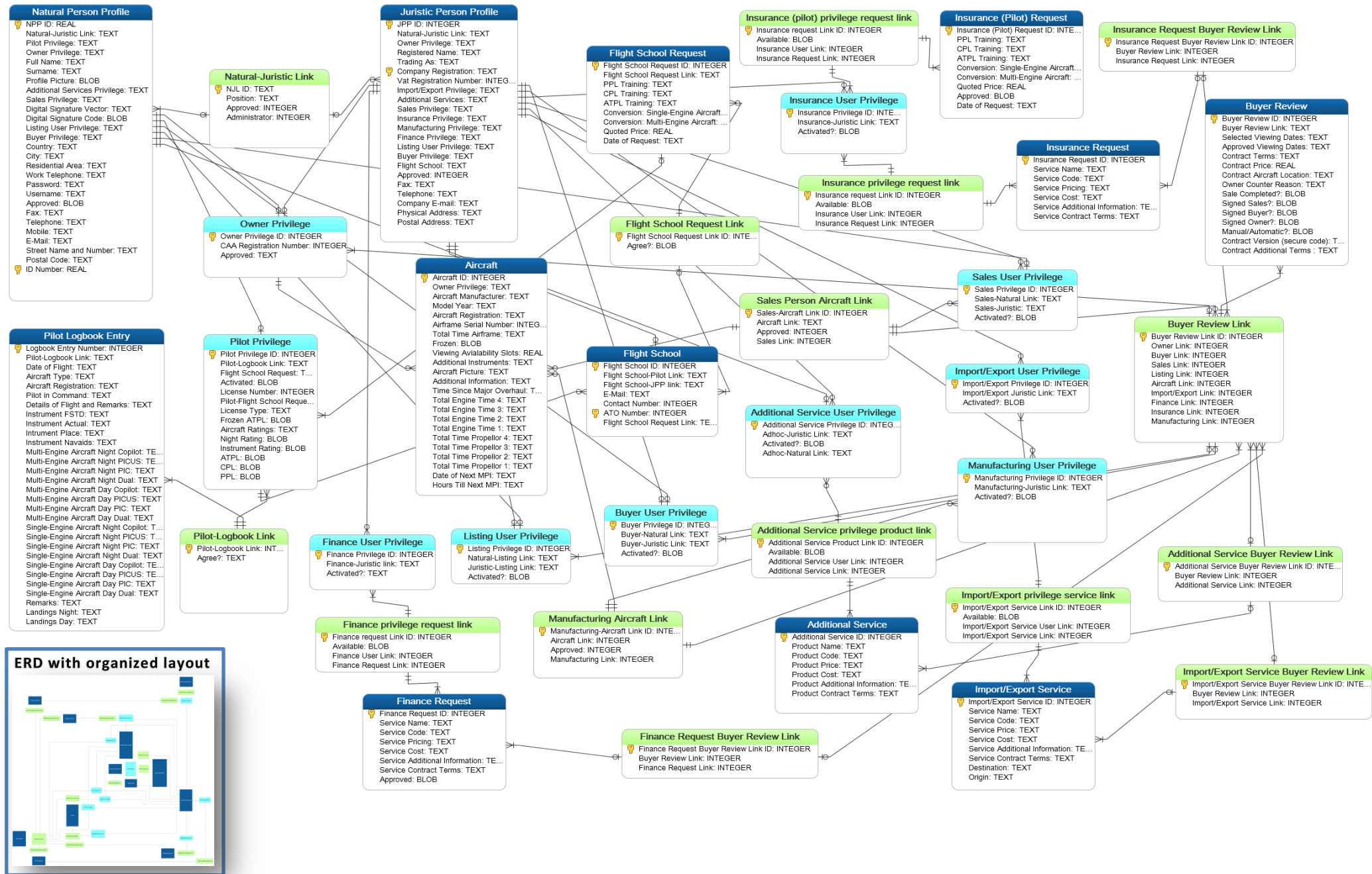


Figure 34 - Entity Relationship Diagram

4.3.2. INPUT FORM DESIGN

Following the data requirements analysis and the entity relationship diagram from the previous section, input forms were created for different aspects of the system including profile creation, applications and document generation. These input forms will provide a reference for the information that needs to be stored in the system database and it will be crucial for the system developers in developing the information system. These forms also provide a manual backbone for the system in case of front end irregularities post-implementation.

NATURAL PERSON PROFILE

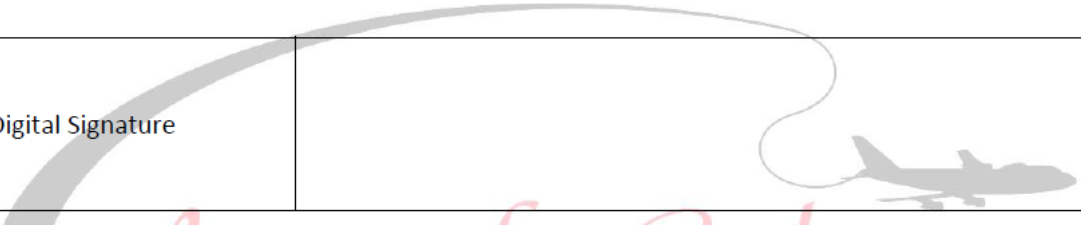
Natural Person Profile	
ASC ID: xxxxx654654xzxx	
Full Name	
Surname	
Identification Number	
Postal Address	
Physical Address	
Country	
E-Mail	
Mobile	
Telephone	
Fax	
Digital Signature	

Figure 35 - Natural Person Profile Form

JURISTIC PERSON PROFILE

Juristic Person Profile	
ASC ID: xxxxx654654xzxx	
Registered Name	
Trading As	
Registration Number	
VAT Registration Number	
Postal Address	
Physical Address	
E-Mail	
Mobile	
Telephone	
Fax	

Digital Signature	
-------------------	--

Associating Natural Persons	
Name	
Identification Number	
ASC Identification Number	
Position	

Associating Natural Persons	
Name	
Identification Number	
ASC Identification Number	
Position	

Figure 36 - Juristic Person Profile Form

AIRCRAFT PROFILE

Aircraft Profile Information Form	
ASC ID: xxxxx654654xzxx	
Aircraft Manufacturer	
Model Year:	
Aircraft Registration:	
Airframe Serial Number:	
Total Time Airframe:	
Hours Till Next MPI:	
Date of Next MPI:	
Total Time Propeller	
Time Since Last Major Overhaul:	
Additional Instrumentation	
1:	
2:	
3:	
4:	
5:	
6:	
7:	
8:	
Additional Information:	

Figure 37 - Aircraft Profile Information Form

PILOT LOGBOOK ENTRY FORM

Logbook Entry Form			
Logbook Entry Number: 00000			
Date of Flight:			
Aircraft Type:			
Aircraft Registration:			
Pilot in Command			
Details and Remarks About Flight:			
Landings:			
Day:			
Night:			
Remarks			
Single Engine			
Day		Night	
Dual:		Dual:	
PIC:		PIC:	
PICUS:		PICUS:	
Copilot:		Copilot:	
Multi Engine:			
Day		Night	
Dual:		Dual:	
PIC:		PIC:	
PICUS:		PICUS:	
Copilot:		Copilot:	
Instrument:			
Place:			
Nav aids:			
Actual:			
FSTD:			

Figure 38 - Pilot Logbook Entry Form

PILOT ONLINE CV

Online Pilot CV Form	
Pilot ID: xxxxx654654xzxx	
License	
PPL	
CPL	
Frozen ATPL	
ATPL	
Experience	
Other Applicable Experience	
Personal	
About Yourself	

Figure 39 - Pilot Online CV Form

4.3.3. WIREFRAME LOGICAL PROTOTYPE

A wireframe logical prototype is a rapid application development tool. The wireframe logical prototype will be used to emulate the user environment to ensure that the system follows a logical flow and to provide stakeholders with a tangible platform for preliminary testing. Parts of the wireframe logical prototype for the Aircraft Sales Central system is depicted below:

HOME PAGE

The home page is the first page that all users and prospective users will see when they link to the Aircraft Sales Central website. This page provides general information about the Aircraft Sales Central system, links to all other parts of the website, and provides a log in to the system.

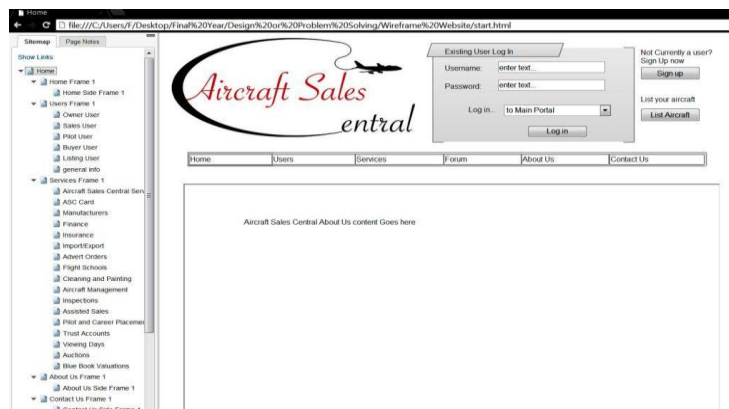


Figure 40 - Wireframe Homepage

USERS PAGE

The users page provides more information on the different types of user privileges that exist within the system.

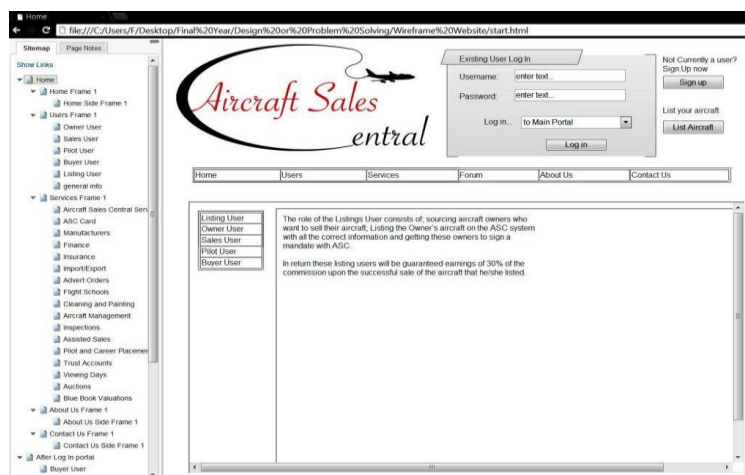


Figure 41 - Wireframe Users Page

SERVICES PAGE

The services page provides information to prospective users about the various types of services provided within the Aircraft Sales Central system by its database of juristic users.

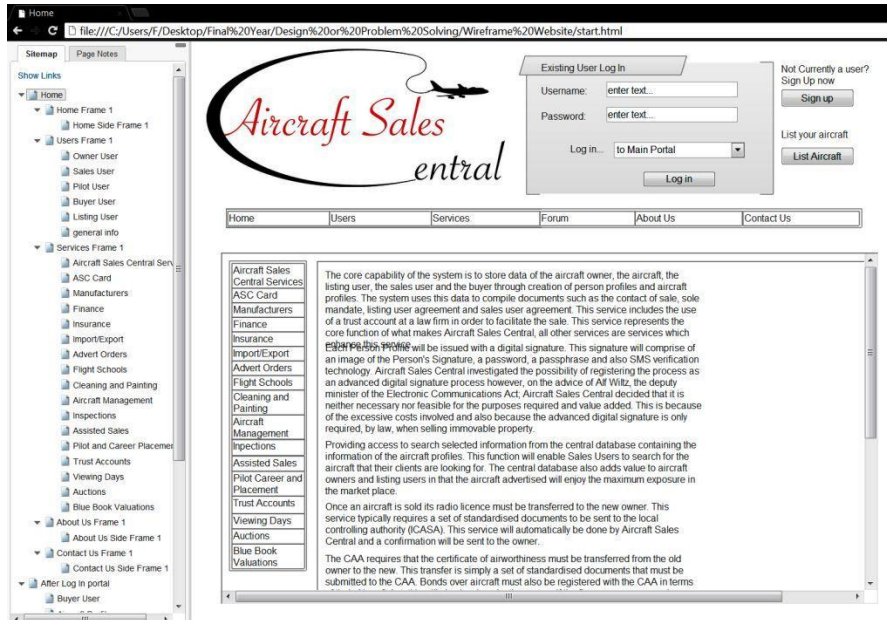


Figure 42 - Wireframe Services Page

FORUM PAGE

Aircraft Sales Central will allow users to make use of an online forum. This forum is provided separately by a third party and is linked to the Aircraft Sales Central website through a simple portal.

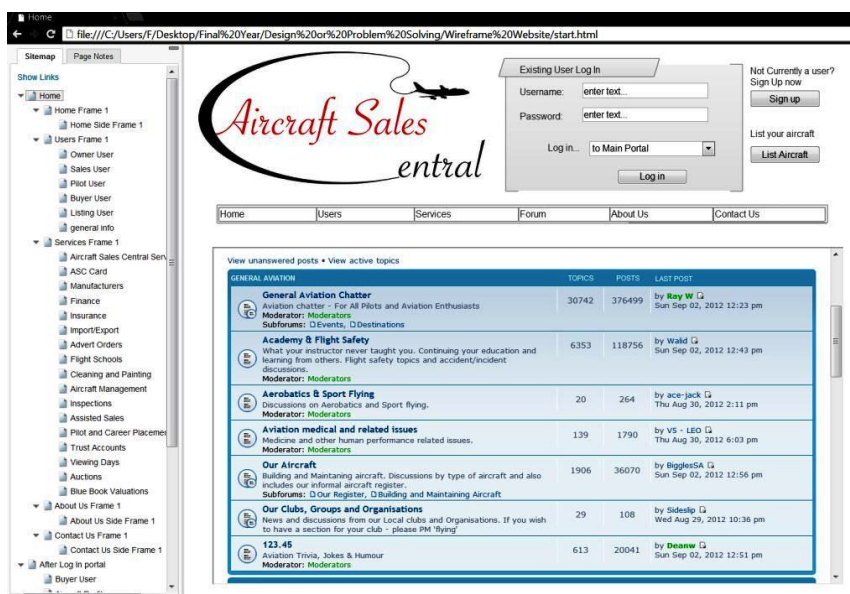


Figure 43 - Wireframe Forum

OTHER PAGES

The 'About Us' and 'Contact Us' pages are pages which explain the Aircraft Sales Central system in general and that lists the applicable contact details for the Aircraft Sales Central team respectively.

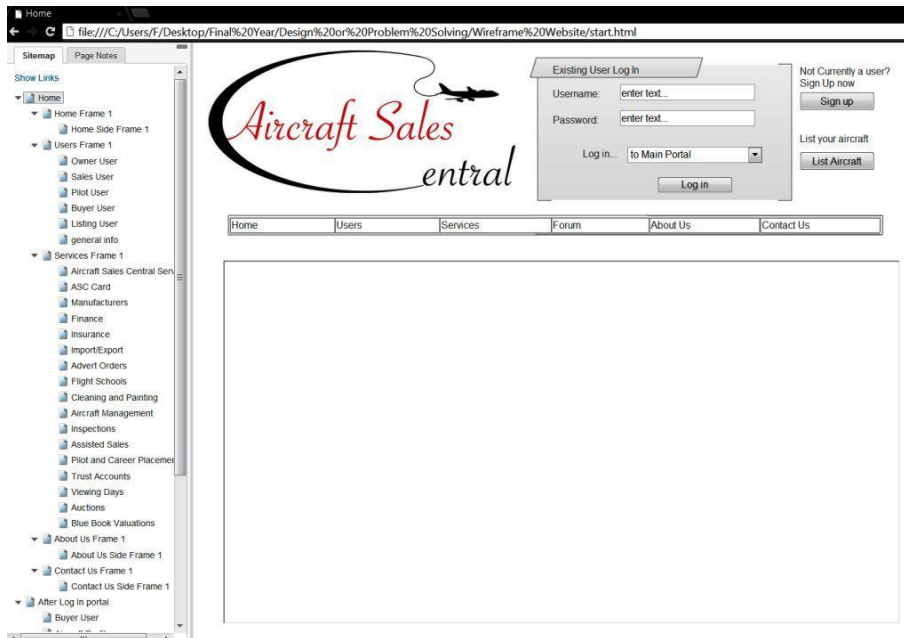


Figure 44 - Wireframe Other Pages

LINKS

The following figure is used to indicate certain links and buttons for the various pages.

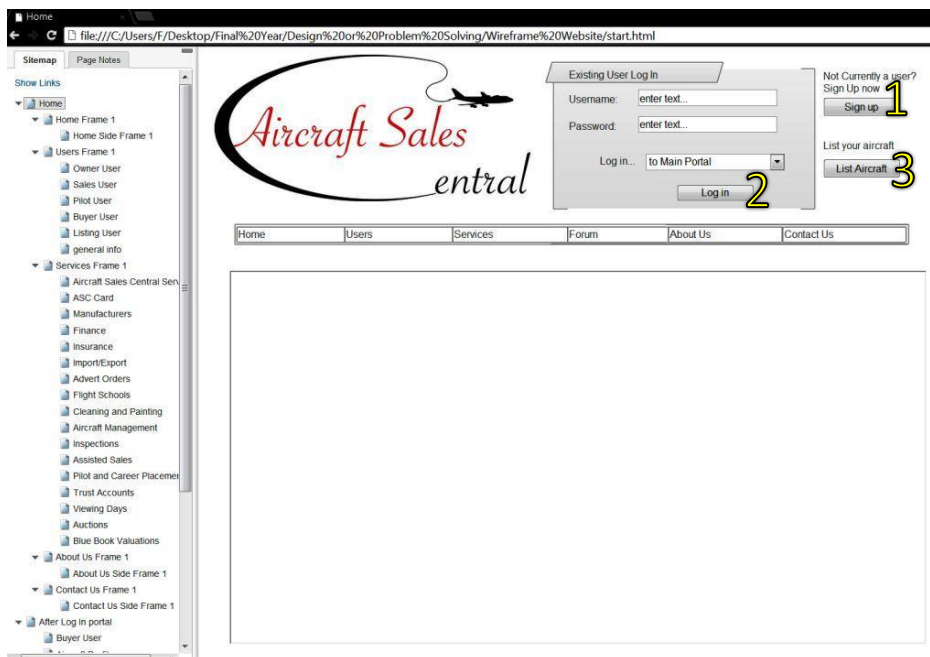


Figure 45 - Wireframe Links

The sign up page appears when the 'sign up' button, marked 1, is clicked. This page shows the input form for the creation of a Person Profile

Figure 46 - Wireframe Sign Up Page

Your Profile has been created successfully. Please check your e-mail and follow the link to activate your account.

Figure 47 - Wireframe Sign Up Page 2

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2010/010124/07

SIGN IN

The sign up page appears when the 'log in' button, marked 3, is clicked. This page shows the various privileges that can be created in the system. The page provides links to access or create these privileges and also indicates whether a certain privilege is active or not.

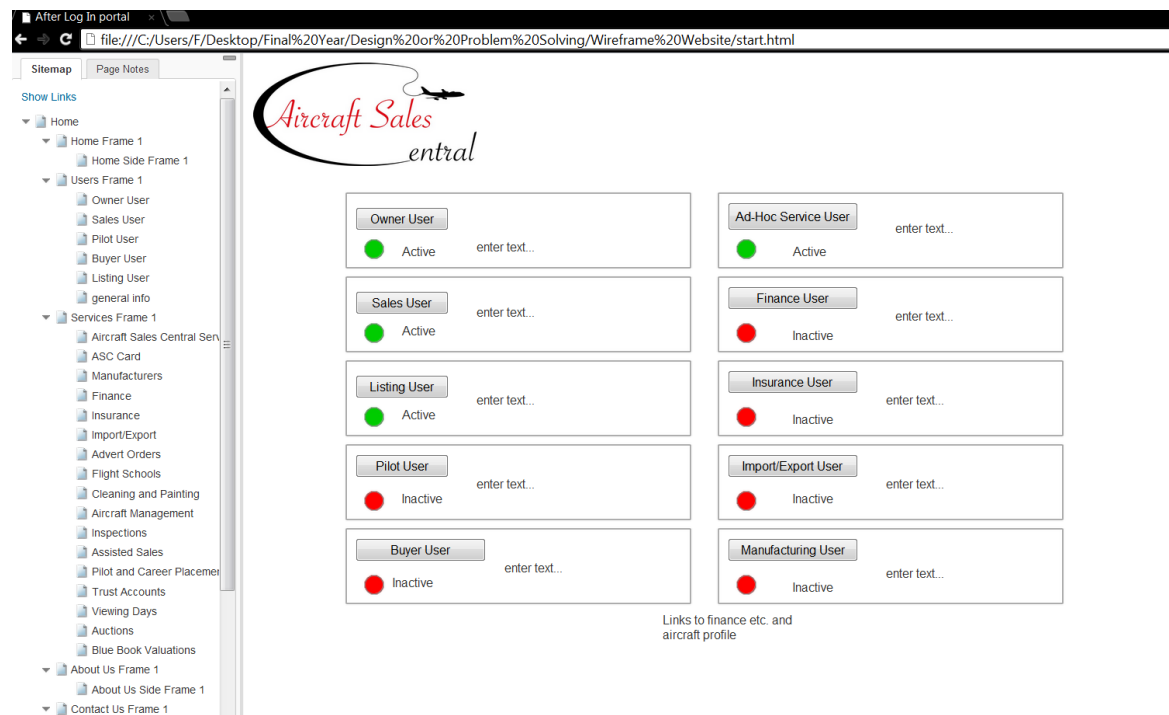


Figure 48 - Wireframe Sing In Page

PRIVILEGES

This section aims to illustrate the wireframe prototype for the various privileges inherent in the Aircraft Sales Central system. Due to the sheer size and scale of this prototype, aspects of the wireframe prototype have been omitted from this document. The important aspects of the system contemplated in previous sections have, however, been included.

OWNER USER

Once the user activates his/her owner privilege and clicks on the 'Owner User' button the following screen appears:



The owner privilege page is quite simple. This page allows the user to add an aircraft owned by that user, Edit or remove an owned aircraft that was added to the system, and search for potential pilots.

Figure 49 - Wireframe Owner Privilege

Add an Owned Aircraft 1

Aircraft Profile Creation:

Aircraft Manufacturer:		Additional Aircraft Information:	1:	
Model Year:			2:	
Aircraft Registration:			3:	
Airframe Serial Number:			4:	
Total Time Airframe:			5:	
Hours Till Next MPI:			6:	
Date of Next MPI:			7:	
Total Time Propeller:			8:	
Time Since Major Overhaul:		Pricing:		
Additional Information:				
		Automatically Populate Through aBlue Book Valuation		
Add Aircraft Images:		Suggested Selling Price:		

Back Add Aircraft

This page allows the user to enter information regarding the aircraft that the user intends on adding to the system.

Edit or remove owned aircraft 2

Aircraft Profiles:

Edit or Remove	(Information regarding aircraft displayed here)
● Approved	
Edit or Remove	(Information regarding aircraft displayed here)
● Pending Approval	

This page allows the user to view the aircraft that he/she added to the system and see their approval status

Edit Aircraft Profile

Aircraft Registration	Registration	Additional Aircraft Information
Model Year	Model Year	1: Registration
Aircraft Registration	Registration	2: Registration
Airframe Serial Number	Registration	3: Registration
Hours Till Next MPI	Registration	4: Registration
Date of Next MPI	Registration	5: Registration
Total Time Propeller	Registration	6: Registration
Time Since Major Overhaul	Registration	7: Registration
Additional Information	Registration	8: Registration

Pricing

Automatically Populate Through aBlue Book Valuation

Suggested Selling Price:

Back Edit Aircraft

This page allows the user amend or remove an aircraft that was submitted to the system

Search For Pilots

3



Search Potential Pilots

Full Name -> Surname -> E-mail -> Mobile -> Pilot Profile -> PPL -> CPL -> ATPL -> Single Eng -> Single Eng -> Multi-Eng -> Multi-Eng -> Instrument ->

Database populated with pilots on the system according to various criteria

Back Contact Selected Pilot

This page allows the user to search a large database of potential pilots according to different criteria

Contact Selected Pilot



Contact Pilot

Email:

Enter Your Name:

Email Address:

Message Subject:

Enter Your Message:

Back Send

This page allows the user to send a message to the selected pilot for recruitment purposes

PILOT USER

The pilot privilege page allows the user to manage his online logbook and CV, to request quotations and communicate with flight schools, and to the pilot forum.

Pilot User



Pilot User Profile

Make a Logbook Entry 1

Pilot Logbook Summary 2

Online CV 3

Request quotation for a license from a flight school 4

Access Pilot Blog 5

Back

Figure 50 - Wireframe Pilot Privilege

Make a logbook entry

1



Logbook Entry

Logbook Entry Number:
 Date of Flight:
 Aircraft Type:
 Aircraft Registration:
 Pilot in Command:
 Details and Remarks About Flight:

Landings:
 Day:
 Night:
 Remarks:

Single Engine:

Day:
 Dual:
 PIC:
 PICUS:
 Copilot:

Night:
 Dual:
 PIC:
 PICUS:
 Copilot:

Multi Engine:

Day:
 Dual:
 PIC:
 PICUS:
 Copilot:

Night:
 Dual:
 PIC:
 PICUS:
 Copilot:

Instrument:
 Place:
 Nav aids:
 Actual:
 FSTD:

This page allows the user to add, edit, and remove logbook entries for his/her online logbook

Pilot logbook summary

2



Logbook Summary

Date of Flight Aircraft Type	Landings:		Single-Engine:		Multi-Engine:		Instrument	# Entries: 2
	Day	Night	Day	Night	Day	Night		
Summary	2	2	11	5	0	0	3	

This page allows provides a summary of hours logged by the pilot in his/her online logbook

Online CV

3



Online CV

License
☐ PPL
☐ CPL
☐ Frozen ATPL
☐ ATPL

Other Applicable Experience:

About Yourself

This page allows the user to update his/her online CV

Request Quotation for a license from a flight school

4



Request Quotation

Select a preferred flight school from the list:

Flight School ID	Flight School Name	CAA Registration Number
1	Fly High	a123123d

Selected flight school:

☐ Check here to confirm that you want to link your pilot profile to the selected flight school

This page allows the user to select a flight school for the quotation from a list of approved flight schools

Request Quotation for a license from a flight school



Flight School Request

Please indicate which services you would like to receive a quotation for:

☐ PPL training
☐ CPL training
☐ ATPL training

☐ Conversion Single Engine
Aircraft Type:

☐ Conversion Multi Engine
Aircraft Type:

This page allows the user to request a quotation from the selected flight school

Request Quotation for a license from a flight school

5



Pilot Blog

Attention all pilots
Moderator: Moderators

Forum rules

POSTREPLY

1 post • Page 1 of 1

Attention all pilots
Dby Capt. Kyle • Sat Oct 13, 2012 4:26 pm

This can be moved to the photography section if the powers that be choose so, but I thought it would be fitting here too.

Ok, a heart warming story to start this thread with... 😊
I am an aviation nut, you probably are too. I am going to be a career pilot I love aviation so much! Because of this, I spend many minutes on the Internet looking at pictures of planes, flying, aviation etc. just to catch interesting glimpses of...

Capt. Kyle
Pre-take off checks
Posts: 87
Joined: Tue Jul 24, 2012 8:35 pm
Location: Lanseria

This page allows the user access to the pilot forum

SALES USER

The Sales privilege page allows the user to conduct administrative and other functions discussed in previous sections.

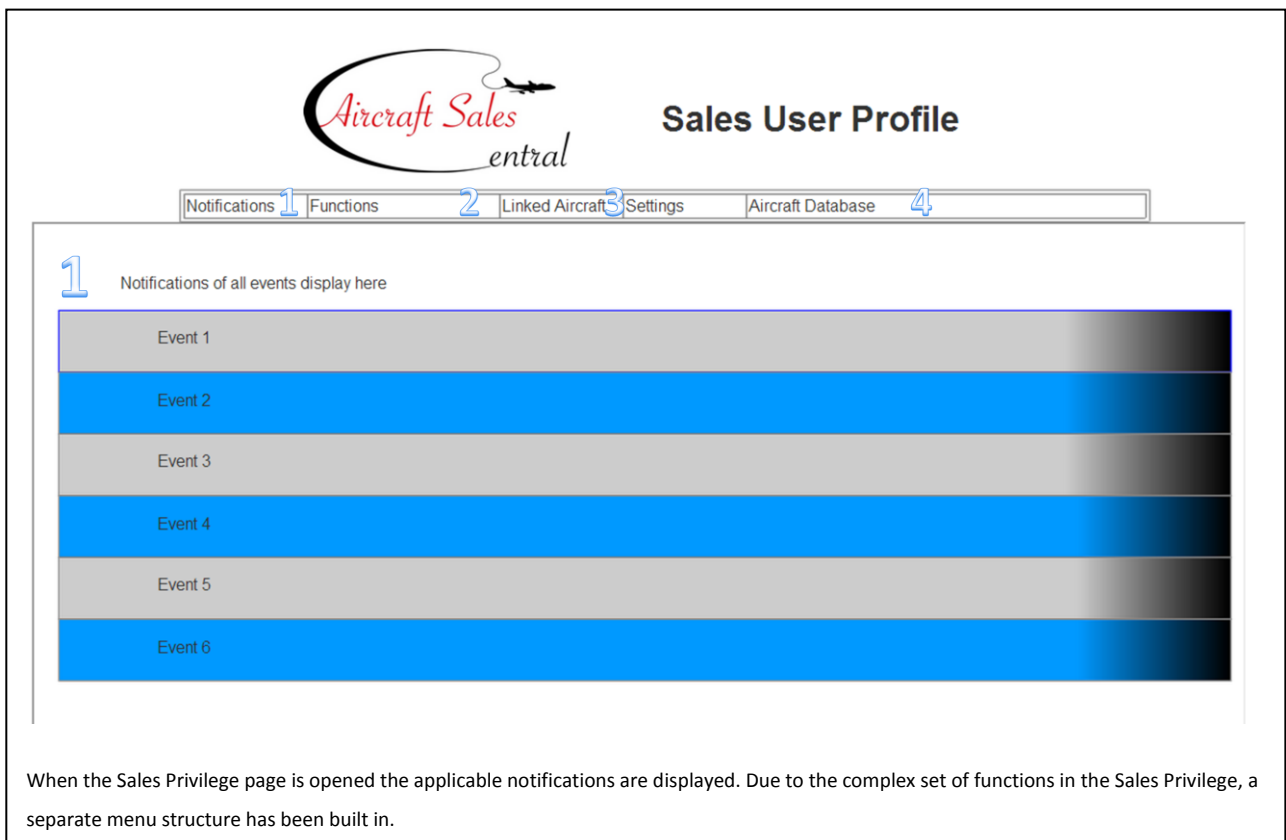
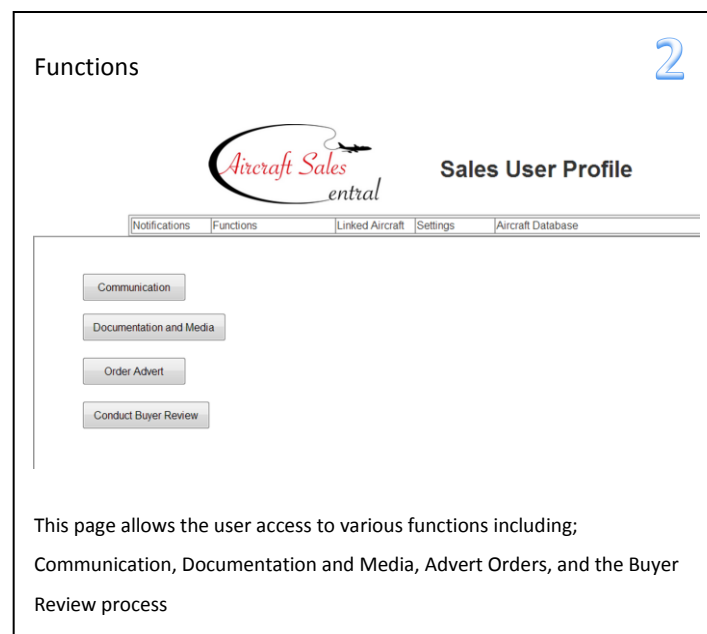


Figure 51 - Wireframe Sales Privilege



Order Advert

2



Advert Order

Select Publication: African Pilot Magazine

Select Advert Section: Front of Magazine

Select Advert Type: Back Cover

Size of selected advert:
x mm



Back

Submit Order

This page allows the user to submit an advert to registered advert providers

Conduct Buyer Review

2



Buyer Review

Aircraft ID	Owner Privilege	Aircraft Manufacturer	Model Year	Total Time in Hours	Time Since Major Overhaul	Date of Next HMR	Total Time Propulsion	Total Time Engine	Time Since Major Overhaul
1	1	Cessna	2009	2009	200	2011/10/14	200	200	100
2	1	Baron	2009	111	22	2011/10/07	234	34	34

Link Selected Aircraft to the Buyer Review process

Select Buyer to link to review process:

Buyer ID	Name	Surname	ID number	Link ID	State

Select if buyer does not have a profile yet

Link Selected Buyer to Review Process

Back

This page allows the Sales User to enter into a buyer review. The Buyer review process is part of the 'Sales Process' outlined in section 4.2.2. This process is complex and consists of many prompts by the system, various pathways, and relies on inputs from other users involved in the process. Therefore the entire process and its steps have not been included as part of the illustration in this section for the sake of simplicity. Please refer to section 4.2.2 for a detailed logical flow of this process

Linked Aircraft

3



Sales User Profile

Notifications | Functions | **Linked Aircraft** | Settings | Aircraft Database

Aircraft ID	Owner Privilege	Aircraft Manufacturer	Model Year	Total Time	Hours Till	Date of Next MPI	Total Time Propellor	Total Time Engine	Time Since Major Overhaul
1		1 Cessna	2009	2000	200	2011/10/14	300	200	100
2		1 Baron	2009	111	22	2011/10/07	234	34	34

Back

This page allows the user view aircraft that the Sales User committed to sell

Aircraft Database

4



Sales User Profile

Notifications | Functions | **Linked Aircraft** | Settings | **Aircraft Database**

Aircraft ID	Owner Privilege	Aircraft Manufacturer	Model Year	Total Time	Hours Till	Date of Next MPI	Total Time Propellor	Total Time Engine	Time Since Major Overhaul
1		1 Cessna	2009	2000	200	2011/10/14	300	200	100
2		1 Baron	2009	111	22	2011/10/07	234	34	34

Back

Commit to sell selected aircraft (link to profile)

This page allows the user view limited aircraft information of all aircraft in the database. In addition the user may select an aircraft he/she wishes to commit to sell to be able to view more detailed information

OTHER PRIVILEGES

The wireframe prototype includes the other privileges in the system. These privileges have not been illustrated in this section due to the complexity and redundancy that the illustration of the aforementioned privileges will add to this document. The other privileges that have not been displayed in this section have a similar look and structure to the privileges already displayed. These privileges have been customised from the templates displayed for the Owner Privilege, Pilot Privilege, and Sales Privilege to include the functionalities described in previous sections.

5.1. SYSTEM IMPLEMENTATION

The final implementation and development of the Aircraft Sales Central system does not form part of this project as defined in the project scope. Therefore, this section will act as a conclusion to the project by evaluation the key activities of the project and discussing the final hand over to the development team at ICOM-IT.

5.1.1. FINAL EVALUATION

This section will briefly establish whether the solution approach defined in section 2.2 was effectively and completely carried out. This section will also ascertain whether the project aim was achieved.

Tables similar to those used in section 2.2, to define the solution approach, have been used to establish whether the solution approach was effectively carried out. These tables are shown below:

Table 11 - Final Evaluation

Activity	Motivation and Sources
Interviews	Interviews were conducted as described throughout the document particularly in the literature review (section 2.1) and provided invaluable insights and information required to complete the information system design of the Aircraft Sales Central system.
Investigation into existing information	Unfortunately there was little in the way of existing documentation and information on the Aircraft Sales Central system. There was, however, documentation about the business model of the Aircraft Sales Central system and these were investigated thoroughly.
Observation of current or future work environment	The current environment was observed both personally by the author of this document and observed through the experiences of the individuals that were interviewed.
Defining the Project Scope and Constraints	The project scope was defined as part of the planning phase of this project and is included in section 1. The project has been completed within its time allocation due to the fact that the deliverables of the project stayed within the scope that was originally defined.
Compiling Results and Recommendations	The compilation of all the results and recommendations is an activity that is directly influenced by the requirements set out by the University of Pretoria and the Engineering and Built Environment faculty. These results and recommendations have been included throughout the document.
Work breakdown	The work breakdown structure was used extensively as part of the project

structure	management and can be seen in section 4.1.1.1.
Implementation of project management techniques	Project management techniques were implemented to ensure the timely delivery of the information system design. Some of these techniques and tools were illustrated in section 4.1.1.
Use Case Modelling	Use case modelling was used to develop an initial understanding of the functions that will be required in the system and have been illustrated in section 4.2.1. The use cases were also ranked and given a priority according to certain criteria. Although the ranking was not part of the original project planning, it proved to be a valuable part of the information system design.
Business Process Modelling	The business processes were extensively modelled in as illustrated in section 4.2.2. The process modelling brought many flawed aspects to light in the original business model. These aspects were then improved upon by the team at Aircraft Sales Central.
Data Modelling and Database Design using Entity Relationship	The entity relationship diagram proved to be complex and challenging. This particular activity nearly compromised the timely delivery of the information system design but will prove to be one of the most important references during the development of the Aircraft Sales Central system.
Form Design	The form design was the next logical step and was implemented using the results from the entity relationship diagram.
User Interface Design using a wireframe prototype	The wireframe prototype was an exciting step in the information system design and the result was quite popular with the stakeholders of the Aircraft Sales Central system. The wireframe prototype was the first glimpse of what the final system would be like once developed which provided a level of assurance for the investors in the business venture.
Evaluation of project aim and deliverables versus the end result	This section aims to ascertain whether the project aim was achieved which addresses this particular activity defined in the solution approach.
Hand over all deliverables from system planning, analysis and design to the development team for coding and final implementation.	This is the final step in the solution approach. The complete information system design will be handed over to the development team to commence the actual coding and implementation of the system. At the time of writing this hand over process has commenced and will be completed before the 29 th of November 2012.

5.1.2. FINAL HAND OVER

Gary B. Shelly and Harry J. Rosenblatt suggested that “During systems implementation, the system design specification serves as a blueprint for constructing the new system.” (Shelly and Rosenblatt, 2012: 506). Therefore, this document along with the deliverables illustrated within it will be the blueprint for the system implementation phase. ICOM-IT will be heading the development of the Aircraft Sales Central system using the information system design outlined in this document.

SOURCES CONSULTED

Avcom (2011) *Home*, 28 November, [Online], Available: <http://www.avcom.co.za> [29 November 2011].

Avdex (2012) *saregister*, 10 January, [Online], Available: <http://www.avdex.co.za/saregister/> [22 January 2012].

Avison, and Fitzgerald, G. (2006) *Information Systems Development Methodologies, Techniques & Tools*, Maidenhead: McGraw-Hill Education.

Bentley, L.D. and Whitten, J.L. (2007) *Systems Analysis and Design for the Global Enterprise*, New York: Mcraw-Hill/Irwin.

Bodenstein, W. (2011) *Personal Interview*, Johannesburg.

Bothma, T., Cosijn, E., Fourie, I. and Cecilia, P. (2008) 'Navigating Information Literacy', in Blues, T. (ed.) *Navigating Information Literacy*, Cape Town: Ceri Prenter.

de Lange, C. (2011) *Personal Interview*, Pretoria.

Els, P. (2011) *Personal Interview*.

Engelbrecht, E. (2012) *Personal Interview*, Pretoria.

FAA (2012) *Home*, 5 January, [Online], Available: <http://www.faa.gov/> [19 January 2012].

Fisher, J. (2012) *Personal Interview*, Pretoria.

Goncalves, R. (2012) *Personal Interview*, Johannesburg.

Gouws, K. (2011) *Personal Interview*, Johannesburg.

Griffith, P. (2011) *Personal Interview*, Johannesburg.

Jacobs, R., Chase, R.B. and Aquilano, N.J. (2009) 'Operations and Supply Management', in *Operations and Supply Management*, New York: Mcraw-Hill Irwin.

Kendall, J.E. and Kendall, K.E. (2011) *Systems Analysis and Design*, New Jersey: Prentice Hall.

Leaker, P. (2011) *Personal Interview*, Johannesburg.

Lim, K.H., Sia, C.L., Lee, K.O. and Benbasat, I. (2006) 'Do I Trust You Online, and If so, Will I Buy? An Empirical Study of Two Trust-Building Strategies', *Journal of Management Information Systems*, vol. 23, no. 2, pp. 233-266.

Lombard-Chibnall, S. (2012) *Personal Interview*, Johannesburg.

Lumsdaine, E. and Binks, M. (2007) *Entrepreneurship from Creativity to Innovation*, London: Trafford Publishing.

Minnaar, P. (2011) *Personal Interview*, Pretoria.

Nagel Et Al (2007) 'General Principles of the Law of Contract', in Lithgow, M. (ed.) *Business Law*, Johannesburg: Lexis Nexus.

Nagel Et Al (2007) *Insurance Law*, Johannesburg: Lexis Nexus.

Nagel Et Al (2007) 'Purchase and Sale', in Lithgow, M. (ed.) *Business Law*, Johannesburg: Lexis Nexus.

Naidu, (2011) 'An Information System for Equipment Management and Consumable Inventory Control for ACTOM (Pty) Ltd.', *FACULTY OF ENGINEERING, BUILT ENVIROMENT AND INFORMATION TECHNOLOGY*, October.

Osterwalder, A. and Pigneur, Y. (2010) *Business Model Generation*, Hoboken: John Wiley & Sons, Inc.

Roux, A. (2012) *Personal Interview*, Johannesburg.

Rowan, R.M. (2001) 'A Review of Information Systems Development Methodologies', *Int Standard*, vol. 15, no. 6, pp. 280-284.

Search Software Quality (2007) *Quality Assurance*, February, [Online], Available: <http://searchsoftwarequality.techtarget.com/definition/quality-assurance> [5 May 2012].

Shelly, G.B. and Rosenblatt, H.J. (2012) *System Analysis and Design*, Boston: Cengage Learning.

Van Emmenis, A. (2012) *Personal Interview*, Pretoria.

Van Staden, P.A.J. (2011) *Personal interview*, Pretoria.

van Staden, P.A.J.S. (2012) *Personal Interview*, Pretoria.

Wilson, W. (2011) *Personal Interview*, Johannesburg.