



SEEK WISDOM, ELEVATE YOUR INTELLECT AND SERVE HUMANITY!



COLLEGE OF NATURAL AND COMPUTATIONAL SCIENCES SCHOOL OF INFORMATION SCIENCE

DESIGNING A GENERIC WEB INFORMATION ARCHITECTURE FOR INFORMATION EXCHANGE AND INTEROPERABILITY OF THE ETHIOPIAN E-COMMERCE LOGISTICS SECTOR

Samuel Berhanu Balcha

Advisor: Million Meshesha (Phd.)

**This thesis proposal submitted to College of Natural Science School of Information
Science in Partial Fulfillment of the Requirement for the Degree of Master of
Science in Information Science**

June, 2020

Addis Ababa



ADDIS ABABA UNIVERSITY

**COLLEGE OF NATURAL AND COMPUTATIONAL SCIENCES SCHOOL OF
INFORMATION SCIENCE**

**This thesis proposal submitted to College of Natural Science School of Information
Science in Partial Fulfillment of the Requirement for the Degree of Master of
Science in Information Science**

By: SAMUEL BERHANU BALCHA

Advisor: Million Meshesha (Ph.D.)

Name and signature of Members of the Examining Board

Million Meshesha (Ph.D.)

Advisor

Signature

Date

Lemma Lessa (Ph.D.)

Examiner

Signature

Date

Temtim Assefa (Ph.D.)

Examiner

Signature

Date

Declaration

This thesis has not previously been accepted for any degree and is not being concurrently submitted in candidature for any degree in any university.

I declare that the thesis is a result of my own investigation, except where otherwise stated. I have undertaken the study independently with the guidance and support of my research advisor. Other sources are acknowledged by citations giving explicit references. A list of references is appended.

Signature: _____

Samuel Berhanu

This thesis has been submitted for examination with my approval as university advisor.

Advisor's Signature: _____

Acknowledgements

የጥበብ መጀመሪያ እግዚአብሔርን መፍራት ነዉ።

After this the following is the heart felt appreciation

Of course It should start with The Great Addis Ababa University and all my educators in particular, I am greatly indebted to my advisor Dr. Million Meshesha, whose professional guidance, advice constructive comments, with valuable inputs and patience has been remarkable, Thank You.

I would also like to thank all participants of the study. In this regard, sampled logistic and transport companies, who were willing to participate in the study as a respondent, deserve special recognition and gratitude for allotting their valuable time. Finally, I would like to thank all individuals that I am greatly indebted in many ways:

My Mother Zewditu Tuji and my family, my wife Menna Betemariam and her family for the constant support, during my study. Thank You all.

Contents

CHAPTER ONE.....	1
Introduction	1
1.1 Overview.....	1
1.2 Statement of Problem	2
1.3 Research Questions.....	4
1.4 Objective of the Study	5
1.4.1 General Objective	5
1.4.2 Specific Objectives	5
1.5 Significance of the Study.....	5
1.6 Scope and Limitation of the Study	6
1.7 Thesis Structure	6
CHAPTER TWO.....	8
Literature Review	8
2.1 Overview.....	8
2.2 Overview of Information	8
2.2.1 What Is Information?	Error! Bookmark not defined.
2.2.2. Information Taxonomy	Error! Bookmark not defined.
2.3 Architecture	12
2.4 General Concept of Enterprise Architecture.....	Error! Bookmark not defined.
2.5 Electronic Commerce Enterprise Architecture.....	17
2.5.1 Electronic Commerce.....	17
2.5.2 E-Commerce Order Fulfillment Approaches	19
2.5.3 Traditional Versus E-Commerce Logistics.....	25
2.5.4 Relation Between E-Commerce and Logistics Management	27

2.6 Operational Definition	27
2.6.1 Generic Information Systems.....	27
Generality and Specificity.....	28
Generative Design.....	28
2.6.2 Benchmark Designs for the Proposed Information Architecture.....	29
A. District Health Information System	29
B. The Ethiopian Electronic Service Platform.....	30
2.7 Related works	31
2.7.1 Summary of Related Works.....	34
CHAPTER THREE.....	37
Research Methodology.....	37
3.1 Overview.....	37
3.2 Research Design	37
3.2.1 Problem Identification and Motivation	39
3.2.2 Objective of the Solution	40
3.2.3 Design and Development.....	40
3.2.4 Demonstration.....	46
3.2.5 Evaluation	47
3.2.6 Communication.....	47
CHAPTER FOUR.....	48
Problem Identification and Defining the objective of the Solution.....	48
4.1 Overview.....	48
4.2 E-Logistics Systems Building Blocks	48
4.2.1 Business Processes Automation.....	48
4.2.2 Logistics Supply Chain Management	49

4.2.3 Awareness of E-Commerce Logistics	50
4.3 Inhibitors Influencing Information Sharing of the Logistic Industry in Ethiopia	Error!
Bookmark not defined.	
4.4 The Design and Development Process	50
4.4.1 Requirements and Specifications	50
CHAPTER FIVE	55
Defining objective of the Artifact	55
5.1 Overview.....	55
5.2 Preliminary Phase	55
5.2.1 Requirements Management.....	56
5.2.1 Approach for the Information Architecture	57
5.2.2 Architectural Definition	58
5.3 Phase A: The Architecture Vision for E-Logistics.....	58
5.3.1 Important Elements to Build an Architecture Vision.....	59
5.4 Phase B: The Business Architecture.....	61
5.4.1 E-Logistic Service Capabilities.....	62
5.5.2 Business Process Models with Respect to Business Capability	63
CHAPTER SIX	80
Implementation, Demonstration and Evaluation.....	80
6.1 Phase C: The Information Systems Architecture.....	80
6.1.1 Proposed Information Architecture.....	80
6.1.1 Transaction Planning Sub-System	82
6.1.2 Service/Case Management Module	82
6.1.3 Organization Management Module	83
6.1.4 Form Builder Module.....	83

6.1.5 Service/Case Manager Module	83
6.1.6 User and Role Management Module	83
6.1.7 Account Management Module.....	83
6.1.8 Authorization Module	84
6.1.9 Customer Portal Module	84
6.1.10 Service Productivity Module	84
6.2 Data Design	84
6.3 Graphical User Interface Designs (Prototypes)	85
6.4 Demonstration of The Artefact.....	87
6.4.1 Service/Case Fulfillment Scenario Demonstration	88
6.5 Evaluation of The Generic E-Logistics Information Architecture	95
6.5.1 Discussion of Results	96
Configuration of the Core	97
End-user Development.....	97
CHAPTER SEVEN	99
Conclusion and Recommendation.....	99
7.1 Overview.....	99
7.1.1. Discussion	99
7.1.2. Conclusion	102
7.2. Recommendation	104

Lists of Tables

Table 2.1 Architecture Types Supported by TOGAF (TOGAF™ Version 9 – A Pocket Guide) 14

Table 2.2 How e-logistics differs from traditional logistics (Turban et al., 2015) 25

Table 2.3 Summary of Related Works..... 35

Table 3.1. Interviewees Distribution across their hierarchy..... 39

Table 3.2 Steps in establishing an architecture practice 45

Table-6.1 Evaluation of the generic web based e-Logistics 96

List of Figures

Figure 2.1: The Architecture Development Method Cycle..... 17

Figure 3.1 problem centered design science process model (Peppers et al 2007) 36

Figure-5.1 Logistics Planning Business Process flow of Information..... 66

Figure-5.2 Warehousing Sub-Process Groups flow of Information..... 69

Figure-5.3 Transport Sub-Process Groups flow of Information..... 75

Figure 6.1 The proposed Information Architecture 78

Figure 6.1 The proposed Information Architecture 81

LIST OF ACRONYMS

3GMobile	Third Generation
ADM	Architecture Development Method
B2B	Business to Business
B2C	Business to Customer
DSRM	Design Science Research Methodology
E-Commerce	Electronic Commerce
EDI	Electronic Data Interchange
EM	Electronic Market
EIA	Enterprise Information Architecture
EA	Enterprise Architecture
ICT	Information and Communication Technology
IT	Information Technology
LSP	Logistic Service Provider
LSB	Logistic Service Buyer
OMG	Object Management Group
SCM	Supply Chain Management
TMS	Transport Management System
TOGAF	The Open Group Architecture Framework
UML	Unified modeling language
WMS	Warehouse Management System

Abstract

The complexity of transport and logistics chains these days needs a fast and reliable information exchange system to ensure an efficient and cost optimized logistics solutions. To this end, standardizing and automating information flow of logistics chain is needed for a more transparent and optimized services. Intermodal logistics connections are becoming more commonplace and complex involving many business actors in the process, transnational scope, and multimodal logistics stages. The objective of this research is to design a generic web Information Architecture (IA) to promote information exchange among the various e-Logistics stakeholders. The research was carried out using design science research. TOGAF was also used as a designing framework to identify entities in the IA. Both primary and secondary sources were used for data collection. Key information sources were selected from logistics companies that are involved in the logistics supply chain on the basis of TOGAF under the umbrella of DSR methodology. The challenges and practices identified during the research were mainly the absence of standardized and interoperating information exchanging platforms, which in turn forces companies to operate disjointedly, the lack of standardized and reliant information exchanging process, planning and implementation was confirmed by the interviews and other documentations i.e. literature reviews and companies' business forms and registers. This has become an impediment on the quality of data, security issues at different levels. This necessitates the design of a generic Information Architecture, which is web based platform to exchange data among the involved logistics actors. Therefore, this research attempts to undertake the design of generic Web Information Architecture. The architecture has covered all the information required regarding the Logistics Supply chain such as transportation warehousing management and operations processes. The proposed prototype was demonstrated to the logistics firms and evaluated by experts from five logistics firms out of the ten the study was conducted. The evaluation outcome revealed that 94.1% of the specialists have confidence in the proposed IA which they deem to be appropriate, to improve information exchanging practice in the logistics chain. However, one major challenge the experts raised is the issue, how the standardized IA can materialize to simplify information exchange of the industry, which in turn necessitates attention of all stakeholders to step forward.

Key words: *information flow, information architecture, Generic Web Information Architecture, Logistics Supply Chain*

CHAPTER ONE

Introduction

1.1 Overview

The world today is globalized, fast changing and shifting, people that accommodated it are facing a meandering way of doing business in their everyday life, and mankind is always striving to change this conditions to a more structured and organized mode of existence. Since Ethiopia is one of the underdeveloped countries in the world in which majority of its population is living in the rural parts of the country and employed in an uncreative agricultural undertakings subjected to the aforementioned detrimental conditions. In light of these harsh realities the need to improve production mechanisms, improve way of conducting businesses and utilizing resources in a manner that will enable the country and its people to make the most out of the resources at hand is an issue that requires everyone's attention and effort. Electronic Commerce is one of the innovative mechanism innovated to overcome these aforementioned adversaries at the same time to conduct business easily within limited boundary and globally. The estimated value for e-Commerce sales in the year of 2017 was 1.843 trillion Euros [1]. e-Commerce initiatives are largely expected to benefit it's agrarian and production sectors that bank significantly on logistics, this has led to the increment of the global logistics market, that is not only large, but it is also very scalable with growth rates reaching up to 10% in mature markets such as Germany and United States; and more than 100% in developing markets [2]. Simultaneously, failed or late deliveries become a very frequent problem due to logistics companies not being able to follow the growth of e-commerce. Nowadays, it is expected that 1 out of every 20 online orders is not delivered on the first attempt [3].

The above challenge is also an opportunity for a new set of competitors, the so-called on-demand urban delivery providers [4]. These start-ups have entered the business to customer (B2C) delivery market and provided the economy with such logistics model that has attracted almost 5 billion USD in venture capital since 2014 in western markets alone [4]. According to Vanelslander and his colleagues; the delivery is the least efficient process between all the transportation phases of parcel delivery, amounting up to 50% of the total supply chain costs in specific cases [5], taunting huge financial losses for retailers and logistic partners, as well as brand image damage and customer dissatisfaction [5]. Nevertheless, the concerns go far beyond the economic issue for the business. Thus,

fulfilling distribution and delivery requirements and capabilities are essential for any online business that sells physical goods.

As companies enter into e-Commerce, better coordinating techniques are required to streamline logistics activities for transactions taking place on the internet. Collaborative technologies for supporting e-Commerce logistics would greatly enhance the future logistics. As Gurung suggested, Multi-agent systems (MAS) provide an interesting avenue of research that is applicable for supporting logistics technologies on the internet [6], that advocate for Intelligent interoperable software tools to be used for e-logistics, which also motivated this research to design an interoperable Information Architecture through re-appropriation of existing information systems in a manner that will simplify the information sharing process of the Ethiopian e-Commerce logistics.

Information Architecture (IA) is a discipline that focuses on, the structural design of shared information environments, the synthesis of organization, labeling, search, and navigation, systems within digital, physical, and cross-channel ecosystems, the art and science of shaping information products and experiences to support usability, findability, and understanding and an emerging discipline and community of practice focused on bringing principles of design and architecture to the digital landscape [7]. The purpose of IA is to help people to understand their surroundings and find what they're looking for – in the real world as well as online. Practicing information architecture involves facilitating the people and organizations we work with to consider their structures and language thoughtfully [8].

As a result of what is discussed above, the logistics industry in Ethiopia needs to modernize its information sharing methods more than ever, to manage the information assets properly and make the information exchange process smooth so as to cope with the current changes in the world. Recognizing this void, this research incorporates the concept of Generic Web Based Information Architecture in the context of e-Commerce Logistics or e-Logistics where it can be used towards development of integrated information exchange and repository platform.

1.2 Statement of Problem

Initiatives of electronically enabled services in Ethiopia are gradually permeating as the development of ICT is fast growing than ever in country and many innovative ways of accomplishing businesses are being introduced both by the government and the private sector. In terms of Skills sub-index also,

Ethiopia sits at the bottom of skill sub index indicator, which lags behind even by African standard. Ethiopia sits at the bottom with global rank of 131 out of 139 countries. In terms of Infrastructure, Africa has the least developed infrastructure compared to the other continents which left behind in the ICT race. Development of the Internet market in Africa is still at infant stage [9]. Ethiopia has small number of Internet users and very small Penetration even by African standard Ethiopia ranked 21th in Africa and 119th in the world [9]. Quality of telecom services which comprises requirements on all aspects of a connection, such as service response time, loss, signal-to-noise ratio, cross-talk, echo, interrupts, frequency response, loudness levels, and so on is also at a low quality. The low quality of services has been a common problem, is a result of the overall bad performance of the telecommunications regulatory environment.

As mentioned earlier E-Commerce initiatives are largely expected to benefit it's agrarian and production sectors that bank significantly on logistics. Hence logistics Service Providers have a significant role in today's supply chains in all industry sectors, by managing the internal and external flows of goods for Retailers, Hospitals, Pharmacies, Armed Forces, Manufacturers, Material suppliers and many more stakeholders [10]. In many of these relationships, trading partners are faced with different business scenarios and data interchanges, especially when they move into more advanced interactions with Logistics Service Providers [10]. Thus, there is a need for common understanding of business processes, common communication and identification solutions, to overcome barriers of interoperability [10].

Information management and efficient means of information exchange is a seminal aspect interoperability to the logistics business as well. Information exchanging is a key element for organizations seeking be competitive [11]. Though limited information exchanging across an organization is most likely to result in information gaps, the understanding and practice of information exchanging is becoming increasingly essential for organizations to stay competitive and boost profitability [12]. According to Ziaee and his colleague, exchanging and integrating large amounts of data with different forms, from different organisations with different geographical locations and different technological platforms also poses numerous challenges regarding other technical factors such as data quality, security, accuracy, consistency, and completeness [13].

Logistics practices of Ethiopia is mainly focused on the transportation and customer service practices using general attributes of infrastructure, performance, information system, human resources, business and political environments. IT is also characterized by poor logistics practices and lack of coordination

of goods transport, low level of development of logistics infrastructure and inadequate fleets of freight vehicles in number and aged, damage and quality deterioration of goods while handling, transporting and storage [14].

On the other hand, the literature suggests, for a developing country introducing yet another, large information system for may not be viable in terms of time and financing [15]. In low-resource settings with a limited availability of software developers, designing a custom solution is often unreasonable [15]. Another option is buying a finished, proprietary software package. Yet, these products often involve running licensing- and support costs, and may lead to a lock-in down the line, where the client becomes dependent on the product [15]. As a result, Nelson et. al. observed that in developing countries, it is not uncommon for existing software to expand to other use-cases and even other domains [16]. By re-appropriating an existing system from another domain, it can be built upon what is already present, such as organizational routines, people and current activities. Yet, this re-appropriation process requires a high level of flexibility of the existing software, may require experts in the other domain and requires the new implementation to free itself from any assumptions from the original domain.

Therefore, this research aims to design a generic web platform Information Architecture(IA) by benchmarking existing IA or IS that are already in use in other sectors, via identifying the logistics supply chain information related elements required for e-Logistics and developing content for information exchanging services for e-Commerce Logistics industry.

1.3 Research Questions

Based on the above problem elicitation, the research has approached the study problem by framing the following critical research questions:

1. What are the main interoperability capability and information exchanging practices in e-commerce Logistics Sector?
2. What logistic supply chain information contents that are required in e-logistics' information architecture according to business entities and internal work unit's requirement?
3. How a generic Information Architecture can be designed for a Logistic chain in supporting e-Commerce?

1.4 Objective of the Study

1.4.1 General Objective

The main objective of this research is to design a generic web information architecture for e-commerce logistics to promote interoperability and information exchanging among logistics supply chain actors and with e-Commerce platform providers, suppliers and customers.

1.4.2 Specific Objectives

To achieve the general objective of the study has the following specific objectives are formulated

- To identify the interoperability capability and information exchanging practices of e-Commerce and e-logistics.
- To define the information structure of the Logistic supply chain focusing on the core Logistics services.
- To design a generic web based information architecture for e-Commerce Logistics.
- To evaluate user acceptance level of the designed information architecture.

1.5 Significance of the Study

Over the past two decades, along with the increasing presence of information technology (IT), there has been increasing interest on studying the value of demand related information in various supply chains. A significant body of theoretical knowledge has been built in this area [17]. Analyzing results from supply chain members with higher levels of employee involvement and logistics integration were more likely to realize the potential benefit of VMI (Vendor Managed Information), moreover, it is also found that VMI seems to have benefited small organizations more than large ones [17].

The significance of this research is, first to prototype a generic e-logistic IA to initiate stakeholders, and others who have the interest, to undertake a more comprehensive investigation of the problem and improve the current e-commerce logistics practice. Besides, as the output of this research is expected to augment a shared body of knowledge, or as it fills the information gap pertaining to the problem of information exchange as a result of implementing the IA. In General, the result of this research is thought to have significance for the seamless implementation and proper use of IA and to increase the understanding of stakeholders in the logistics industry.

1.6 Scope and Limitation of the Study

Because Logistics has wide variety of activities such as transportation, packaging, distribution, promotion, inventory and warehousing to mention a few, this study focuses on the IA pertinent to the collaboration of e-Commerce with e-Logistics. For this reason, the research concentrates only with the areas that are essential to the problem and objectives of the research.

This research focuses on the design of generic web Information Architecture to improve the information exchanging practice among and within e-logistics actors. The research discusses on how to design and prototype suitable Logistic IA which is limited to the warehouse information assets management, transport information assets management, and their relationship to the business processes and business objectives. This research attempts to single out the required information, flows of information, and data interrelations of the business units and represent the data to build a web based IA. The end product of the study is a generic web information architecture. However, the research did not include remaining components of e-commerce such as payment and other services that are essential to e-commerce.

While undertaking this study, the researcher had encountered some limitations to mention some; absence of well-organized and documented data with regard to Ethiopia as well, an inter-organizational alignment frameworks scholarly works since the research theme is relatively new. Shortage of reference materials about e-Commerce Logistics practice in Ethiopia enforced the research to depend largely on foreign countries experiences. Moreover, inconsistency of data kept by different organizations is another limitation that affects the research.

1.7 Thesis Structure

The thesis report is organized in seven chapters. The first chapter present statement of problem, objective and relevance of the thesis is presented. The different subjects that are treated in the thesis are introduced and justified after which the purpose along with its limitations and delimitations is stated and problematized.

The second chapter compiles conceptual and empirical literature review. The chapter presents review of related works and what kind of theoretical framework and practical approach the research used, and also methodological approach that has been used is discussed in this chapter.

The third chapter provides methodology and research design followed by the study. Here following design science and research, here following design science research methods tools used at each step of the design science process model are also shown in this chapter.

Chapter four presents problem identification and defining objective of the solution artifact.

Chapter five presents the development of the artifact, this section of the research provides the development processes of proposed framework for e-Logistics.

The sixth chapter presents implementation demonstration and evaluation continuing from the previous section this chapter discusses the IA Logical and physical parts of the IA.

The seventh chapter provides conclusion and recommendation of the research. The research major findings are discussed in accordance with the researches' objective and research questions.

Finally, the thesis presents all the reference materials that are cited and included in each section of the research work.

CHAPTER TWO

Literature Review

2.1 Overview

This Chapter summarizes contributions of different study reports, articles, journals, books and any other relevant materials on Defining Information Architecture, on the major principles, theories, models and frameworks of IA design and re-appropriation as well as on the major principles behind the integration of e-Commerce & logistics and finally the chapter is concluded summarizing with related works.

This literature review is carried out to create up-to-date literature overview as input for the design of the IA artefacts. This literature will contain knowledge from the several different fields such as information management, enterprise architecture management, e-Commerce, the concept of generification design. The review protocol ensures the traceability and reuse of the gathered data for further research.

2.2 Information Architecture

2.2.1 What Is Information Architecture

IA is a construct that has been defined by several scholars in many dimension to mention some of them Resmini and colleagues defined it as a professional practice and field of studies focused on solving the basic problems of accessing, and using, the vast amounts of information available today [18]. Other definition of IA can be seen as how people communicate, how they express their points of view, how they organize folders in their own computers [19]. Another example is signs in a shop to direct customers to their desired products as quickly as possible. Information architecture aims to assist users with understandability, findability and usability.

During 1980s, even though the field got quiet, many useful products were created such as blueprints, requirements, information categories. Information architecture is not only applied for physical objects but also for digital products. In 1991, the World Wide Web became popular and started to steer the practice of Information Architecture into the digital side. In 1998, Louis Rosenfeld and Peter Morville, the two librarians, released a book called “Information Architecture for the web and beyond”, the term information architecture became more popular than ever [18].

Although IA has been directly connected with the design of web sites both large and small, and when wireframes, labels, and taxonomies previously, nowadays it has primarily become beyond that to a production activity, a craft, and it relies on an inductive process and a set, or many sets, of guidelines, best practices, and personal and professional expertise. In other words, information architecture is arguably not a science but, very much like say industrial design, an applied art with the focus clearly on the managing of information for improved enterprise-wide consumption and use [18].

2.2.2 Core Information Architecture Components

It can be difficult to know exactly what components make up an information architecture. People interact directly with some, while (as we just saw) others are so behind the scenes that users are unaware of their existence [7], according to Rosenfeld some of the components are:

Organization Systems

Organization can be a person or a group of people that has its own functions with responsibilities, authorities, and relationships to achieve its objectives [20]. Organization system has the action of arranging something in a way that is easily understood, in this case, information. Organizing information would help users understand the background of the website and find answers for questions that users are looking for when using the website [7]. Moreover, organization system will control the amount of information on an individual page or section, and maintain the relevance of information. Organization systems are comprised of organization schemes and organization structures.

Organizing is based on an individual's way of organizing and comprehending information and this is why it is difficult to create a perfect organization system. Since information is made of languages and languages are undoubtedly ambiguous, one word could have various meanings. Thus, in different contexts, the word itself could be comprehended differently depending on how people receive it. In either digital or physical environment, the nature of information is highly heterogeneous, so it is hard to come up with one general scheme to organize the whole system. As mentioned earlier, the organization system is divided into two parts, which are organization schemes and organization structures [7]. Organization schemes define the common characteristics of items as well as how to logically group those items [7].

Due to the complexity of information, organization schemes are broken down into Exact Organization Schemes and Ambiguous Organization Schemes. Exact organization schemes are used when the set

of items is well defined and has similarities [7]. Ambiguous organization schemes are used to divide information into categories due to its definition, although this scheme is rather difficult to design and maintain, compared to exact organization schemes, it is more useful and important [7]. When it comes to searching for information, users may not know the exact location of information they need. There are some prominent schemes for ambiguous organization schemes: topical organization schemes, task-oriented schemes, audience-specific schemes, metaphor-driven schemes, hybrid schemes [7]. Within organization systems, organization structure also plays an important role [7]. Similar to any other part of information architecture, organization structure is invisible. Organization structure is a structure where users can navigate within [7]. The most popular organization structure is a hierarchical structure.

To design a hierarchical structure, breadth and depth should be taken into account carefully to balance the hierarchy. If the hierarchy is narrow and too deep, it will cause frustration for users because they need to go through many levels of information to find the wanted information. In another hand, if the hierarchy has too many options in one level and not so many levels, the content will be limited in each section and users will find the site confusing [7].

Labelling Systems

It appears to go out of notice that everything has labels. Brands are labels, products or service grades are labels, sometimes people receive labels. Labeling is a form of presenting information in a concise way and helps users distinguish the information and select the right one. Usually, when users come to a website, they already have an existing mental model of where to find information. Labeling is an element to enhance users experience. A good label is relatively easy to recognize and helps users browse through the page without being confused.

Therefore, the best labels are ones the users are already familiar with or have interacted with before. A common set of labels may not make the best impression but a guarantee for user experience. Designers may try to make the website unique by creating a unique set of labels, but this may backfire. It is either a unique and interesting website or a confusing and irritating website since customers do not have enough patience to get familiar with the website labels. A new set of labels could drive users away from the website. Labels are divided into two main categories: textual labels and iconic labels [7]. Textual labels have been used long before the digital environment was even thought of. Users may interact with textual labels under the form of contextual links, heading or within navigation systems [7]. Iconic labels have recently been adopted due to the popularity of smaller screen devices [7]. This could help save space on the screen but still maintain the meaning of the label.

Navigation Systems

When travelling to a new place, a map would be an essential object to discover the place. Without a map, travelers tend to be lost and end up being frustrated. This is also the case in digital environments and websites and why a Navigation system is needed. Even though navigation bar is only a subset of navigation systems, it is what users use the most to navigate within the website and systems. Navigation systems are composed of two groups [7]. The first group contains global navigation systems, local navigation systems and conceptual navigation systems. The second group contains the supplemental navigation systems. Global navigation systems are the systems that users will notice the most. These systems are commonly seen as the navigation bars. Although this type of systems should be consistent in any pages within the website, there could be some adjustments for some special cases [7]. Their function is to guide users through the website and their main mission is to help users switch back to any main pages no matter where they are in the website. Moving on to local navigation systems, their function is to give related information on the current page [7]. The related information may be displayed as a menu that provide sub systems. These systems will help users access to the site's supporting information. If done right, local navigation system will be an element to enhance user experience. Like local navigation systems, contextual navigation systems give supporting information for the site/ system [7]. The difference is the information in this case is not prominent enough to be shown in local navigation systems. The second group of navigation systems is supplemental navigation systems. Supplement navigation systems are composed of sitemaps, indexes and guides [7]. These systems are usually adopted by a large information environment and help users explore the site and locate information fast.

Search Systems

Commonly, when coming to a website web-systems, users tend to expect that there should be a search box that helps them look up information. This search box represents the search systems. Search systems are considered to be a part of navigation systems since search box is usually displayed within the navigation bar. When it comes to search systems, most users acknowledge on the surface of the search systems – the search box. However, there is a strong technical side buried underneath it. In this section, the discussion will be about the information architecture side of the search systems.

Not all websites/systems need search systems, so the determination of whether to implement the search function should be put first [7]. There is no defined rule of thumb if the websites need search systems. It depends on the website itself, if it is a large website or a small one, if the targeted users prefer to

browse more or search more. Even though there are many reasons to build search systems, it must not be used to excuse a poorly-designed navigation systems. Search sub-systems would be a good idea in a large informative environment. When a user searches for something, there are several different processes happening that the user may be unaware of. The basic flow of the search is as follows. The users' question will be a user query, search box is the search interface, then it gets sent to the technical side where the search engine with its technology such as "indexing, spidering" [7], will go through the content of the current information environment. After retrieving information, the system will display.

So far, we've focused on concepts and components of IA. Now we're going to shift the gears and explore the process and methods for creating IA in an integration with enterprise architecture. The following subsection provide the process, techniques and methods required to construct IA from the broader perspective of an enterprise wide and service oriented architecture.

2.3 Enterprise Architecture

2.3.1 Architecture Definition

Architecture has many definitions, including those specifically for enterprise- or software architecture. For this research, a broader definition of architecture shall be delivered. This definition may not solely emphasis on enterprise or systems architecture, but confront architecture holistically. According to ISO/IEC/IEEE FDIS 42010:2011: Architecture refers to the fundamental elements of a system and how they relate to comprise a perspective of a system in its context [21]. The main goal is managing the system's growing complexity and allows for support in the maintenance thereof [22]. In short, this definition can be interpreted as a holistic perspective of a system in its context. Some specific definitions exist regarding enterprise- or software architecture, e.g.: a set of design artefacts, or descriptive representations that are relevant for describing an object that can be produced to requirements as well as maintained over the period of its useful life by Zachman (1987) or the software architecture of a system is the set of structures needed to reason about the system, which comprise software elements, relations among them, and properties of both.

As one need an architecture for designing a building, architecture is needed to create and develop an enterprise system. Similarly, an overview of an organization, its business processes, their technical infrastructure, the people, the information streams, application landscape and their interdependencies

need to be defined. With regards to software, interrelated software elements and functions have to be defined [23].

Architecture Development Process

Architecture is should always be perceived as a work in progress not as a finished product. Architecture is a process, an important player in the architecture process is the stakeholder [24]. A stakeholder is, according to the ISO/IEC/IEEE standard (2011), a role that has some stake in concerns to a system [21]. This creates the need for a holistic perspective of a system that needs to be presented toward roles with various backgrounds.

2.4 Architecture Frameworks

We have previously established that the key goal of architecture is to manage the growing complexities of systems. Architecture Frameworks provide architects with guidance on how to develop architectures [24]. Considering the process of architecture design is complex and intricate, frameworks offer an overview of elements that an architecture should contain and instructions on how to create these elements. For simplicity, a brief analysis of the architecture frameworks is presented and summarized at the end of this section in Table 2.1 rationale in selection of Architecture Frameworks.

This subsection targets to identify what industry standard frameworks and approaches exist to support design at the same time as also checking drawbacks of design rational support in the frameworks. 4 frameworks have been selected, discussed and examined. The selection criteria of these frameworks are frequency of usage, reference count and industry popularity. The selection process is in accordance with referenced books and research papers.

Zachman Framework (ZF)

The Zachman Framework is an Enterprise Architecture framework which serves as a fundamental structure for viewing an enterprise system from a number of different perspectives [25]. Its key goal is to provide a two-dimensional schema that guides the organization of an enterprise system. The framework offers a comprehensive list on which elements to address when defining an enterprise system. An artefact designed using Zachman should address a key element in the system on a particular issue (how, what, who).

The why in the Zachman framework represents the motivation or reasoning for a specific element of the architecture. For example, a planner would want business goals or a strategy in order to define the

motivation and reasoning behind designing a system. The Zachman Framework does not inherently provide instructions on what, why and how to do so.

The Open Group Architecture Framework (TOGAF)

The Open Group Architecture Framework (TOGAF) is a high-level framework and method that provides an approach to the development and management of an architecture [24]. Its key goal is to provide a method by which enterprise architects can produce and maintain a system architecture.

TOGAF consists of four main components:

- The Architecture Capability Framework: the capability framework addresses the required capabilities (processes, skills, roles etc.) in order to implement and maintain a system architecture.
- The Architecture Development Method (ADM): ADM provides a concrete, iterative method and approach on how to develop the system architecture. ADM is considered to be the core of TOGAF.
- The Architecture Content Framework: the content framework consists of four interrelated specialization domains. These are the business-, application-, data- and technical architecture. These domains together form the overall enterprise architecture composition.
- The Enterprise Continuum: the enterprise continuum consists of the architecture- and solution continuum and provides a way of classifying system architectures and illustrate how architecture are developed through various reference models.

The Architecture Development Method (ADM) is the most well-known element of TOGAF and provides architects with a stepwise approach how to develop an architecture. See Figure 2.1 TOGAF ADM version 9.1 [26].

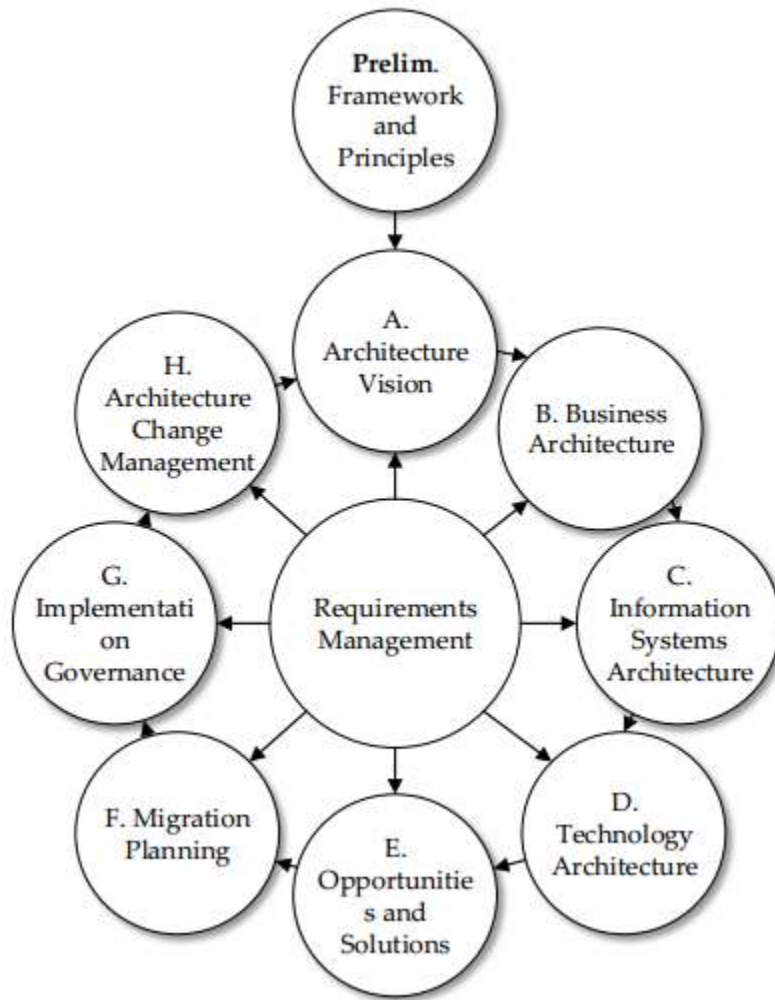


Figure 2.1: TOGAF ADM Version 9.1 (The Open Group, 2011)

TOGAF provides the architect with comprehensive process from start to finish. However, TOGAF does not provide guidance on deciding how broad the scope should be or how specific the level of detail should be [24]. TOGAF is intended as a generic method, to be used in as many situations as possible. According to the architecture principles book published by The Open Group, the documentation of design rationale is recommended. However, TOGAF itself does not provide clear instructions on how to do so.

IEEE Std 1471 Conceptual Framework

The IEEE standard 1471 is an IEEE best practice for the architectural description of system architectures [27]. It focuses mostly on software intensive systems, and provides a theoretical base for the definition, analysis and description of system architectures [24]. Its main goal is to provide a standard in terms of concepts, definitions and their relationships [27]. The 1471 model does explicitly

mention a rationale is to be provided when defining the architectural description, however it does not provide a means or offer guidance on how to go about doing so.

Department of Defense Architecture Framework (DoDAF)

The Department of Defense Architecture Framework (DoDAF) is another example of an architecture framework developed for and by the US federal government [28]. The framework provides guidance on how to address various stakeholder concerns through multiple viewpoints. Its main goal is to combat the complexity of large enterprise systems by creating a partitioned overview of the whole system from various stakeholder perspectives. The different viewpoints offer detailed specifics in order to address concerns from multiple different domains. The DoDAF framework is designed to form a holistic system view for large and intricate systems, with an emphasis on its context and how the different perspectives relate. The accompanying documentation provided by the DoD does mention the writing of an Architectural Description (AD) which should include design rationale. However, instructions on how to do so are not present.

Architecture Framework Selection

For simplicity, the analysis of the architecture frameworks analyzed are summarized in Table 2.1. This table features each architecture framework and marks them with regards to what extent it supports design reasoning. The rows represent the individual architecture frameworks whilst the columns represent the extent to which design reasoning or -rationale is supported. The requires facts are obtained by analyzing the accompanying specification and documentation of the frameworks.

Architecture Framework	Guidance / Description	Dependency	Design Reasoning	Community Support
Zachman	Partially	Partially	No	Yes
TOGAF	Yes	No	Yes	Yes
IEEE	Partially	Yes	Yes	Partially
DoDAF	Partially	Yes	Yes	Partially

Table 2.1 Reasoning/criteria for selecting the Framework

Therefore, based on table 2.1 selection criteria TOGAF is the front runner architecture framework that supports designing, evaluate, and build the right architecture for a particular business or domains with

more guidance description less dependency with a more refined design reasoning and higher support, which in turn makes it ideal framework to for us to use it in this research.

Because the objective and scope of this research is to design a generic IA for e-Commerce Logistics we will concentrate on the following three TOGAF ADM areas that helps us to design the right Architecture for the objectives:

- Architecture vision
- Business Architecture
- Information Systems Architecture

2.5 Electronic Commerce Enterprise Architecture

The “Information Revolution” has been going on well before the creation of the Internet. It has inspired lofty rhetoric about how it will change the way we live and conduct business. It has also created several new concepts and terms. The purpose of this section is to define and clarify the basic terms and constructs used in this study.

2.5.1 Electronic Commerce

Network Technology, Electronic Commerce and its Evolution and Electronic Marketplaces

Though the focus of this study is constructing IA for e-Commerce logistics industry in Ethiopia, it is helpful to define the technology that makes full implementation of e-Commerce possible. The network technology has been here for a relatively long period of time. The telephone and the fax have been around a long time, and their effects are well understood. More relevant to e-Commerce are the newer technologies that link computers together. There are two major types of computer networks that are used for e-Commerce; Electronic Data Interchange (EDI) and the Internet [29]. EDI systems are proprietary networks that enable firms to send data between remote establishments or to link with other firms and conduct business transactions. EDI predates the Internet. One advantage of an EDI is that it is private and the data transmitted through it is secure from the public. EDI systems tend to be more expensive than the costs of just connecting to the Internet [29]. While EDI networks are private, the Internet is an electronic network open to the general public. Any firm or individual with the right equipment may access it. The Internet can be used for transactions between firms as well as transactions between firms and individuals. Another network technology, “extranet”, is a hybrid of

EDI and the Internet. An extranet uses the Internet to transfer information, but encodes the information to maintain privacy. The rapid growth of the Internet has given rise to the concept of e-commerce. Popularly, e-Commerce is thought of as conducting business on the Internet [29]. For these reasons Electronic Commerce is the process of buying, selling, transferring, or exchanging products, services, and/or information through the use of internet and the World Wide Web (in short, the web) to enhance business activity [30].

E-marketplace

E-marketplace is an online business transaction platform for buyers and sellers [31]. It is an online market, usually B2B, in which all buyers and sellers exchange goods or services [30]. They stated main three functions for e-marketplaces:

- Matching buyers and sellers.
- Facilitating the exchange of information, goods, services, and payments associated with market transactions.
- Providing an institutional infrastructure, such as legal and regulatory framework, that enables the efficient functioning of the market.

We are witnessing an increase in the number and functionality of information systems that cross organizational boundaries, such as systems linking one or more firms to their customers and/or suppliers. The term Inter-organizational Information Systems (IOS), is first introduced by [32], is now widely used to characterize these systems. An electronic marketplace (or electronic market system) is an inter-organizational information system that allows the participating buyers and sellers to exchange information about prices and product offerings. The firm operating the system is referred to as the intermediary, which may be a market participant a buyer or a seller, an independent third party or a multi-firm consortium.

Real-world electronic market systems typically offer valuable features beyond the posting of prices and product characteristics. For example, airline reservation systems allow ticketing and billing in addition to their market-related functionality. In this article the focus is primarily on the role of electronic marketplaces in bringing together a supplier and a customer; it is recognized, however, that once this relationship has been established, through an electronic market system or by any other means,

inter-organizational information systems can play an important role in supporting the resulting bilateral relationship [33].

2.5.2 E-Commerce Order Fulfillment Approaches

Receiving The Order and Managing the Transaction

A. Electronic Payment

There was a belief a few years ago that online customers would be extremely reluctant to use credit cards when shopping on the web [30]. It was assumed that special forms of electronic or digital cash were necessary for B2C electronic commerce to survive and thrive. This turned out to be not true as, today the overwhelming majority of Internet purchases are made credit cards, not with digital cash.

Payment cards: A payment card is a card that contains information that can be used for payment purposes. There are three types of payment cards, these are [30]: *Credit cards, Charge cards Debit cards*. Where A credit card provides the holder with credit to make purchases up to a limit fixed by the card issuer; while, charge card is supposed to be paid in full upon receipt of the monthly statement. Technically the holder of a charge card receives a loan for 30 to 45 days equal to the balance of their statement and with a debit card, the money for a purchased item comes directly out of the holder's checking account (called a demand-deposit account).

Direct payment: When using this type of payment, the retailer connects the customer directly to his/her Internet bank. This method requires that the customer has an Internet bank account.

Offline payment methods

There are two different offline payment methods in B2C e-commerce and they are all well known by customers which makes them easy to use. These are [30].

- **Bill:** The customer gets a bill when the goods are delivered. The buyer is charged extra for using this type of payment.
- **Cash on delivery:** this is the most common payment method in Sweden when purchasing on the Internet. The customer does not provide any sensitive information and thus is very secure. From a company perspective there is a big risk as the seller cannot be sure that the customer will or can pay for the purchased items.

B. Security

For transactions on the Internet the security aspect is very important. “B2C e-commerce has undergone rapid growth, particularly through the use of the Internet, business and consumer fears and concerns about the risks, both have inhibited its growth real and perceived, of doing business electronically”, [34]. To achieve better security for transactions, companies can use an authentication system. Such system identifies legitimate parties to a transaction, determines the actions they are allowed to perform, and limits their actions to only those that are necessary to initiate and complete the transaction the authentication can be done by distinguishing characteristics (passwords), something one has (tokens) or something one is (biometric systems), [30].

C. Warehouse and Transport Management (Logistics Management)

In-house or outsource

Whether a company chooses to host its own fulfillment center or outsource its fulfillment services, an enterprise that adopts an e-business model will have to make changes in its distribution efforts, [35]. Fulfillment centers, distribution centers and warehouses should implement state-of-the-art systems that allow them to keep pace with the e-business model. The principle is to do it right, do not do it “bass-awkward.” The first action that must be done is to upgrade the database management systems and put in state-of-the-art tracking and bar-code systems. When those improvements are operating as needed, the next task is to build Web-enabled systems. If the e-business is still in the initial growth period with good prospects of huge growth spurt within the next 6 months, it is convenient to outsource. However, if the growth is expected to increase steadily over time and the in-house staff is still sufficiently managing the fulfillment process, then it is more convenient build a proper in-house fulfillment infrastructure that can scale as the order volume increases, [35].

For pure-plays, the correct move is to parting with an independent FSP (fulfillment service provider) to store product and provide fulfillment services. Click-and-mortars are courting fulfillment providers as well, [35]. A click-and-mortar’s back end legacy systems and warehouse systems are required to be prepared for the impact that a Web site will bring. Specialized systems, build out of a fulfillment center within existing warehouses (or new facility), are needed to provide the facilities, equipment and manpower necessary to service all these tasks. The majority of e-businesses, once the decision has been made to move online, speed to market becomes a serious issue. If the online order volume is low

and inventory requirements are not burdensome, then it is probably better to handle fulfillment in-house until the volume justifies a more formal order-fulfillment procedure, [35].

Fulfillment houses, operating as 3PLs, were developed to use expertise in progress management tracking and warehousing for both manufacturers and retailers, [36]. Retailers are using fulfillment services to maintain a large inventory, reduce inventory costs, and drop-ship orders directly to customers [35].

Distribution options in e-commerce

Very important business decision that organizations need to take in account is the determination and implementation of the processes necessary to deliver the ordered products to the customer quickly and cost effectively [37]. Companies can gain competitive advantages by making the right e-fulfillment decisions in e-Commerce, which is characterized by tailored direct orders. Handling the details of customer direct orders is the area in which battles for domination in the e-commerce market will be won or lost [37].

Distribution options that companies can utilize include the following [37].

Distribute from an existing distribution center: Products are available at one or a small number of warehouse locations and assets. Some organizations may use this approach to ship to its online store customers as well as to fulfill its retail store replenishment orders. This can result in operational problems because the distribution center not only delivers to retail stores but also to a new set of customers with different requirements, [37].

Acquire a dedicated e-fulfillment center: This model offers several advantages. A separate facility focusing on e-commerce shipments can incorporate the best processes for this type of orders. These specialized processes can yield the delivery costs and times required for one-item shipments. This model requires significant up-front investment in the physical facilities and information technology required. Thus organizations must have in mind that there may be net losses in the nearest time schedule. Another disadvantage of a dedicated facility is that low or unpredictable sales may lead to high inventory carrying costs at the same time that the flexibility to meet variable demand is decreased because of the facility infrastructure, [37].

Use a third-party e-fulfillment service provider: By using this model organization have to lease the skills and facilities needed for fulfillment. Fulfillment processes outsourcing can be thought of as virtual warehouses. This model can have advantages as it uses existing specialists in these processes, thus making use of existing information systems and proven technology. This method also better accommodates swings in demand while treating order fulfillment as a variable cost. One disadvantage of the approach is that few existing companies can accommodate a wide range of products. Also, multiple fulfillment centers may be required to reach a number of customers in a minimum amount of service time. Perhaps, most important, the approach requires ceding control of a core business process, [37].

Ship direct from the supplier to the customer: An alternative is to act as a sales intermediary and have products shipped directly from the manufacturer's suppliers. The process requires combining the sale of products with the fulfillment processes through a distributor and results in negotiation power shifting away from the company to the supplier. This model is the least expensive for the consumer. For a company to be successful with this model value chain relationship must be equitable and the technology to synchronize deliveries from many points must be in place. Advantages include low inventory and facility costs, flexibility, and low shipping cost to the customer. Disadvantages include integrating Web-front-end operations with procurement and order-fulfillment systems and ensuring service quality, [37].

Pick and ship from existing retail stores: For a company in the retail business with existing stores, another possible model is to pick and ship from the existing retail stores. This approach, sometimes termed clicks and bricks or clicks and mortar is used by many small retail boutiques. The company may have a street front retail store and have added online sales for growth potential. In these companies, an order is placed electronically via the Web, but the order is filled by people who pick stock from regular retail shelves for delivery to the customer. The main advantage comes from avoiding additional facilities and keeping lower inventories. However, this model, although appropriate low volume specialty sales, may be difficult in the high-volume world of large-scale retailers. Adding direct shipping capability at every location and ensuring picking capability and product availability may be cost prohibitive. Also, picking from existing stores may disrupt the normal operations of the retail store. Another difficulty is the required technology integration across many fulfillment points, [37].

Ship to a local store or central pickup point: A manufacturer with no local stores could ship products to an affiliated for local delivery or to a designated customer pickup point. Advantages include keeping local dealers in business and providing the local store with partial revenue along with using traditional methods to ship to its local stores. Disadvantages of this method include extra shipping costs for small quantities, exchanging revenue with the local store, and assuming responsibility for product returns, [37].

D. Customer Services

E-responses to customer queries, order acknowledgement, delivery and payment information via e-mails or automated responses are greatly appreciated by customers , [38]. The character of e-responses also helps strengthen the relationship between suppliers and customers, and makes up for the personal response that prevails in the traditional shopping arena. Singhs study showed that customer relationships can be strengthen through the use of e-mail order acknowledgement. E-mail responses were widely used by organizations to acknowledge receipt of orders, payment and delivery of information. “An e-response to say thank you, an apology for any delays, tailored e-mails from analysis of shopper profile to provide online shopping guidance and to announce the release of new products and specials supported online shoppers. Customer responses confirmed the value of e-responses in the B2C e-space.” [38].

According to Singhs [38], secure payment systems, updated product delivery information and quick responses to customer queries are some of the services that are important to win online customers. Customers in e-Commerce highly appreciate e-tailers that provide services like personalized and accurate customer information with better tracking, delivery and payment details. [38], presents five E-service tools that are used to offer customer services online:

- **Personalized Web pages.** Many companies are allowing customers to create their own Web pages. These pages can be used to record customer purchases and preferences. Also, customized information such as product details, add-on purchases and warranty information can be delivered on these Web pages. The information is easily disseminated when the customer logs on to the electronic commerce Web site. Not only can the customer pull information as needed, information analyzed to match customer interests is pushed to him/her. The customer databases record purchase queries, problems and requests. This information can be analyzed and utilized to improve customer service. Personalization is important for Internet marketing, and specially for managing customer relationship to increase customer loyalty.

Involving customers in the personalization process makes them feel more comfortable with, and more in control of, their Web site visits [38].

- **FAQs.** Frequently asked questions (FAQ) are the simplest and least expensive tools to deal with repetitive customer questions. FAQs are developed to provide answers to common questions about products, services or their applications. Self-service FAQ software and Web software assist companies in providing helpful answers to common customer questions. Online customers use this tool by themselves (on the Web), which makes delivery cost minimal, freeing up time for customer service representatives to handle questions that cannot be answered without human interaction. FAQs are e-services on Web sites presented via links [38].
- **A chat room.** Online text chatting provides real time communication between customers and suppliers. Those who are not able to get an answer online have the option to contact a service representative immediately if the company offers text chatting cited by [38]. Chat rooms also attract new customers, increase customer loyalty and enhance relationships. For example, a virtual vineyard's chat room allows a customer to discuss issues with both company experts and wine lovers. This is an e-service that is widely used to support e-communities. E-mail addresses of loyal customers can be provided to prospective customers to enable them to seek the opinions of other users of the product on sale [38].
- **E-mail and automated response.** The most popular tool for customer service is e-mail. Inexpensive and fast, e-mail is used to disseminate information and fast, e-mail is used to disseminate information (e.g. catalogues), However, the greatest advantage of e-mail as a communication tool is providing quick and accurate information to all customer queries. E-mails can include forms, reviews, referrals and new contacts sent to customers as attached files [38].
- **Help desks and call centers.** To find answers to electronic commerce queries customers can communicate by telephone, fax or e-mail. However, because this communication was done initially by phone these remote help desks are referred to as call centers. For electronic commerce new technology products are extending the functionality of the conventional call center to e-mail and to Web interaction, integrating these into one product [38].

E. Reverse Logistics Management

Once an order has been picked and shipped, the e-fulfillment operation's job is far from over, [39]. E-fulfillment operations must be ready to handle another post-delivery task-processing product returns.

In offline commerce, an unsatisfied customer has the ability to bring back the product to the place where he or she bought the item. But unhappy online shoppers send their merchandise back to distribution centers, forcing companies focused on pushing product out quickly to shift gears and take product back. Returns have proved to be one of the most troubling aspects of e-distribution. Some pure-plays have solved this problem by establishing a centralized return center, [39].

The approach that blends using the Internet with in-store (and sometimes mail order) systems for handling pick-ups and returns may be the best method at present for providing customer satisfaction. Strong measures can be taken to assure quality by inspection of shipments before they are released, [40]. This approach does promise lower probabilities of returns. Also, the quality of packing might be a vital factor in reducing damaged products that decrease customer loyalty, [40]. [30], claims that allowing for the return of unwanted merchandise and providing for product exchanges are necessary to maintain customers' trust and loyalty. The Boson Consulting Group found that the "absence of good return mechanism" was the number two reason shoppers cited for refusing to buy on the Web frequently [30]. A good return policy is a must in e-Commerce, [36]. Managing returns is a major logistics problem for e-Commerce actors. Several options for handling returns exist and these are:

- *Return the item to the place where it was purchased.* This is easy to do with a purchase from a brick-and-mortar store, but not a virtual one. To return a product to a virtual store a customer needs to get authorization, pack everything up, pay to ship it back, insure it, and wait up two billing cycles for a credit to show up on their statement.
- *Separate the logistics of returns from the logistics of delivery.* In this option, returns are shipped to an independent returns unit and are handled separately.
- *Completely outsource returns.* Several outsourcers provide logistics services for returns. The services deal not only with delivery and returns, but also with the entire logistics process.
- *Allow the customer to physically drop the returned item at a collection station.* Offer customers locations (such as convenience store or at Mailboxes Etc.) where they can drop off returns.

2.5.3 Traditional Versus E-Commerce Logistics

e-Commerce logistics, also called e-logistics, is the logistics of e-Commerce systems. The major difference between e-Commerce logistics and traditional logistics is that the latter deals with movement of large amounts of materials to a few destinations (e.g. to retail stores), e-Commerce logistics on the other hand typically are small parcels sent to many customers' homes [30]. However,

there are more characteristics separating traditional logistics and e-logistics, these are shown in Table 2.3 below.

Characteristic	Traditional Logistics	e-Commerce Logistics
Type Bulk,	large volume	Small, parcel
Destinations	Few, concentrated in one area	Large number, highly dispersed
Demand type	Push	Pull
Value of shipment	Very large, usually more than 1,000	Very small, frequently less than \$100
Nature of demand	Stable, consistent	Seasonal (holiday season), fragmented
Customers	Business partners (in B2B), usually regular (B2C), not many	Usually unknown B2C, many
Inventory order flow	Usually unidirectional	Usually bidirectional
Accountability	One link	Through the entire supply chain
Transporter	Frequently the company, sometimes outsourced	Usually outsourced, sometimes the company
Warehouse	Common	Only very large shippers (e.g., amazon.com) or moving companies (UPS, FedEx)

Table 2.2 How e-logistics differs from traditional logistics (Turban et al., 2015)

Tran also stated characteristics for separating e- logistics from traditional logistics as follows [41],

- The customer base is broad.
- Customer expects competitive price, quality products and fastest delivery.
- Higher number of order transactions.
- Order sizes tend to be small, one or just a few stock-keeping units (SKUs) per order.
- High probability of significant fluctuation in customer demand.
- Seasonality in customer demand.
- The broad customer base combined with high probability of demand fluctuation makes seasonality factor in demand forecast more unpredictable.
- The broad customer base makes it harder for e-retailers to ship product quickly.
- Since most e-customers do not see and feel their products before purchasing, the probability that the customer will return a product becomes higher than the traditional purchasing process.
- Higher numbers of small size vehicles and/or third party logistic(3PL) partners are required to support delivery of small order sizes to a demographically dispersed customer base.
- E-retailers experience more peaks and valleys than traditional businesses.

2.5.4 Relation Between E-Commerce and Logistics Management

Effect of e-marketplace and E-Commerce on Logistics management

The effect of e-Commerce on Logistics is special and it may practically facilitate any inter-organizational communications and reduce time intervals with further cooperation. E-Commerce is a chance for an organization which intends to develop its markets throughout the world. When a company specifies its products and services, it is possible to expect an increase in demands. This is the responsibility of supply chain management system to reply all increasing demands in an effective form [42]. Also, logistics management should be on-line enough to reply all special necessities of customers. This is possible through programming systems and/or virtual agencies. E-Commerce will extend further communications and network opportunities.

2.6 Operational Definition

This section consists of operational definitions on the major concepts and expressions regarding technological and technical aspects that are used in this research and adapted for designing the proposed IA, so as to give a brief overview and definitions in relation to the research context.

2.6.1 Generic Information Systems

The notion of Generic information systems is well documented in existing literature. Some software packages are designed in a way that accommodates a collection of requirements, rather than the specific needs of individual users and organizations [43]. These generic information systems are developed independently of individual usage patterns and organizational routines. Rather, they rely on serving templates to capture larger groups of users at once. While the core system is created and maintained as a stable half-product, organizations wanting to implement the software must complete the package themselves, tailoring the software to their needs. Exposing an open metadata model and a flexible user interface, the information architecture has accumulated a large set of generic capabilities through processes of open generification [44].

Instead of focusing on a certain domain, customer and sole projects, software ecosystems are designed in a way that enables the software to travel across a vast number of environments and configurations, reusing a various number of features or modules. The result is, in contrast to a tailored solution, “rather a half product that has to be configured and customized to a specific context” [45]. A general software package would attempt to capture a broad applicability, rather than being limited to a specific context.

A generic solution would attempt the same thing, but by under-design rather than an exhaustive, “all-purpose” solution [46].

Generality and Specificity

Fischer illustrates the trade-off between a general and specific software solution. On one hand, general, “all-purpose” software is able to achieve a lot of tasks, emphasizing objective rather than subjective computability [47]. Yet, this flexibility often makes the software difficult to use in practice. As described by computer scientist Alan Perlis, “Beware of the Turing Tar Pit, in which everything is possible, but nothing of interest is easy”. On the other hand, specific software can be great at a certain task, but useless outside the narrow scope for which it was designed.

A generic solution does not try to capture all, possible use-cases, rather, it provides a “shared toolbox” [48], that is built for configuration, and the product is finished during the implementation phase. Fischer et al. writes further about these two, distinct phases, dubbed design time and use time [46]. The genericity of a “toolbox” is also a matter of discussion, which can be illustrated with an anecdote from the creation of DHIS project and of the recent cases from Ethiopian E-Services project.

Generative Design

Avital and Te’Eni introduces the concept of generative design to information systems research. They argue that system design should focus on more than “measures of task efficiency, accuracy or productivity” [49]. Instead, we should consider human’s creativity, which may reveal new opportunities and “uncharted frontiers”. An information system with generative capabilities, the authors argue, should be evocative, adaptive and open-ended. For instance, the system could supply multiple abstraction levels and tools for communication (evocative); enable customization as per user’s preference and artificial intelligence-powered automation tools (adaptive); and they could enable peer-production and include a modular architecture (open-ended). The premise of open generification is not about managing a community of users attached to generic software; rather, it is a design strategy for developing software packages that serves diverse user needs [44].

This research suggests that some form of innovation, backed by sociotechnical generativity and forms of generative design can further leverage the flexible properties of a generic information architecture and enable the adaptation to other domains. Especially in developing countries, where resources are scarce, it is crucial to form generative relationships between the various actors, each driven by different

incentives, so that the generative technology is successfully leveraged to the other domain. In such settings, accessibility to the required technology and ease of mastery is especially relevant. In this regard, end-user development can be used to support these properties.

2.6.2 Benchmark Designs for the Proposed Information Architecture

A. District Health Information System

“DHIS2 is a free and open source software platform for the collection, management, analysis, and use of health data” [50]. Rather than a sole software product, DHIS2 is part of a larger software ecosystem. While the software core is developed and maintained by the University of Oslo (UIO), the District Health Information System (DHIS) platform is the result of a joined effort between multiple university groups, NGOs, health authorities and other actors. This network of actors is known as the Health Information Systems Programme (HISP). As of 2018, the DHIS is used in over 60 countries, either as part of a pilot project, integrated in other systems or as the country’s national HMIS. The project is available and evolving as several modules on GitHub², which means anyone can inspect the open source code. Also, anyone can fork³ the software, or download and modify the code to their own needs.

The main feature of DHIS is how data can be aggregated and used in decision-making. Once the metadata is configured to reflect the real world, users can begin entering data into the system as shown in Figure 2.2.

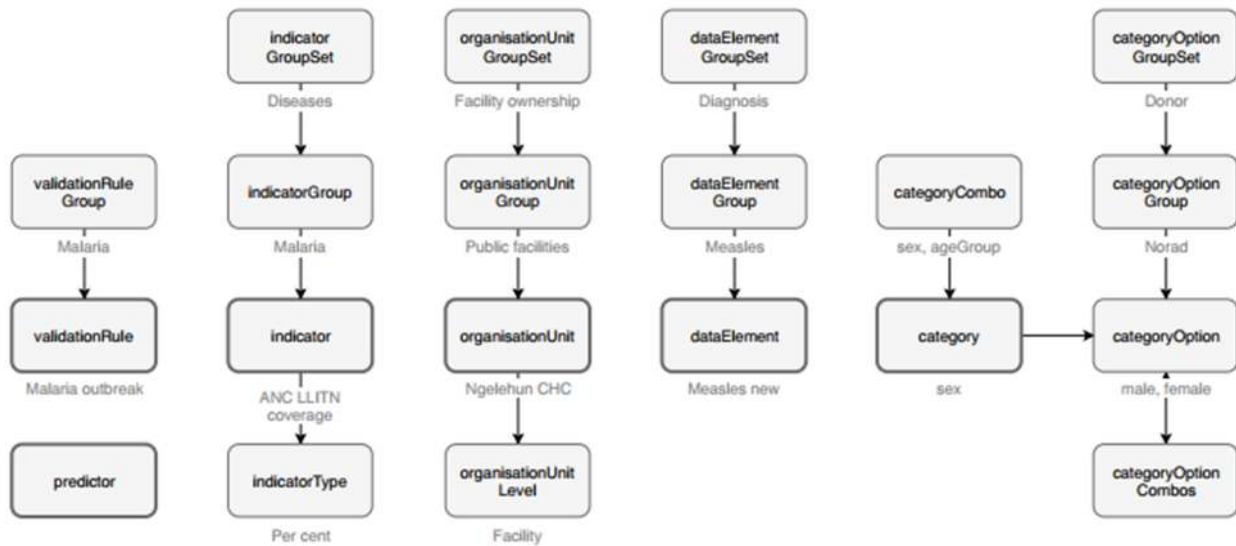


Figure 2.2: Figure 2.4: Essential metadata components in DHIS2 (thick border) with their closest relations. The brackets show an example of what such an element may represent.

B. The Ethiopian Electronic Service Platform

The Ethiopian transactional e-Service system was designed and developed to provide a common platform and generic tools for the enablement of online transactional services, and to easily modify them whenever business processes are changed without the need of complex programming tasks. The system was also designed to be easily scaled up by adding new organizations and services into the platform. Using the system, government organizations are expected to render electronic public services to citizens, non-citizens, businesses, and governmental and non-governmental organizations [51].

The eService system comprises of the following sub-systems as further illustrated in Figure 2.3 [51].

- Backend National Administration Module
- Backend Organizational Administration Module
- Backend Caseworker Module
- Frontend public portal (i.e. www.eservices.gov.et)
- Integration Services & libraries

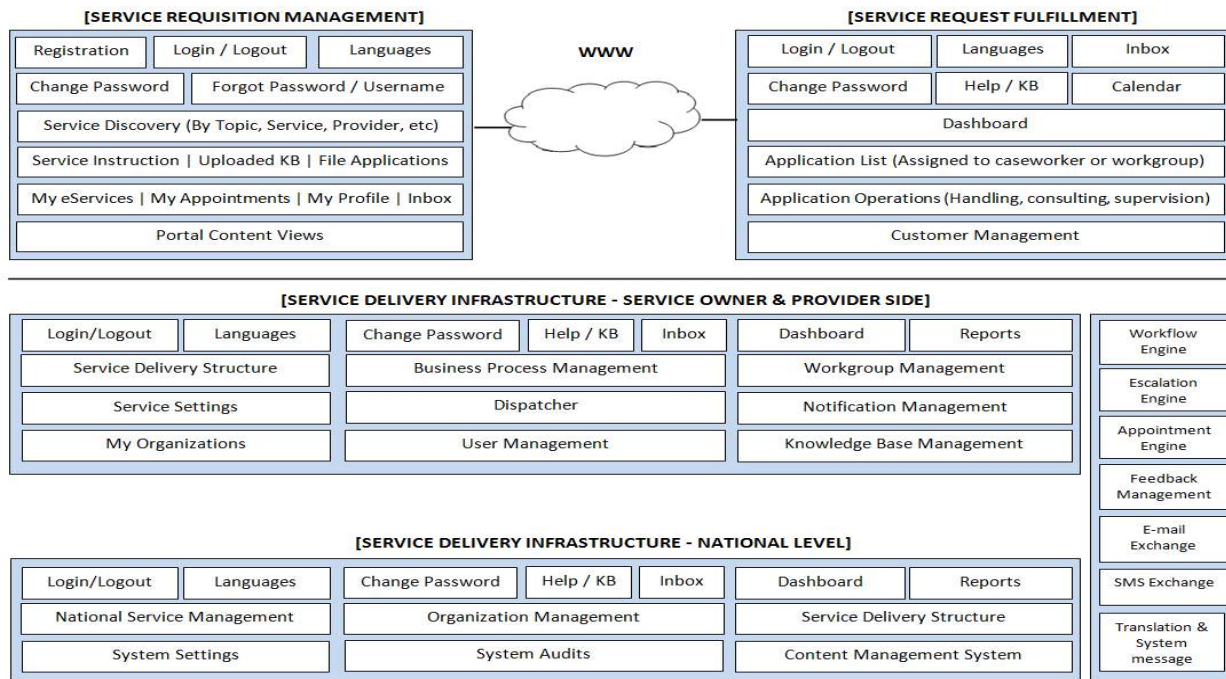


Figure 2.3 Ethiopian Electronic Service System Architecture

2.7 Related works

Discussion of IT design that works for multiple contexts is not new; it has been widely reported in the literature of large-scale global systems. However, a recent theoretical construct, the concept of generification (Pollock et al., 2007), argues for more emphasis on global level practices.

The premise of generification is to divert the attention away from local practices and organizational adaptations over to the origins and characteristics of globally generic software packages. It is based on observations of practices of global level software vendors and their strategies of producing generic software package that embodies characteristics common across a range of customers [52]. In generification work, vendors have a central role, as they are the ones responsible to make the technology work in a particular context as well as take it further globally to multiple other contexts [53]. Technology working in a particular context is fixed in time and space [54]. Transporting it to another context requires a complex work of disentanglement [55]. This calls for ‘a process by which software packages are successively

In last decade or so studies in integrating logistics practices and e-Commerce have gained momentum. This research aims to propose a MAS information architecture for creating an interoperable e-Commerce logistics to support this claim the research presents several related works either form the e-logistics or neighboring fields that can support the research objectives. Below are some of related

works of e-logistics or e-Commerce logistics. Online network shopping is a popular logistical service with the development of internet. Accordingly, as we are in the era of big data, online shopping has gradually become the mainstream of modern life [56]. To this end logistics and delivery has become one of the critical success factor for the fulfillment of e-Commerce services, as Bask and others noted, the increasing importance of consumer delivery capabilities for LSPs has been reflected in the development of cost-efficient delivery networks that can reach consumers [57]. They reckon that many research issues that have not been resolved yet: Future retail strategy related logistics research issues include the final stages of the delivery chain to consumers, i.e., the last mile challenge, the second issue is to acknowledge that traditional logistics channels mostly operate in the b-to-b mode, whereas in e-commerce logistics channels the focus shifts to b-to-c distribution, resulting in different logistics strategies and capabilities. As a result, they found out that Much of the e-commerce related research has focused on digital channels. However, as many solutions seem in practice to combine brick-and-mortar with electronic channels, more attention should be paid to different combinations of traditional and novel channels. Moreover, logistics research has traditionally been b-to-b biased. However, the rise of the b-to-c and c-to-c trade calls for studies on the services, structures and processes needed for efficient logistics solutions. And they suggest that among many other one research gap could be, adoption of electronic channels necessarily involves the use of applications by both service providers and customers, which in this research try to accomplish.

The issue of integrating different 3PL databases and datasets is being attempted by several researchers for instance Yan et. al, have proposed a 4PLIS based on web service and middleware architecture which tried to integrate several systems, by using Web Service and middleware techniques, a heterogeneous data integration platform has been built up [58]. The integrated platform primarily consists of the core Web Service of databases, UDDI registration center and middleware. It uses the technology based on Web Service heterogeneous database integrated middleware to achieve data integration and sharing related to 4PL [58]. The limitation to their research is first when there is no automation in a particular 3PL to integrate in the first place, the second limitation observed is the architecture they proposed requires of too many activities to construct a uniform dataset which are generated from several 3PL systems, as a result could affect performance, data accuracy through data redundancy.

According to The Logistic Institute Asia Pacific, with the multiple models and operational complexities, what is needed to ensure smooth and optimized flow is ultimately the deployment of

good enough (for e-commerce logistics service level expectations), and in some cases, best in class, technology solutions [59].

- Rethinking Planning & Orchestration
 - Control Tower & exception management
 - Integration across e-Commerce ecosystem, including marketplaces, LSPs, suppliers, and even retailers (for O2O operations)
 - Orchestration of all transportation activities, including decision support around fulfilment from warehouse or drop-ship fulfilment (from Consumer Goods supplier), and by which LSP/provider
- Rethinking Transportation Management System (TMS)
 - Ability to organize and track shipments across modes and across LSPs
 - Seamless interface with appropriate heterogeneous (SCM/ERP) systems across the ecosystem
 - Real-time online order, dispatch/transportation and POD status,
 - Online alerts for critical information via text or mobile
- Rethinking Warehouse Management System (WMS)
 - Rethinking dock management to optimize flow of goods in/out of warehouse
 - Rethinking load optimization/management for optimal productivity gains for loading/unloading
 - Warehouse design and location optimization is important to optimize productivity /movements within the warehouse
 - Explore the use of drones for inventory counting and visual analytics to optimize productivity within the warehouse, especially with the impact of the high throughput and small item type environment.

In this paper, we build on and extend these insights. The objective is to produce a generic IA that serves e-Commerce Logistics needs in different contexts. We did this through a study of other research projects.

2.7.1 Summary of Related Works

Author, Title and Year	Objective	Methodology	Key Findings
Anu Bask, Mervi Lipponen, Markku Tinnilä, E-Commerce Logistics: A Literature Research Review and Topics for Future Research 2012	The objective of this study is to provide a systematic literature review of e-commerce logistics.	Literature Review	As a general observation, it seems that not as many e-commerce logistics service solutions have been presented and researched as one would expect. This suggests that more work could be done in developing and researching cost-efficient but still flexible and responsive logistics solutions that are optimal for Internet based sales. Especially now there seems to be a need for innovative logistics solutions that are developed to meet the requirements of e-commerce. Another important future research area in e-commerce logistics will be the new service implementation opportunities enabled by technology support for e-commerce. Which provide a conceptual backing to this research.
Nils Meyer-Larsen, Jannicke Baalsrud Hauge, Rainer Müller, Kahina Hamadache, Georgia Aifadopoulou, Margherita Forcolin, Violeta Roso, George Tsoukos and Hans Westerheim Accelerating the Innovation Uptake in Logistics, 2013	Examine existing approaches of innovation uptake in logistics in Europe.	Case Study, and Literature Review	After classifying the findings in three categories i.e. Business models, Innovative practices and Innovative solutions, the research have pointed out that the innovative solutions' barriers can be divided in to three sub-categories 1. Technological barriers such as Immaturity of innovative technologies, lack of reliability and accuracy, security concerns and lack of standardization 2. Barriers related to solutions' business model such as the cost, privacy concerns, limited target group, organizational issues, lack of transferability and lack of awareness. 3. Barriers related to business Often the information channels through which information is gathered are not owned by the organization using the information. This fact raises questions about the data consistency, integrity and

			<p>liability. Specific mechanisms have to be set for securing the data and evaluating their source.</p> <ul style="list-style-type: none"> • One of the main constraints for most technology solutions is the unsolved issue of the standardization of communication technology and protocols. Before solutions are adopted by the industry on a large scale, issues of technology incompatibility and lack of standardization have to be resolved and. • The other barrier appears in solutions that they were built at first place customized for a specific organization or a specific part of the logistics sector.
<p>Wout Hofman, Simon Dalmolen Data sharing in supply and logistics networks – development and implementation of extendable, standardized platform services for the Physical Internet in an open dynamic ecosystem of organizations, 2018.</p>	<p>To proposes the construction of extendable, standardized platform services for business services that can support all types of supply and logistics chains.</p>	<p>Design Science and Literature Review</p>	<p>The research has two key findings:</p> <ul style="list-style-type: none"> • Conceptual model for interoperability in supply and logistics i.e. <ul style="list-style-type: none"> - An upper ontology - Views and extensions - Business services that is directly related with this research - Business transaction interaction pattern, which also support this research in providing a bases for a conceptual frame of reference. • Guidelines for data sharing in supply chains. <p>As a result, this research article provides conceptual foundation to this research theme.</p>
<p>Majid Mohammadi, Wout Hofman, Yao-Hua Tan, Interoperability in Logistics: An Ontology Alignment Approach, 2019</p>	<p>To reduce these development and implementation time for interoperability between any two organizations, this paper explores the application of ontology alignment</p>	<p>Ontology Alignment Evaluation</p>	<ul style="list-style-type: none"> • The first experiment was the alignment of the two ontologies representing implementation guides of open standards. • The second experiment was to align these ontologies with LogiCo. The alignment is not satisfactory. In view of the challenges encountered for alignment of implementation guides of open standards, it is safe to assume that alignment of (functional views of) database

			schemes represented as ontologies will even be more difficult.
Abyot Asalefew Gizaw, Bendik Bygstad & Petter Nielsen Open Generification, 2017.	They explore an approach that they call open generification, which extends Pollock and Williams' work in the sense that they propose a generification framework that support a global and diverse user community.	Using longitudinal case study in the health information system programme (HISP), which is long-term action research programme coordinated by the University of Oslo, which designs and implements District Health Information software version 2 (DHIS2)	Results from the study show that they indicate that: <ul style="list-style-type: none"> • First, the generification process is different. A distinguishing aspect of open generification is the qualifying term 'open' that refers to openness in actors and contents of generification. • Second, the roles of developers and users are different. Open generification allows local developers to exercise their agency and perform situated innovation. • Third, it supports user-centered innovation. While the existing generification research treats users and organizations mainly as consumers of technology, open generification considers them as a prime source of innovation.

Figure 2.3 Summary of Related Works

As shown in summary of related works above, currently in many countries e-Commerce Logistics assessments have been done, using different methods and approaches. These marks to identifies the necessities of designing issues to be overcome and also improve. Therefore, those related studies' ways of research methodology, identified gaps, and designed and proposed solutions models were used as an input for this research.

CHAPTER THREE

Research Methodology

3.1 Overview

This section contains the research methodology that is defined and adopted for this study. Due to the explorative nature of this study the Design Science (DS) Framework of [60] is used to structure the research process of this study. This research methodology focuses on developing solutions for the needs of the 'e-business' and its environment in the field of information systems (IS). Design research revolves around developing solutions in the form of artifacts. Figure 3.1 shows the application of the design science framework [61].

This research tries to deliver artifact to the needs as described in the motivation. The delivered solution will be the e-logistics Information Architecture. This artifact is validated qualitatively through semi-structured interviews. The interviews are focused on validating the correctness of the overall design of e-Commerce logistics information architecture implementation current practices and initiatives. The validated artifact and the created knowledge flows back into the environment as a framework on how to select certain e-Logistics Information Architecture in different situations.

In order to achieve a suitable solution, it is necessary that the solution is developed iteratively and is validated. Design Science Research also distinguishes a development and validation process. Developed solutions are added to the knowledge base and thus provide a basis for future research. In addition to these scientific contributions, the developed solution is also practically applicable for the operating environment into which the solution is realized.

3.2 Research Design

To ensure that the choice of design science research is the correct choice, this research looked into other research that is published as Design Science Research (DSR). This section contains the Design Science Research Methodology (DSRM) Architecture Development Method (ADM) Enterprise Information Architecture (EIA) Information and Communication Technology (ICT) Enterprise Architecture (EA) proposed by Peffers and his colleague [62]. They constructed a design science process model which takes into account features that are shared throughout literature. The design science process model is presented in Figure 3.1 The DSRM includes principles, practices and procedures required to carry out design science research, offering a nominal process model for doing

DSR, and it offers a mental model for presenting and evaluating DSR in IS. The nominal process models for design science takes into account seven different design science approaches which led to six common process elements being part of the nominal process sequence. Peffers [62], and Hevner [61], state that, besides the six process steps, the aspect of iteration also plays a major role when doing design science research. Important is to define beforehand of doing this research the entry point for this research to start the DS process with. The process makes a distinction between the following entry points [62],

1. Problem centered initiation
2. Objective centered solution
3. Design and development centered initiation
4. Client/context initiation

The design science entry point ‘problem centered initiation’ is the best fit for this design science research. The problem centered initiation entry point is applicable because of the problem being observed by researchers and businesses within the BR domain. Figure 3.1 shows the DSRM proposed by [62] and together with the activities adapted to this research.

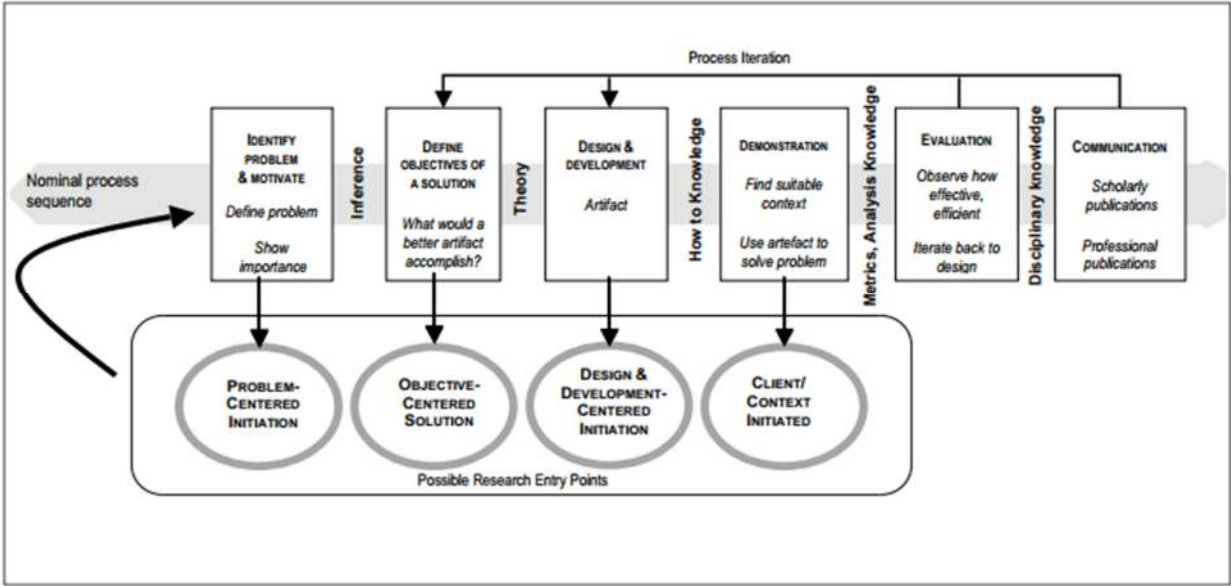


Figure 3.1 problem centered design science process model (Peffers et al 2007)

3.2.1 Problem Identification and Motivation

[63], highlight a strong need for more relevance in IS research. They argue that to date an over emphasis has been placed on rigor over relevance, often resulting in research outputs that are not prescribed in a manner that can be easily used by practitioners to address a problem or opportunity. Research must address the problems faced and the opportunities afforded by the intersection of people, organisations, and information technology, [61].

In the DS framework proposed by [61], connects the research project’s contextual environment with DS activities. This contextual environment sets out the problem space which includes the phenomena of interest i.e. the problems, opportunities, goals and tasks defining business needs of the organization as perceived by individuals and their positioning relative to existing technological architecture and capabilities. Together these set out the problem or business need that needs to be addressed. Problems or opportunities identified in the application domain (i.e. the research requirements) initiate DS research. The problem addressed, i.e. the difference between the goal state and current state of a system, needs to be relevant to the community of practitioners involved in planning, designing, managing, implementing, operating and evaluating IS and technologies. Field testing of the built artifact in the application domain based on predefined acceptance criteria determines if further iterations of this relevance cycle are needed.

Data Collection Technique Process

This subsection will focus on the construction of the e-Logistics as-is observation and the collection of the data. The semi-structured interview is constructed with a combination of existing literature from the Situational Engineering Method. The respondents were chosen on their experience and knowledge in the field. All the structured interviews were conducted in the same controlled environment and each interview had a length of 60 minutes. Questions are can be found in the complete questionnaire in Appendix III.

Interview Process and Tools Used				
N	List of Survey Tools	Methodology	Respondents selected	Time Allocated
1	Interviews Schedules for Logistics and Transport Support Service Providers	Interviews	10 respondents	90 Minutes

Table 3.1. Interviewees Distribution across their hierarchy

3.2.2 Objective of the Solution

DSR aims to create what is effective. DS is a problem solving paradigm that involves building and evaluating innovative artifacts in a rigorous manner to solve complex, real world problems, make research contributions that extend the boundaries of what is already known, and communicate the results to appropriate audiences [64]; [61]; [65]. Knowledge and understanding of the problem domain is achieved through artifact construction [61], which must have novelty and utility in the application environment [66]; [65]. Analysis of the utility and performance of the developed artifacts provide improved understanding and identification of further improvements that enable the business problem/need to be addressed more effectively. The design and the proof of its usefulness is the central component [62]. DS research in the IS field is not limited to IT artifacts in the form of computer based systems. Artifacts or solution technologies may include IS development methods, tools and techniques, IS security and risk management practices, and IS planning and management methods [67].

3.2.3 Design and Development

Artifacts are potential constructs, models, methods, or instantiations of new properties of the technical, social or informational resources, [61]. The essence of Information Systems as design science lies in the scientific evaluation of artifacts, [68]. Rigorous evaluation methods are required to demonstrate the design artifact's utility, quality and efficacy. The evaluation process helps researchers to understand the nuances in their design and contribute to the body of knowledge to facilitate learning by future researchers, [66]. Applying rigorous evaluation represents one of the key DS challenges [61]. The design and development stage will utilize the theoretical results, derived from earlier stages, to discover situations and the relationships between these concepts.

Frameworks for designing the artifact in the study

The Open Group Architecture Framework

TOGAF is a framework used to develop an EA [69]. It was developed and is currently maintained as a standard by The Open Group (TOG) [70]. TOGAF proposes a cyclic procedure for architecture development Each phase is split up in various steps that make a veritable checklist for the phase. TOGAF provides informationon documents that should go into a step and should be produced in each step. Implementing any capability within an organization would require the design of the four domain

architectures: Business, Data, Application, and Technology. Establishing the architecture practice within an organization would therefore require the design of [26]:

- The Business Architecture of the architecture practice that will highlight the architecture governance, architecture processes, architecture organizational structure, architecture Information requirements, architecture products, etc.
- The Data Architecture that would define the structure of the organization’s Enterprise Continuum and Architecture Repository
- The Application Architecture specifying the functionality and/or applications services required to enable the architecture practice
- The Technology Architecture that depicts the architecture practice’s infrastructure requirements and deployment in support of the architecture applications and Enterprise Continuum

The steps in establishing an architecture practice are summarized below in table 3.2, based on the objective of this research the first four ADM phases are incorporated and discussed based on [70].

ADM phases	Objectives	Approach	Inputs and Outputs
Preliminary Phase	<p>The objectives of the Preliminary phase are:</p> <ul style="list-style-type: none"> - To review the organizational context for conducting enterprise architecture - To identify the sponsor stakeholder(s) and other major stakeholders impacted by the business directive - To ensure that everyone who will be involved in, or benefit from, this approach - To enable the architecture sponsor to 	<p>This Preliminary phase is about defining “where, what, why, who, and how we do architecture” in the enterprise concerned. The main aspects are as follows:</p> <ul style="list-style-type: none"> - Defining the enterprise - Identifying key drivers and elements in the organizational context - Defining the requirements for architecture work 	<ul style="list-style-type: none"> • Inputs <p>Non-Architectural Inputs</p> <ul style="list-style-type: none"> - Board strategies and board business plans, business strategy, business principles, business goals, and business drivers, when pre-existing - Major frameworks operating in the business - Budget for scoping project - Partnership and contract agreements - IT strategy <p>Architectural Inputs</p> <ul style="list-style-type: none"> - Organizational Model for Enterprise Architecture

	<p>create requirements for work across the affected business areas</p> <ul style="list-style-type: none"> - To identify and scope the elements of the enterprise organizations affected by the business directive and define the constraints and assumptions - To define the “architecture footprint” for the organization - To define the framework and detailed methodologies that are going to be used - To select and implement supporting tools and other infrastructure to support the architecture activity 	<ul style="list-style-type: none"> - Defining the architecture principles that will inform any architecture work - Defining the framework to be used - Defining the relationships between management frameworks - Evaluating the enterprise architecture maturity 	<ul style="list-style-type: none"> - Existing Architecture Framework - Existing architecture principles - Existing Architecture Repository • Outputs - Organizational Model for Enterprise Architecture - Tailored Architecture Framework - Initial Architecture Repository populated with framework content - Restatement of, or reference to, business principles, business goals, and business drivers - Request for Architecture Work - Governance Framework
Phase A: Architecture Vision	<p>The objectives of Phase A are:</p> <ul style="list-style-type: none"> - To ensure that this evolution of the architecture development cycle has proper recognition and endorsement, support and commitment from the corporate management of the enterprise, to define and organize architecture development cycle within the overall context of the 	<p>Phase A starts with receipt of a Request for Architecture Work from the sponsoring organization to the architecture organization. These activities will lead to creating Architecture Vision and Business Scenarios using ADM methods by documenting enterprise</p>	<ul style="list-style-type: none"> • Inputs Non-Architectural Inputs - Request for Architecture Work Business principles, business goals, and business drivers Architectural Inputs - Organizational Model for Enterprise Architecture - Tailored Architecture Framework - Populated Architecture Repository, existing architectural

	<p>architecture framework, as established in the Preliminary phase</p> <ul style="list-style-type: none"> - To validate the business principles, business goals, and strategic business drivers of based on Key Performance Indicators (KPIs), to define the scope of, and to identify and prioritize the components of, the Baseline, to define the relevant stakeholders, and their concerns and objectives, to define the key business requirements to be addressed in this architecture effort, and the constraints that must be dealt with 	<p>mission, vision, strategy, and goal.</p> <p>The Architecture Vision provides a first-cut, high-level description of the Baseline and Target Architectures, covering the business, data, application, and technology domains.</p> <p>These outline descriptions are developed in subsequent phases.</p>	<p>documentation</p> <ul style="list-style-type: none"> • Outputs <ul style="list-style-type: none"> - Approved Statement of Architecture Work - Refined statements of business principles, business goals, and business drivers - Architecture principles - Capability Assessment - Tailored Architecture Framework (for the engagement) - Architecture Vision - Communications Plan - Additional content populating the Architecture Repository
<p>Phase B: Business Architecture</p>	<p>The objectives of Phase B are:</p> <ul style="list-style-type: none"> - To describe the Baseline Business Architecture - To develop a Target Business Architecture, describing the product and/or service strategy, and the organizational, functional, process, information, and geographic aspects of the business environment, 	<p>A knowledge of the Business Architecture is a prerequisite for architecture work in any other domain (Data, Application, Technology), and is therefore the first architecture activity that needs to be undertaken, if not catered for already in other organizational processes (enterprise</p>	<ul style="list-style-type: none"> • Inputs <p>This section defines the inputs to Phase B.</p> <ul style="list-style-type: none"> - Request for Architecture Work - Business principles, business goals, and business drivers - Capability Assessment - Communications Plan are Non-Architectural Inputs - Organizational Model for Enterprise Architecture, including:

	<p>based on the business principles, business goals, and strategic drivers</p> <ul style="list-style-type: none"> - To analyze the gaps between the Baseline and Target Business Architectures - To select and develop the relevant architecture viewpoints that will enable the architect to demonstrate how the stakeholder concerns are addressed in the Business Architecture - To select the relevant tools and techniques to be used in association with the selected viewpoints 	<p>planning, strategic business planning, business process re-engineering).</p> <p>The Key approaches this phase can be fulfilled are:</p> <ul style="list-style-type: none"> - Developing the Baseline Description - Business Modeling, such as, Activity Models, Use-Case Models, Class Models and Information Exchange Matrix are the main techniques to undertake activities in this phase. 	<ul style="list-style-type: none"> - Scope of organizations impacted - Maturity assessment, gaps, and resolution approach - Roles and responsibilities for architecture team(s) - Tailored Architecture Framework - Architecture Vision are some of the architectural inputs in phase B • Outputs - Refined and updated versions of the Architecture Vision phase deliverables, where applicable - Draft Architecture Definition Document - Draft Architecture Requirements Specification - Business Architecture components of an architecture roadmap are the outputs.
Phase C: Information Systems Architectures	<p>The objective of Phase C is to develop Target Architectures covering either or both (depending on project scope) of the data and application systems domains.</p> <p>Information Systems Architecture focuses on identifying and defining the applications and data</p>	<ul style="list-style-type: none"> • Phase C involves some combination of Data and Application Architecture, in either order. Advocates exist for both sequences. • Implementation of these architectures may not necessarily follow the same order. For example, 	<ul style="list-style-type: none"> • Inputs - Request for Architecture - Work Capability - Assessment and Communications Plan the are some of the major categories of non-architectural inputs - Architectural Inputs in TOGAF are - Organizational Model for Enterprise Architecture

	<p>considerations that support an enterprise's Business Architecture; for example, by defining views that relate to information, knowledge, application services, etc</p>	<p>one common implementation approach is top-down design and bottom-up implementation</p> <ul style="list-style-type: none"> • Design: <ul style="list-style-type: none"> - Business Architecture design - Data (or Application) Architecture design - Application (or Data) Architecture design - Technology Architecture design • Implementation: <ul style="list-style-type: none"> - Technology Architecture implementation - Application (or Data) Architecture implementation - Data (or Application) Architecture implementation - Business Architecture implementation 	<ul style="list-style-type: none"> - Tailored Architecture Framework - Application principles, if existing - Data principles, if existing - Statement of Architecture Work - Architecture Vision - Architecture Repository - Draft Architecture Requirements Specification - Business Architecture components of an Architecture Roadmap are the inputs for this phase • Outputs <ul style="list-style-type: none"> - Refined and updated versions of the Architecture Vision phase deliverables, where applicable - Draft Architecture Definition Document - Baseline Application Architecture, - Target Application Architecture - Process systems model - Place systems model - Time systems model - People systems model are some of the outputs for this phase
--	---	--	---

Table 3.2 Steps in establishing an architecture practice (Source: TOGAF® Standard, Version 9.2, a standard of The Open Group)

Unified Modeling Language (UML)

The Unified Modelling Language (UML) is arguably the most used ADL due to its general nature. UML was developed to support visualization of system designs with a general purpose mind set [71]. It was adopted as a standard by the OMG in 1997, who have been maintaining the ADL. UML supports the representation of activities, system components, system behaviour and software interaction, among others. On top of visual clarity, UML diagrams can comprehensively demonstrate relationships and dependencies [72].

Visual Paradigm and MS Visio

The research incorporated Visual Paradigm and MS Visio for the purpose of designing the models and diagrams. Visual Paradigm is a very easy tool to visualize, explore and communicate complex information. Visual Paradigm provides broad range of templates where one can draw any type of graph, table, charts, and models by using these templates. Visual Paradigm templates include: business process flow charts, network diagrams, workflow diagrams, database models, and software diagrams. The software is user friendly and its support for multiple types of diagrams is very handy. Due to its support for UML diagrams and business process model diagrams, it is comfortable to draw the diagrams in Visual Paradigm.

3.2.4 Demonstration

After developing proof-of-concept level prototypes, the artifact will extensively be adapted to production use by user organizations. The researchers point to the artifact implementation framework provide documentations screenshots of several output screens in their publications. A number of features notion of the prototype (i.e., factors, features, heuristics) identified are demonstrated to assess the efficiency and utility of the instruments. Different configurations and notions of the artifact structure and component are showed together with the configuration of certain design issues; this leads to an advice on which component of the artifact should be improved to solve the problem and which design situation of a problem should be selected. The demonstration process of the artifact is done through user acceptance test (UAT) by experts and scenario demonstration to several experts

3.2.5 Evaluation

without evaluation, we only have an unsubstantiated design theory or hypothesis that some developed artifact will be useful for solving some problem or making some improvement [71]. This study aims at developing a framework. So as to evaluate the design artifact of the framework, the researcher followed [71] evaluation methods. These evaluation methods are Logical Argument, Expert evaluation, technical experiment, Subject based experiment, action research, framework, case study and observational.

The researcher selected observational based evaluation, because it is suitable for a framework evaluation. observational based evaluation mechanisms are an application of an artifact to a synthetic or real-world situation aimed at illustrating suitability [71], or utility of the artifact. The reason behind for selecting an illustrative Scenario is that [71], recommended this evaluation method for a framework type artifact. According to [71], most researchers who designed a framework type have used the illustrative scenario design science evaluation method.

The researcher developed an evaluation checklist to evaluate the proposed the e-Logistics information architecture framework. The respondents were selected from 10 organizations that have implemented information systems that facilitates e-Commerce such as Tracking Systems, Delivery Tracking Systems, Warehouse Management Systems, Customer Relationship Management System, External Web Portal Interfaces to Customers to track Deliveries, Internal Web Portal Interfaces to internally manage aspects Logistics process and Mobile Apps or Mobile Handheld Devices for Goods Checking-In and Checking-Out at any point in the Logistics Chain. The expert feedback is used as an input to check the framework of the proposed framework to solve the e-Commerce logistics barriers.

3.2.6 Communication

Communicating the problem and its importance, the artifact, its utility and novelty, the rigor of its design, and its effectiveness to researchers and other relevant audiences, such as practicing professionals and experts, when appropriate. The outcome of the study can be communicated through final thesis report to the university, and to other scholarly research publications after the research is evaluated by authoritative scholars and practitioners in the field. Communication requires knowledge of the disciplinary culture.

CHAPTER FOUR

Problem Identification and Defining the objective of the Solution

4.1 Overview

In the previous chapter we have justified the adopted research methodology used by this research. The expectation of this chapter is to demonstrate the discoveries from the data collected. To this end this section presents the findings which aims at analyzing the data from the e-Commerce logistics systems through interview technique, resulting in identification of the factors of the e-logistics systems implementation, which then highlights the responses provided by the respondents during the interview and its analysis. Finally, requirements and specifications for the architecture are discussed.

4.2 E-Logistics Systems Building Blocks

One of the objectives of this study is to investigate the current e-logistics information exchanging practices and what logistics supply chain information contents are required. This research analyzed the data collected through the interview process and compared the different IA designs and their maturity development and based on this study created a list of requirements for the proposed IA, which should be taken into account for the to-be situation. The development process consists of four phases: define scope, design artifact, demonstrate artifact, evaluate design, and reflect evolution. The define scope phase includes decision parameters that define high-level description of the model and also setup initial boundaries. First, the focus of the model should be set. This can be a general or a specific issue. For example, adoption of e-business can be considered as a general issue and adoption of e-business logistics model among small retail companies in developing countries is regarded as a specific issue. The research has identified the following results.

4.2.1 Business Processes Automation

The development level of business process of automation of the logistics industry is one of the factors that is critical to full scale implementation of e-Commerce and its seamless integration with logistics service in based on the organizations maturity level, the following results were discovered through the interview processes. And evidences used to prove this concept from participants during the interview sessions explained as follows:

“Let me list you the main reason why business process gap exists in our organization. Firstly, the IT unit doesn’t understand the business process well. The IT unit focuses on IT based systems without first understand the business need in detail. Second, the IT doesn’t have full knowledge about most of the features in the existing logistics IS system that might lead the system to expire without even using some features at all. Finally, the business process elicitation gap has occurred mostly when the business unit is articulating system requirements to IT unit.”

[Respondent R-03-02]

“Business process elicitation gap has been the main challenging issue in our organization in the last few years in our business since doing business has become complicated. The process elicitation gap has been revealed mostly whenever business unit articulate system requirements to IT part. It’s obvious that there are several gaps between IT systems and logistics business processes automation in the existing structure of our company. The main reason that the logistics business process engineering gap has happened is due to the technological and innovation advancement in order to make our firm more competitive with international standard via upgrading the existing manual structure.”

“Our approach is unable to indicate practical way in order to update business process activities in ways of addressing the business process especially how they are supporting for e-logistics. The other gap that I have traced out is the business activities expect the IT systems either purchased or developed to articulate their own business process requirements in order to build their desired computer based systems without taking in to consideration of the local context.”

[Respondent R-03-02]

4.2.2 Logistics Supply Chain Management

The data analysis revealed that, there are only slight differences between the organizations that have been assessed in terms of LSCM functionality. In most cases, orders are consolidated to maximize vehicle fill by the in-house transport management system before being imported. The reverse logic holds for each. Another difference is that in the type of technology the companies use, five companies have employed Fleet Tracking Systems, ten companies use Delivery Tracking Systems, six out the twenty use Warehouse Management Systems, seven use external Web Portal Interfaces to Customers to track Deliveries, five are using Mobile Apps or Mobile Handheld Devices for Goods Checking-In and Checking-Out at any point in the Logistics Chain and two outsource the e-logistic SCM.

Therefore, the logistics supply chain has many discontinuities in the LSC processes from the start of the process to end. To substantiate this, claim the following interview segments are presented below:

“The primary reason why logistics supply chain management gap occurred is because of the three exist organizational structural limitations due to many reason such as, finance/economic issues, manpower and the fact that, the complexity of implementing such organizational structure requirements. In order to overcome the shortcomings, we have outsourced the LSCM. But still this has its shortcoming, since the outsourced company is doing the business based on its strategy and standard making our organization performance and reliability dependent on their performance and capability level.”

[Respondent-06-008]

4.2.3 Awareness of E-Commerce Logistics

Transforming the traditional logistic business to e-logistic is not a one-way step, it’s a dynamic process through a long journey. The Companies selected to go through e-logistics implementation assessment to help as a benchmark to reveal a strategic tactical and operational level of gaps. Thus, the primary focus of this study is to identify the factors that hinder the implementation of e-Commerce logistic through their as-is maturity assessment as a benchmarking. The results discussed above provide serious of perceptions and lessons learned that can be applied.

4.4 The Design and Development Process

4.4.1 Requirements and Specifications

The requirements are identified from the respondent’s interview and the results from the previous research done in Logistics industry. Interview during the case study was done to get the idea about e-Commerce Logistics requirements. Then after, specifications are defined according to the selected organizations. These requirements and specifications are further used for designing purpose. And among these specifications elicited below are requirements to enable the e-Commerce logistics inter-operation in order to answer research questions.

FUNCTIONAL REQUIREMENTS

Requirements for e-Logistic implementation architecture are identified after transcribing the interviewed data. Interviews were transcribed and clustered accordingly. The analysis of the interview data was done in previous sub section. Requirements are discussed in the following aspects below:

1. SYSTEMS ORIENTED WITH HIGH DEGREE OF INFORMATION INTERCHANGE

The present systems that are being used in the logistic organizations are isolated and single application based systems, all the organizations have their own data (either manual or semi-automated). The business processes digitization of the organizations does not implement the necessary information systems components it needs to contain. It is highly imperative that every leg, every agent & every actor in the e-Commerce Logistics lifecycle is system driven in order to effectively undertake:

- Enterprise Planning and Management
- Warehouse Management
- Transport Management
- Online Goods & Delivery Tracking at each Item Level
- Regular / Real-Time Notification on Stock and Transactions to all Stakeholders
- Electronic Check-In and Check-Out for every Transaction / Leg of the Lifecycle
- Electronic Alert system for Missing Items, Unaccounted Items or Delayed Transactions at each stage
- Electronic Stock and Sell-Thru Reconciliation – configurable on a Periodic Basis
- Mobile Data Collection and Transaction Update for mobile Logistics Transactions
- System Managed Packaging, Storage and Handling Rules with Electronic Alerts in the event of failure or non-compliance.

2. System Agnostic Information Interchange

All systems involved in the Logistics lifecycle – Logistics Operator ERP, e-Commerce Portal, Various Mobile Check-In/Check-Out Transaction Points, Customer Touch points need to be loosely coupled with each other via APIs. Each system should offer a well-documented and Online API using which all other systems should be able to query & transact automatically. *"For Example, the Courier Pickup Agencies may all expose APIs which will allow any e-Commerce system to query for best cost for a particular package from Point A to B. Based on this query the Consumer may select the cheapest or fastest option on the e-Commerce portal. Then based on this selection, the e-Commerce system will place an online Order for Package collection from the selected Agency – again via an API-call. Next, the Collection Courier Agency will in turn query Forwarding options from multiple Agencies via their APIs and select the most appropriate Agency, and so on."* So APIs allow the various Actors/Agencies involved in an e-Commerce Logistics Lifecycle (all the way from Customer Ordering on e-Commerce

Portal to Delivery) to talk to each other, to place Orders, to query current transaction status and to receive success or failure notifications. Currently there are no mechanisms to handle this tasks at all.

3. Logistics Planning

As per the public procurement legislation, the first stage of public procurement is the development of procurement plan. The procurement plan is required to spell out intended purchases, proposes the procurement method to be used, and shows different phases of the procurement process for the delivery of the goods, works or services as necessary. Procurement planning is a mandatory requirement and a cross-cutting initial stage that should be done annually irrespective of the procurement methods and objects of procurement.

4. Warehousing Management (Tightly Controlled & Traceable at all Points)

The logistics control and trace mechanism in the current situation is almost non-existent in the current logistics undertakings. A logistics chain catering to an e-Commerce business needs to ensure that all aspects of goods handling, storage and transit are tightly controlled, predictable and traceable at any time. This means every leg of the Logistics cycle is to be mandatorily handled by approved & specifically enlisted agents, each of whom have the requisite legal and commercial contract to carry out specific transactions in addition to having the technology and process to trace & control to track any item within their channel at any given point in time. An entire Logistics Delivery chain is susceptible to a single point of failure, often caused by the weakest link in the chain. In the event there is a delay or failure by one of the Agents, it is imperative that details of such delays, the spread of the delay or failure is instantly published (online) to all other dependent stakeholders – whether it affects one package or a whole consignment. Most of the evolved Logistics operators today offer a variety of methods – apart from checking in and checking out – including:

- **Stock availability Management** - The constant automatic updating of information enables a system to trigger a warning as soon as stock levels reach a minimum threshold. Company personnel can then submit replenishment orders immediately.
- **Security and shrinkage** - This enables companies to reduce or prevent theft and other causes of inventory loss, such as product diversions.
- **Shelf-life Management** - Older products can be placed nearer to the front of shelves, for example.

- **Inventory management** - This prevents inaccurate data capture and reduces warehouse cycle times.
- **Distribution** - Enabling companies to track the locations of assets, It is possible to analyze.

5. System Driven Transport Optimization

Another requirement observed is Transport Optimization of service as well. Transport Optimization involves ensuring the right transport is used for the right Package and Delivery Requirements, ensuring that available transport resources are maximized in terms of capacity utilization, and following a Just-In-Time policy to ensure that the whole process is highly optimized with minimal stocking, idling and exposure to unnecessary damages. For example, smaller and valuable packages can be airlifted whereas larger and more price-sensitive packages can be shipped. These combinations can also be driven by Customers – for instance a Customer may be willing to pay airlift a large package that is typically shipped and so on. The systems should be flexible enough to accommodate this special requirement by overriding default rules. These aims can only be fulfilled by strong systems driven Logistics Management. Contemporary systems used by leading e Commerce Providers are capable of performing real-time simulations to arrive at Package – Transport Option Itineraries that are just-in-time, optimal and that maximizes general fleet utilization.

6. Delivery Timelines

Each leg of the Logistics lifecycle has to be predictable because the preceding and succeeding legs depend on it completing within a predictable timeframe. Using Online Tracking and Monitoring system with proactive warning notifications for each stage of the logistics lifecycle ensures just this. If any stage gets delayed, then the next stage (systems) gets intimated with the delay via messaging and API calls with expected revised time to fulfill so that backup arrangements can be deployed seamlessly and well in advance.

7. Pliable to Reverse Logistics

A key attribute of e-Commerce based Logistics as compared to traditional Logistics is the relative proportion of Returns. Depending on the commodity being sold on e-Commerce sites, returns tend to be an inevitability and any Logistics planned around ecommerce fulfillment should be in a position to adapt to reverse logistics, albeit with a few constraints.

8. Financial Settlements

A key requirement for the smooth functioning of the e-Commerce Logistics Lifecycle is seamless financial transactions and reconciliations between all parties. The API driven interfaces between all Actors in the lifecycle allows for innovative features like on-the-fly rate enquiry for a specific package – for a specific destination – for specific shipment medium and for specific delivery conditions (cold/sensitive etc.). Rates are electronically aggregated – updated daily – and the best rate can be selected based on real-time rate comparison between multiple service providers for any transaction type. Compared to legacy practices of obtaining rates daily and manually from a multitude of agencies in the Logistics lifecycle, this connected and online look up is highly advanced and ensure seamless optimal price selection done automatically though the cycle across Agencies and Actors.

CHAPTER FIVE

Defining objective of the Artifact

5.1 Overview

In order to solve the problem and finding an answer to the identified problem this investigation argues that the constructed solution could be a procedure that supports the management of EA capabilities involving a standardized and well defined capability approach. This section is divided in to four sections, which correspond to the first four phases of the ADM development cycle. Section 5.2, describes a preliminary phase of the TOGAF, which aims to provide a description on how the architectural work for a logistic company Information exchanging would be done. Section 5.3, addresses phase A “the Architecture Vision”, which is intended to define the scope, clarify the vision, and to identify the stakeholders. Finally, Section 5.4, phase B “Business Architecture”, gives insights on the logistic business capabilities, logistics business Service/Function, logistics business process information.

5.2 Preliminary Phase

This sub-section provides first assumptions for a solution based on the problem definition and requirements from the previous section. Based on the problem described and on the lack of suitable solutions, the research proposes EA integration through the definition of an EA, with principles, concepts, methods and models, for organizations that need to manage the logistic services. This architecture uses the EA approach for organizational business and strategic alignment, along with the TOGAF framework and UML for modeling e-logistic Interoperability Architecture (IA).

The purpose of this research is providing with the information necessary in order to design an integrated e-logistic IA for the exchanging of information among e-Commerce Customers, e-Commerce Platform Owners & Service Providers, Suppliers, Logistics Asset Providers, Delivery Recipients. As with any architecture, this chapter provides decision-making guidance; in this case, the architecture supports more consistent, efficient, and effective decision making regarding the planning, design, acquisition, and implementation to enable the exchanging of products and service information. Moreover, the architecture guides the e-Commerce Platform providers and product suppliers to exchange information in a way that maximizes reliable information exchange,

5.2.1 Requirements Management

This study has established an EA program to develop a coordinated approach to designing and implementing e-Commerce logistics companies IA solutions for the exchanging of information among different e-Commerce entities. The Information Architecture contains the design of information exchange and service level integration architecture that will specify how those interfaces are implemented from a business functionality standpoint. This research specifies the technical architecture for integration of and with enterprise applications at a single e-logistic provider company level. It lists principles that should be applied to future application integration initiatives, and highlights the endorsement of existing principles from other domain teams. It continues to state the business and technical benefits obtained from the design architecture and the summary of key findings from the domain.

Objective of the Solution

The objective is to develop a generic Information Architecture framework that lays out a standard logistics lifecycle with all the standard components required for successful e-Commerce fulfillment. As one can infer from the problem statement there exist a large gap between the already established e-Commerce providers and the logistic service providers, hence it is essential to enable the sector to cope with the e-Commerce environment. Therefore, this can be achieved through the construction an implementation framework that create a controlled environment for the organization that adopt the technology. Moreover, the architecture guides every actor in the e-logistics continuum to exchange information and services in a way that minimizes unnecessary dependencies between systems, maintaining organizations' autonomy to govern internal business processes, and improves the partners' collective ability to respond rapidly to new business needs and opportunities.

According to TOGAF 9.1 the determination of information architecture is present throughout the Architecture Development Method (ADM) as described chapter 3.2.2 to accomplish this, the architecture defines a set of standards, guidelines, and requirements around a small set of key decisions typically encountered in information exchange projects:

- At what points should we exchange information?
- How do we describe information exchange points to reduce development costs and promote reuse?
- What data format should be used for information exchange?
- How should systems communicate (what protocols and technologies)?

- What infrastructure capabilities do we need to share in order to maximize the return on our infrastructure investments?

The following responses present a brief summary of the IA framework contained in the architecture. The key objectives of establishing a architecture Model of Logistics Information Exchange Systems support e-Commerce ecosystem in Ethiopia includes:

- a) Provide an easily accessible electronic data driven solution to provide single access point to enable, track and fulfill all logistics services, in this case specifically towards the e-Commerce sector.
- b) Interoperability - Enhance the accessibility and handling of information, expedite and simplify information flows between the various stakeholders.
- c) Provide a unified information exchanging mechanism for both national level system support and transnational level.
- d) Data harmonization and standardization for the two level of systems.

To successfully cater to the needs of e-Commerce Businesses, it is important for Logistics player's/service providers to:

- a) Tag, Identify, Classify & Trace Products & Goods according to globally accepted Data Standards that is recognized over the world.
- b) Maintain electronic Transactional Information on all Logistics Operations & Transactional Use Cases in a Data format that is compliant with Global Standards.
- c) Ensure Storage, Transport & Delivery transactions are all electronically recorded, maintained and all adhere to Globally Accepted Data Standards.
- d) Deploy Information Management Systems that have Data Management Capabilities compliant with Global Data Standards in the Logistics & Supply Chain space.
- e) Maintain EDI & Data Exchanging Capability to share data and transact with third-party systems compliant with Global Standards – specifically Logistics, Compliance, Governmental, Statutory Bodies

This starting phase of the ADM cycle is there to prepare the enterprise organization, or in this case the logistic enterprises for the development process. This includes in the case of a service-oriented solution the presentation of the service orientation principles, the consideration of existing reference architectures and models for Service Oriented Approach (SOA), and the elaboration of a governance strategy for the planned SOA solution [70]. Thus the SOA development using TOGAF/ADM is intended to prepare the enterprises for a successful “architectural work”, which is the design of an Information Architecture. The main objective of this phase is to delineate how this design work will be done.

5.2.2 Approach for the Information Architecture

The starting point for architecture development with TOGAF is that the organization adopts service orientation as an architecture principle [26]. What enterprise architecture provides in an SOA context

is a set of tools and techniques to link top-down business-led SOA to bottom-up developer-led SOA in a robust and maintainable way that addresses many of the nontechnical challenges associated with SOA adoption [70]. The concept of Enterprise Architecture, as used by TOGAF in the ADM cycle, refers to a work made for the internal use of an enterprise in order to guide the development of information assets. The notions of Information will become ever more important in the Service Oriented Architecture (SOA) environment where services will be shared internally and externally in ever more inter-dependent extended enterprises [70]. Therefore, an important part of the Information Architecture construction is devoted to connect the architectural work to the internal organization of the enterprise so as to ensure adequate support.

The purpose of IA is to represent the information necessary for the adoption of a e-logistics information architecture to be used for interoperability process of the e-Commerce logistics development and implementation. This information is the one required to adjust the information exchanging activities to the ongoing process of the Omni modal information Architecture design to share and integrate information in the context of e-logistics. Hence, the requirements for the architecture are determined by these two events. Information Architecture is designed to avail a shared platform for the efficacy of information sharing within a single organization or across organizational lines while respecting the security, privacy and appropriate use of that information. It must enable each organization to manage information as an asset to better serve the e-Commerce industry and the logistics industry of Ethiopia.

5.2.3 Architectural Definition

The objective of this step is to perform an analysis of the target architecture from a number of requirements or viewpoints and to document each relevant view-points. The purpose of considering these viewpoints is to ensure that the concerns of all relevant stakeholders be considered in the final target architecture so as the target IA meets all the requirements put on it.

5.3 Phase A: The Architecture Vision for E-Logistics

This is the first phase of the ADM cycle. Its main objective is to define a clear vision for the architectural work to fulfill the purposes defined in the preliminary phase. In this case, the vision of architecture is to develop a high-level target vision of the capabilities and business values to be delivered as a result of the proposed enterprise architecture. The vision of the architecture must mention that the scope is to develop up to Information Architecture to design web IA of the selected

logistic companies using SOA styles by Identifying the Business Architecture components and analyzing the information required for the information exchanging activities of a company and mapping it to the Information Architecture components. Other elements of the architectural vision can be deduced from the following information.

5.3.1 Important Elements to Build an Architecture Vision

1. The Business Motivation

The information exchange among logistics company, e-commerce business and with the entire supply chain is the process that is essential to the effectiveness and efficiency of the e-commerce realization. The availability of accurate and timely information in the hands of the right decision-makers at the right time is essential component to reduce and improve the efficiency every leg, every agent & every actor in the e-Commerce Logistics lifecycle. The integration of systems and the automated electronic exchanging of information eliminate error-prone redundant data entry, lead to improved information quality and security and better informed decisions. Integration speeds up the access of decision-makers to records and information and improves the efficiency of the work process of each stakeholder.

2. Vision and Mission

The Vision & Mission can be assumed from the business motivation of the individual companies that are participating in the logistics undertakings.

3. The e-Logistics Business Goals

The goal of this research is to develop an interoperable information architecture that supports the information exchanging activities of an e-Commerce logistics or e-logistics company. This architecture provides concrete, objective and formal guidance to the information exchanging activities of a typical logistic company regarding how the information architecture should share data and its services functionality. It is expected that the entire e-commerce logistics and logistics supply chain will use the architecture to guide the planning, design, acquisition, and implementation of interrelated systems within their own environment wherever these systems provide information or consume information from one another. It is also expected that the architecture to guide and inform the design and acquisition of shared, common infrastructure to support the inter-system inter-organization exchange of information in accordance with other statutory or mandated initiatives.

The Information, Technology units of the interviewed companies periodically and dynamically gather and processes data to create information needed to attain its mission whether if they are promoting investment, innovating, Transferring technologies, environmental protection, or other direct services. The Information, Technology management units have different activities where the major activities are the following.

1. Corporate planning, monitoring & evaluation

- Creating linkage between the mission and vision of the sector; and Government policies and strategies.
- Monitoring and evaluation of performances, take actions based on the findings and produce a report.

2. Data collection, organization & dissemination

- Production and dissemination of accurate and timely information which supports the business.
- Designing a conducive environment for information management systems.
- A centralized information service.
- Customer feedback and analysis system.
- Sector oriented, current and correct information.
- IT supported inter-sectorial information exchange system.

The Vision: Each organizations' data and information is managed as a company asset to provide value to their logistic business and other partners. The Data Strategy vision points towards the future unlocking of the potential of e-logistic data assets. The following goals support this vision:

Goal 1: Implement an Enterprise Data Management Program.

Data management will provide a common framework for the cost effective information exchanging across inter-organizational lines while respecting security, privacy and appropriate use of information.

Goal 2: Enable Enterprise Data Exchanging

Create structures that support collaboration among the logistics supply chain, and facilitate the responsibility to provide culture across companies to share data, information, knowledge and expertise.

Goal 3: Establish Data Governance and Oversight

Business and IT leaders must provide governance and oversight to ensure that the direction set and decisions made to carry out the data strategy remain in line with the business strategy of a company. These goals are building blocks for a solid foundation to leverage the data assets of company. The continued commitment and participation of company's stakeholders in advancing this vision is necessary to keep this model responsive to company, the sector and the governmental organizations.

3. Objectives of e-Logistics

It is deduced from the assessment in the research the objectives of every individual organization objective is somewhat different but they all share similarities when considering the core business undertakings autonomous all of them are business entities having their own legal personality with the primary objective of facilitating the businesses in warehousing, transportation courier services and delivery thereby providing accurate and timely services and information so that transparency and accountability be realized and facilitating the work environment via IT support.

As stated in the business policies or service level agreement of the selected companies' objectives can include has the following minimum points:

- To ensure customers right to information.
- To provide quality services to customers.
- To insure accountability.
- To notify the kind of services, time and standard delivered to the customers.
- To lay down conditions to ensure customers sense of ownership, and air their comments to the institute.

5.4 Phase B: The Business Architecture

The construction of a Business Architecture is the second phase of the ADM cycle. Business architecture relates business strategy to ICT. The Business Architecture identifies the functions, process, organization unit, and information flow to achieve the objective of e-logistics. Business architecture cannot contain all the minor details of the business because of the restrictions in the modeling language, but it focuses on the core business task and the key mechanisms [70]. However, it tries to clarify the complexities within the organizations and support the initiative to the development of further functional applications [70]. The business architecture captures the enterprise's core mission and the business practices of the enterprise as the primary set of requirements for the information

architecture that need to serve. It represents the enterprise's most important work activities and assets. The business architecture shows the processes that a typical logistic firm performs and provides a framework that allows IT to map its activities in line to business processes. Therefore, this section includes the baseline of the current and target (TO-BE) organizational, functional, process, information, services and physical aspects of the Architecture with the focus on the information architecture.

5.4.1 E-Logistic Service Business Modeling

Business models should be logical extensions of the business scenarios from the Architecture Vision, so that the architecture can be mapped from the high-level business requirements down to the more detailed ones [70]. In order to understand the capabilities of e-logistics, toward achieving the desired outcomes, the capability elements of the meta model of TOGAF need to be directly linked to the Motivation Extension (Driver, Goal, Objective which are illustrated on the Architecture Vision) elements so as to measure direct impacts of strategic changes on the business capabilities of the organization. In the TOGAF SOA Entities Content Meta Model [70], the Motivation Extension elements need also to be linked with the Business Capabilities and Functions so as to align business and IT system components to the strategic changes to this end this section provides Process Flow diagram of logistics interoperability Business Footprint diagram is created as illustrated in the figures in each sub-process.

According to TOGAF 9.1 Meta Model, business functions are designed to "deliver" business capabilities where each business functions are bounded by a business service that provides governed interface to access the business function. This means, the capability components created in section are supported by a set of underlying business functions that collaborate to deliver the business value expected from the capability (i.e. realize its goal). In order to realize this goal, business functions that are part of each capability are orchestrated by a business function whose access is governed by its corresponding business services.

As illustrated above, six process groups and fourteen key activities of logistic that are geared to provide services are identified. To describe the research focus more, i.e. e-Commerce logistics we have to recognize its main services with respect to the logistic functionality. Special importance is given to the services that are vital to the e-logistics supply chain processes and from those 14 key activities the research depicted the logistics situations as formed by meta-model: processes with their business

function and business service that show the focus area of the research which is Develop interoperability capability. This is described in detail below

5.4.2 Business Process Models with Respect to Business Capability

1. Inter-operating Contract

1.1 Scope

The " **Inter-Operation Agreement** " signifies the first of the IA building blocks. Its objective is to create It contains the following constituents, where the roles and responsibilities as well as requirements and objectives has to be pre-defined such as: master data alignment, warehouse and transport capacity management, service delivery, payment, claims, systems security, confidentiality/non- disclosure agreement, traceability requirements, service levels (and other performance measures), quality management and requirements and escalation procedures. It also defines the technical, administrative and computing methods by which integration between Logistics Service Provider and Buyer will occur, including standards used, performance expectations, back-up procedures and data privacy.

The " Inter-Operation Agreement " signifies to the first of the IA building blocks. Its objective is to service level contract on the operational levels among Service Provider and Service Consumer. It contains the accompanying constituents, where the roles and responsibilities as well as requirements and objectives has to be pre-defined such as: master data alignment, warehouse and transport capacity management, service delivery, payment, claims, systems security, confidentiality/non- disclosure agreement, traceability requirements, service levels (and other performance measures), quality management and requirements and escalation procedures. It likewise characterizes the specialized, managerial and processing techniques by which mix between LSP and LSB will happen, including standards used, performance expectations, back-up procedures and data protection.

1.2 Interoperation settings

Purpose: This sub-process takes into account the exchange of the interoperation agreement, containing data on situations to be executed and boundary settings to be applied between the exchanging parties.

2. Master data alignment

2.1 Scope

"Master data alignment" incorporates description of the delivery, locations and routing codes utilized in the logistics undertakings to guarantee that the two have equivalent and unambiguous comprehension of this essential supply chain information.

2.2 Transactions

2.2.1 Party master data

Purpose: The Party Master Data exchange supports the alignment and synchronization of stakeholders related information between transacting partners. Party Master Data comprises of nonexclusive information.

Trigger: The LSB will be liable to keep up and communicate the party and location information of its exchanging partners to the LSP.

2.2.2 Item master data

Purpose: The Item Master Data exchange allows the alignment and synchronization of item data between exchanging partners. Item Master Data is a set of information that portrays the specifications and structures of every item engaged with supply chain practices.

Responsible party: Party in question: In logistics service, situations the Item Master Data will be provided by the LSB. The Item Master Data will be aligned each time data changes or new data is included.

2.2.3 Transport routing data

Purpose: The Transport Routing Information enables the alignment and synchronization of steering information between LSB and LSP. The information contained in the message permit a shipper to create dispatching unit tags showing right steering and travel data and, whenever required, to load prepositioned delivery vehicles as per the carrier's or freight forwarder's directing arrangement.

Trigger: The LSP – consignment forwarder or transporter – will send the transport directing data to the LSB. Transport Routing Data will be adjusted each time data changes or new data is included.

3. Logistics service conditions

3.1. Scope

The "Logistics service conditions" depicts the obligation between the LSP and LSP on implementation of the concurred services around warehousing, transport or both, for a given period and at the expressed rate/cost. The Logistics service conditions characterize the important contractual information to have the option to receipt the logistics services materialized. It doesn't plan to cover the totality of the contractual information.

3.2 Logistics service conditions

Purpose: The Logistics Service conditions exchange is commonly utilized for the situation where a general agreement has been built up between parties against which services will be requested over a period on a request by-request premise. The agreement will have been recently arranged and acknowledged. The point of the exchange is to give the authoritative states of a formerly arranged agreement to empower programmed request approval of and receipt check preceding installment.

Trigger: Triggered by LSP on establishment of the contract.

4 Planning

4.1 Scope

"Planning" centers around future warehousing or transport practices and targets guaranteeing capacity to fulfill requested services. For warehousing capacity, this applies to the storage volume and resource capability. For transportation limit, this applies to shipping volumes and timings. The scope quantification is driven by the month to month and additionally week by week anticipated shipments/pallets /picking until the actual request (shipment) is discharged to the stockroom as well as transport provider by delivery instruction (for transport booking, request picking, loading and stacking).

4.2. Transactions

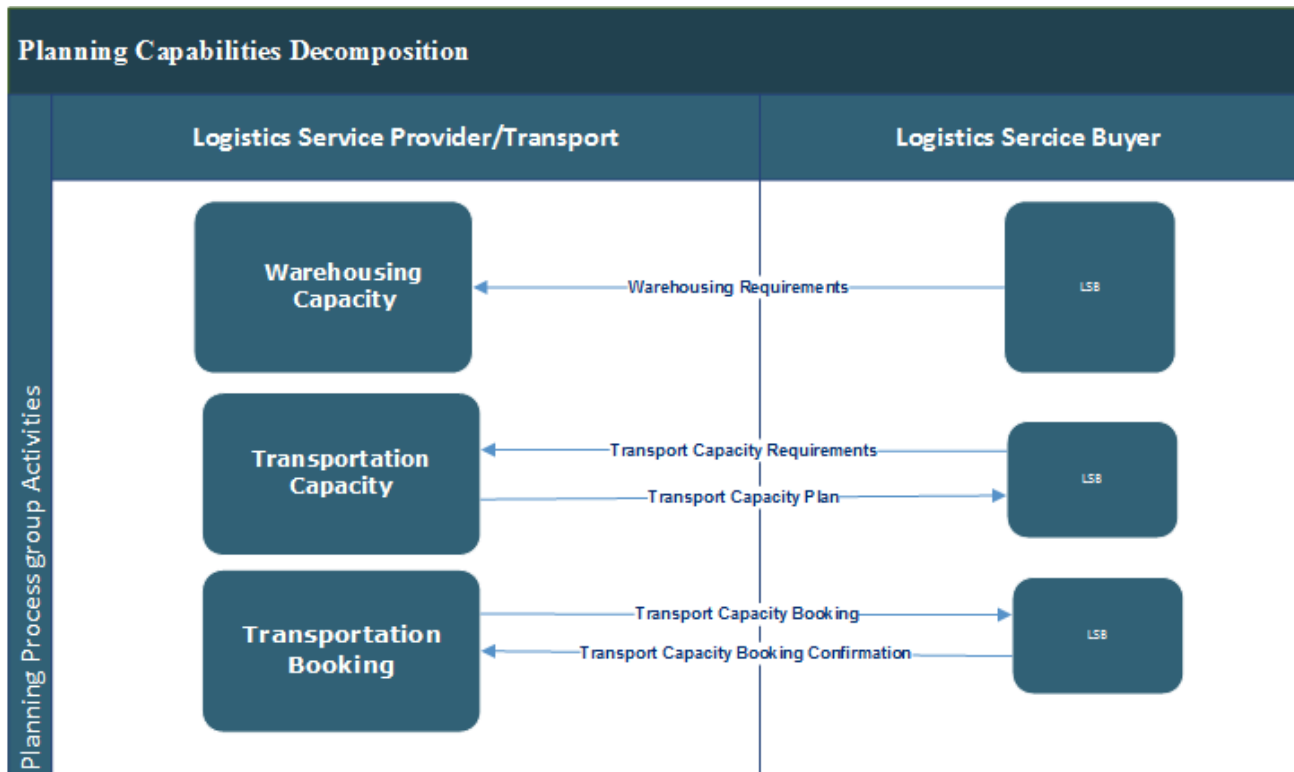


Figure-5.1 Logistics Planning Business Process flow of Information

4.2.1. Warehousing requirements

Purpose: The purpose of this transaction is to define and share warehouse planning information based on historical and forecasted demand data (by category and customer), event data and, in some business cases, actual planned shipments before they are released to the DC for processing. This and any other relevant data can be shared between the two parties in order to mutually plan warehousing capacity demand for the future.

The purpose behind this exchange is to characterize and share warehouse planning information based on historical and forecasted demand data (by category and client), event information and, in some business cases, real planned shipments before they are discharged to the DC for processing. This and some other significant information can be shared between the two parties so as to mutually plan warehousing limit interest for what's to come.

Trigger: The Logistics Service Buyer will communicate the planning information monthly and/or weekly, until the actual demand (shipment) is released to the DC for order picking, packing and loading.

4.2.2. Transport capacity requirements

Purpose: The reason for this exchange is to define and share transportation planning information dependent on verifiable and forecasted request information (by category and client), event data and, in some business cases, actual planned shipments before they are discharged to the DC for handling. This and any other significant information can be sent by the LSB so as to plan transportation capacity request for the future Transportation Capacity Requirements may incorporate information that will allow the LSP to Plan:

- Variety and Number of Transport
- Trade-lane (from/to location markers)
- Accessible transport LSPs
- Foreseen dates/period

Trigger: The LSB will impart the Planning information month to month or potentially week by week, until the actual request (shipment) is discharged to the DC for transport booking

Response: The LSP ought to affirm if the planned transport information can or can't be utilized for the actual firm vehicle booking. It is performed with the Transport Capacity Plan.

4.2.3. Transport capacity plan

Purpose: To affirm whether the LSP has ability to convey all or part of the required transport services.

Trigger: After receipt of the Transport Capacity Requirements, the Logistics Service Provider will calculate whether the requirements can be satisfied and will send a reaction.

4.3.4. Transport capacity booking

Purpose: The way toward reserving a spot for space on a means for transport for the movement of merchandise. To reserve space, the LSB and LSP will share booking demand and booking reply messages.

Trigger: The capacity booking process starts with the LSB sending a booking demand to inquire as to whether there is the likelihood to reserve space on a specific date and time to a specific destination.

Response: The LSP will send back a transport capacity booking affirmation message.

4.3.4. Transport capacity booking affirmation

Purpose: The SP gets and approves the booking information, checks the transport prerequisites, and decides if they can acknowledge the booking or reservation dependent on space openness. The LSP

will send back a reply message either affirming the space setting up for the methods for transport or showing that they don't acknowledge the space booking (and potentially supplies an alternative to the space booking).

Trigger: The capacity booking process starts with the Logistics Service Buyer sending a booking solicitation to inquire as to whether there is the likelihood to reserve space on a specific date and time to a specific goal. A capacity booking is regularly for a solitary pickup date and a solitary conveyance date from a solitary sender to a solitary consignee.

5 Warehousing

5.1. Scope

"Warehousing" is the receipt, storage, and preparation of products of items for client conveyance dependent on orders. It likewise incorporates all included managerial undertakings. Inside storage, this also covers the control of stocks traceability in the warehouse. The return flow of items and materials in the supply chain is additionally included, similar to item recalls and reverse logistics for void pallets or crates. In addition, warehousing activities, extra services might be rendered, similar to dry filling, repacking for advancements, re-stacking or re-naming are likewise included. This is frequently characterized as value added services. For whatever length of time that the GTIN of dation behind Warehousing Operations Notification data

5.2 Modules

The Warehousing business exchanges have been grouped in various intelligible modules. Every single module represents a collaboration between two exchanging accomplices.

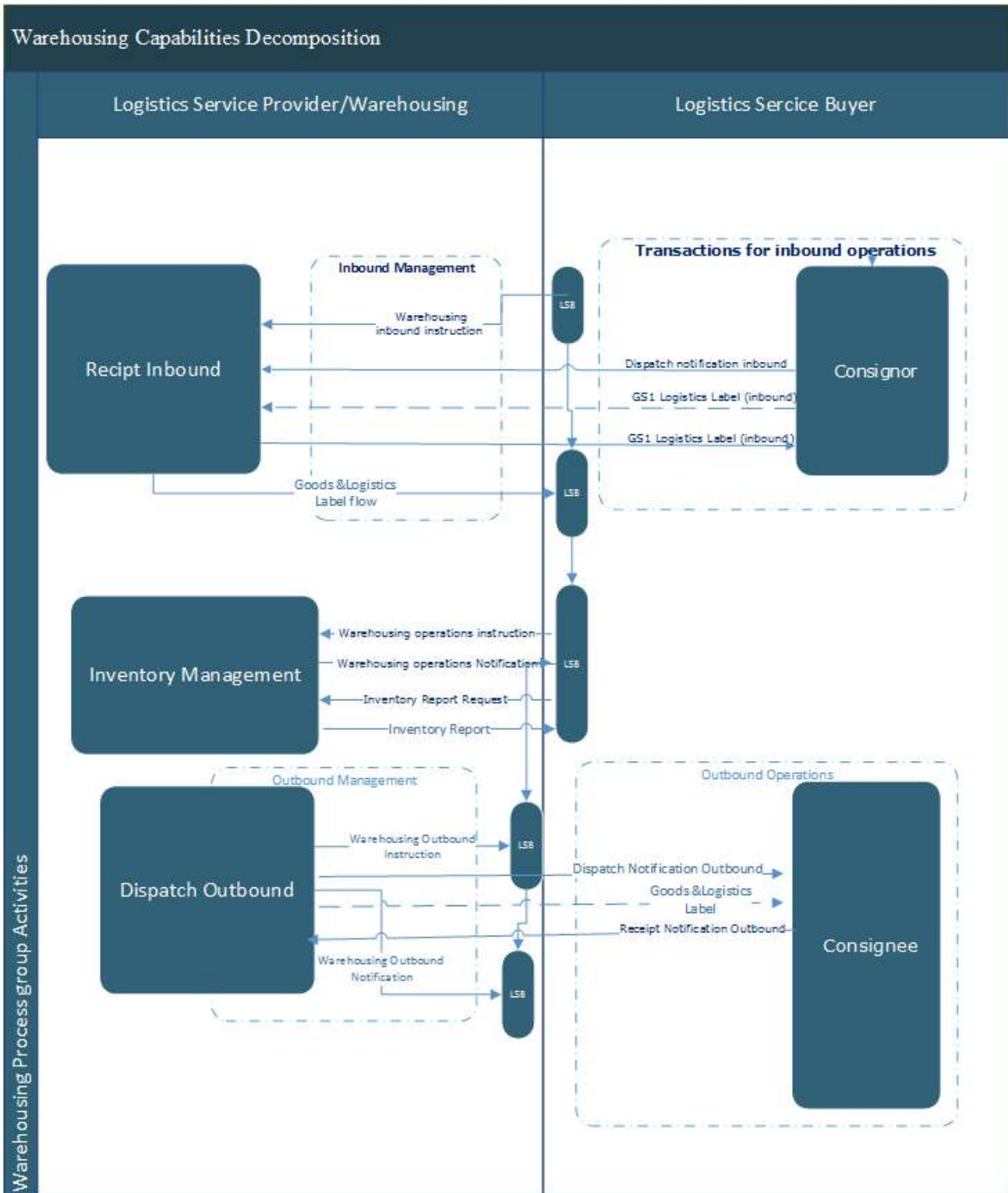


Figure-5.2 Warehousing Sub-Process Groups flow of Information

5.3 Transactions for inbound administration

5.3.1 Warehousing Inbound Guidance

Purpose: Communicate foreseen receipts to the LSP. This will assist the LSP with planning required capability. The Warehousing Inbound Instruction is additionally employed if there should arise an occurrence of return logistics.

Trigger: Triggered by the LSB after the products have been requested, and the buyer got the request verification or dispatch call from the provider of merchandise or an update, (for example, pre-planned receipt) or request withdrawal.

Reaction: Warehousing inbound notification.

5.4 Warehousing Inbound Notification

Purpose: The design is for the LSP to notify the LSB with respect to the status of the inbound delivery. The exchange is utilized to impart the real receipt (counting disparities – assuming any) versus the data in the Warehousing Inbound Instruction.

Trigger: Triggered by the LSP after she/he has acquired the products. The message can likewise be utilized to pull out the Warehousing Inbound Instruction on the off chance that it is realized that the products will never be received.

Response: Response to LSP isn't predicted, nevertheless a Receiving Guidance might be send to the provider in the wake of handling the Warehousing Inbound Notification, to report the real receipt.

5.5 Transactions for inbound tasks

5.5.1 Dispatch warning inbound

Purpose: Generally, the Dispatch Notification empowers one Transporter (Consignor) to give data about the product of a delivery to one Receiver (Consignee). In particular, the Inbound Dispatch Notification serves to notify the LSP (Consignee) on deliveries (with returns) dispatched to him.

Trigger: Triggered by the Consignor at shipment creation.

Response: Receipt Notification

5.5.2 Logistics Label (Inbound)

Purpose: Logistics units are things ready for transport and distribution, and shipment beds are one specific type. Utilizing the GS1 Logistics Label containing the Serial Shipping Container Code

(SSCC) let clients to recognize logistic units exclusively with the goal that they can be tracked and traced all through the chain.

Trigger: The consignee is liable at the hour of accepting the products to record data from the logistics tag, and to utilize it in the further correspondence.

5.5.3 Receipt Notice Inbound

Purpose: The motivation behind the Inbound Receipt Notification is for the LSP to notify the transporter (Consignor) of actual products received, contrasted with what was acknowledge as being sent. Customary business application of the receipt data can incorporate updating of inventory, identifying delivery disparities and modifying orders along with invoicing.

Note: The accepting warning message in GS1 EDI gauges is called Receiving Advice RECADV in (GS1 EANCOM).

Trigger: Activated by the LSP (Consignee) at receipt of the shipment.

Response: Dependent on the transaction circumstance.

5.6. Exchanges for Outbound Administration

5.6.1 Warehousing Outbound Instruction

Purpose: The motivation behind the Warehousing outbound guidance is to arrange the picking and stacking/load readiness of a particular delivery, and can incorporate client related value added services on products It doesn't cover the requesting of transport administrations.

The data may include:

- Carrier and Service to be utilized/goal (advertise, nation, postal code zone)
- Type of transport intends to be utilized
- Type of bundling to be utilized
- Information to be imprinted on the transportation archives

Trigger: Triggered by the LSB at the purpose of request discharge to the stockroom.

Response: No reaction is predicted, just over-all notice message that the business application has gotten the demand.

5.6.2 Warehousing Outbound Notification

Purpose: The LSP notifies the LSB about the status of the outbound shipment. The statement can be used to reckon information, such as, utilized carrier, logistics units, track and trace information, just as disparities between the factual Shipment and the data in the Warehousing outbound instruction. The LSB is activated by this message to begin the subsequent procedures, such as, billing and sending a Dispel Guidance to the service buyer.

Trigger: Activated by the LSP after dispel of the merchandise.

Response: Reliant on the transaction situation.

5.7 Transactions for Outbound Operations

5.7.1 Dispatch Notification Outbound

Purpose: Generally, the Dispatch Notification enables the Transporter (Consignor) to give data about the substances of a delivery to the Receiver (Consignee). In particular, the Outbound Dispatch Notification serves to notify the Consignee about shipments dispelled to them.

Trigger: Triggered by the LSP(Consignor) at delivery creation.

Response: Receiving Notification Outbound

5.7.2 Receipt Warning Outbound

Purpose: The drive behind the Outbound receipt warning is for the Consignee to advise the LSP (Consignor) of actual delivery received, juxtaposed with what was informed as being sent. Common business uses of the receipt information can incorporate – updating of stock inventory, distinguishing transporting inconsistencies and changing orders also related invoicing.

Trigger: Activated by the Consignee at receipt of the shipment.

Response: No response is predicted, just a general notice message that the business application has gotten the solicitation.

5.8 Other Transactions

5.8.1 Warehousing Operations Instruction

Purpose: A Buyer can employ a LSP to complete non-client related value added services on products (e.g., inside activities, re-packing, checking, destroying, gathering, and so forth.). The Warehousing tasks instructions are consumed to arrange these operations.

Trigger: Triggered by LSB at request creation.

Response: Warehousing activities communication

5.8.2 Warehousing Operations Messaging

Purpose: The incentive behind warehousing operations notification informs their LSB the status of inventory management operations that have been completed.

Trigger: Triggered by LSP at the completing of requested orders.

Response: Dependent on the transaction situation.

5.8.3 Logistics Inventory Report Requisition

Purpose: To demand inventory report from another party, applying explicit selection rules.

Trigger: Triggered by the party that needs information about inventory status.

Response: Logistics Inventory Report.

5.8.4 Logistics Inventory Report

The inventory report comprises of two sections: Inventory Status and Inventory Event. These two sections can be utilized freely or joined:

- Only Inventory Status: to report the status of the inventory situation toward the end of the reporting time frame.
- Only Inventory Event: to report tasks done by the LSP to the LSB in the revealing time frame.
- Combined Inventory Status and Inventory Events: All applicable tasks done in the given time span and the subsequent inventory state toward the finish of the reporting time frame.

Inventory status

Purpose: Inventory status is utilized for detailing the actual inventory situation at one point in time (e.g., hour, week, day, month). Inventory information can be traded depending on the location and

then goods or on the goods and then location in the event of a similar goods stored at more than one location.

Trigger: The exchange will be activated by the LSP at the contracted upon date(s) and time(s) for sending or in light of an Inventory Report Request.

Response: Dependent on the stock inventory status circumstance.

Inventory Events

Purpose: Inventory occasions are recognized as modifications of the stock inventory over a specific period (e.g., hour, week, day, month) or at one point in time (e.g., hour, week, day, month). Inventory information can be shared depending on the location and afterward item or on the item and then location – if there should arise an occurrence of a similar item stored at more than one location.

Trigger: The exchange will be activated by the LSP at the agreed upon date(s) and time(s) for sending, after a demand from the LSB or if there should arise an occurrence of an occasion that expects answering to the LSB according to arrangement (e.g., merchandise is damaged in the warehouse). The activity is explained in the InventoryEventReasonCode.

Response: Dependent on the situation and agreement.

6 Transport

6.1 Scope

"Transport" is the movement of items from manufacturing plants to warehouses or stockrooms, the movement of products from warehouses to distribution centers to the client conveyance places (delivery) and the monitoring of these movement. While the LIM model plans to be transport mode autonomous and it may be applied to street, rail, sea and air, it is centered around mainland transport modes. For street transport, this incorporates Full Truck Load (FTL) transport, Less Than Truck Load (LTL) transport and Parcel dissemination.

3.6.2 Modules

The business interactions have been grouped in various intelligible modules. Every module characterizes to a collaboration between two transacting partners.

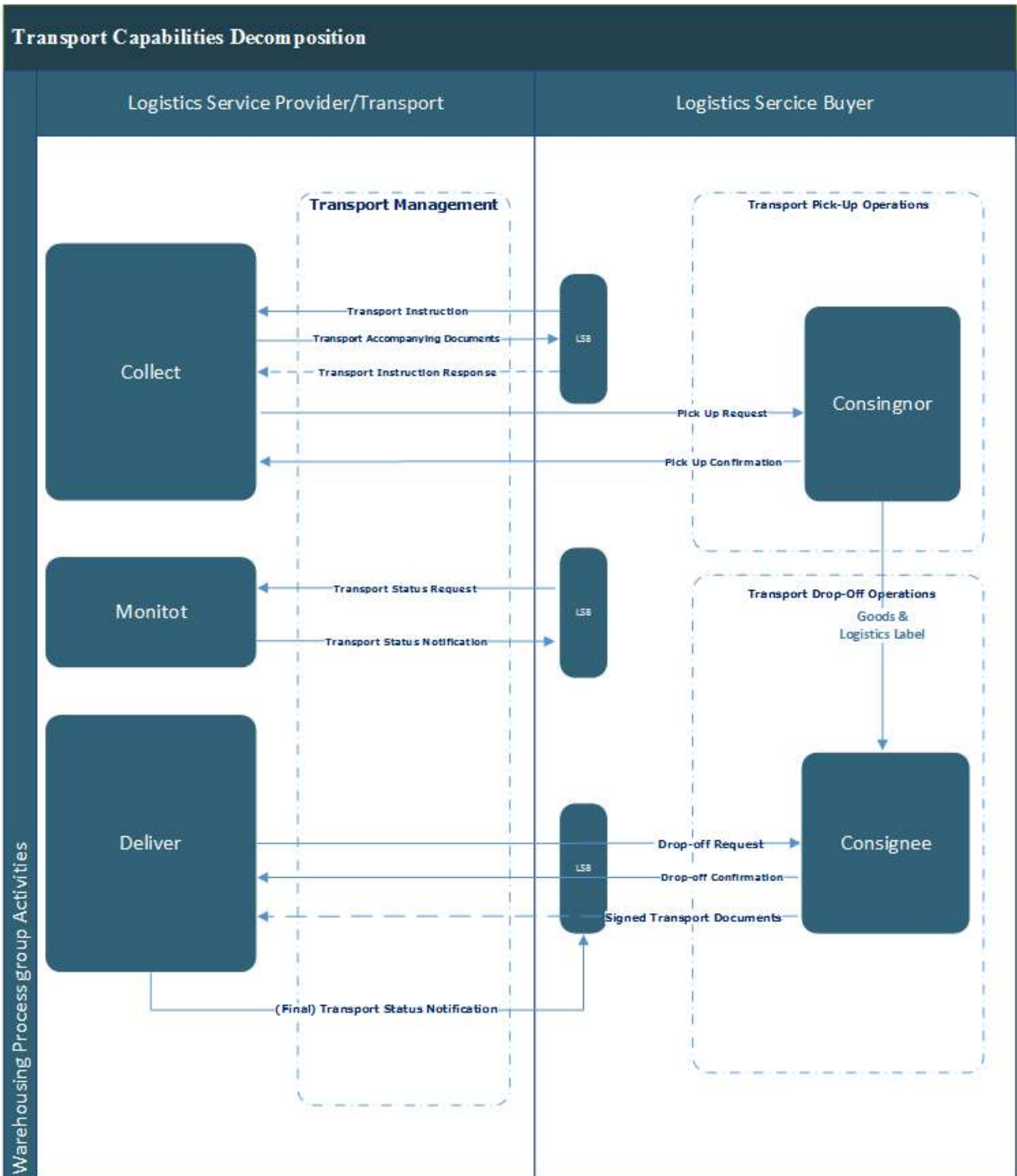


Figure-5.3 Transport Sub-Process Groups flow of Information

6.3 Transactions for Transport Administration

6.3.1 Transport Instruction

Purpose: The key targets are to communicate/share the preparation of the vehicle of products between all parties linked with the movement of the consignment(s) just as availing information that are important to carry out that transport and delivery of the products. The exchange can provide for one transferable or multiple transfers.

Trigger: The Transport Instruction will be sent by the LSB (supplier, retailer, 3rd party warehouse or freight forwarder) to a LSP (freight forwarder or transporter) upon request creation.

Response: Transport instruction reply.

6.3.2 Transport Instruction Response

Purpose: The fundamental objectives are to give sanction or adjustment of the arrangement of the transport of items between all parties.

Trigger: The Reply will be sent by the LSP (transporter) to the LSB. The exchange will be activated inside the concurred time span from receipt of the Transport guidance.

Response: Dependent on the transaction circumstances.

6.3.3 Accompanying Transport Documents

Response: Communicate data for paper records that must be moved along with the merchandise, for example, hazard info. This data can be imparted electronically, yet at the same time should be accessible as physical archive during transport.

Trigger: These documents are sent by the LSB to the LSP (freight forwarder or carrier) at the settled upon date and time. LSB and LSP need to indicate and concur who will be responsible for printing the documents.

Response: Dependent on the transaction circumstances.

6.3.4 Transport Status Request

Purpose: To demand data with respect to the status of the transfer.

Trigger: The Transport status solicitation will be sent by the LSB (who can be the supplier, retailer, 3rd party warehouse or cargo forwarder) to the LSP (the carrier). The transaction can be utilized whenever. The LSB may approve other parties to have access to the transport status data, for example, the consignor or the consignee.

Response: The Transport Status Notification is the reaction to this exchange.

6.3.5 Transport status Notification

Purpose: This deal allows the transmission of status data by a shipment forwarder or transporter, to the gathering mentioning data concerning a transfer of products, for which a transport instruction was recently sent. Status data at a consignment level, either coded or free text, is given with related some other data relevant to the reported status.

Responsible party: The Transport status notice will be sent by the LSP to the LSB. The transaction might be sent on a booked premise at foreordained times, in consequence to a straight enquiry (Transport status solicitation), or following a predefined event or milestone. The LSB may approve different Parties to access transport status data, for example, the sender or the recipient.

6.3.6 Final Transport Status Notification

Purpose: This transaction permits sending the final status of the delivery (otherwise called IoD, Information on Delivery) to the LSB. Data may incorporate actual date and time of delivery, special cases, such as, damages and deficiencies, name of the individual who finished paperwork for receipt.

Trigger: The Final Transport Status Notification will be sent by the LSP after the conveyance.

Response: Dependent on the exchange circumstance.

6.4 Transactions for Transport Pick-up Operations

6.4.1 Pick-up Request

Purpose: Request data for the pick-up of the merchandise.

Trigger: The Pick-up request will be sent by the LSP (carrier) to the Consignor before the pick-up is to occur, accurate timing relies upon the agreements.

Response: Pick-up affirmation

6.4.2 Pick-up Confirmation

Purpose: To correspond the pick-up data to the LSP.

Trigger: After receipt of the Pick-up application the Consignor will send the pick-up confirmation to the LSP (transporter).

Response: Dependent on the exchange circumstance.

6.5 Transactions for Transport Drop-off Operations

6.5.1 Drop-off Request

Purpose: Request data for the drop-off of the products, for instance, the time window and unloading dock. The exchange may also function as pre-arrival notice to the Consignee. The Drop-off solicitation should just contain fundamental data, for instance, estimated aggregate weight, total volume, shipper, type of materials that would let the Drop-off point to arrange for when the delivery (products) ought to be conveyed.

Trigger: The Drop-off solicitation will be sent by the LSP (transporter) to the Consignee before the drop-off is to occur, precise planning relies upon the understandings.

Response: Drop-off verification.

6.5.2 Drop-off Confirmation

Purpose: An activity to convey the drop-off data to the LSP. The Drop-off Response should just contain essential data, for instance, date and time-window, booking-reference to quote when delivering and delivery-instructions.

Trigger: Afterward receipt of the Drop-off solicitation the Consignee will send the Drop-off affirmation to the LSP (carrier).

Response: Not anticipated

6.5.3 Signed vehicle records

Purpose: The signed transport documents (otherwise called POD) fill in as evidence for the LSP that She/he acquired the products at the Consignor and conveyed them to the Consignee. After the transport has been done, the LSP (transporter) files the marked transport documents. The LSP may permit the LSB to access to the filed transport reports, for instance by giving a web link.

Trigger: The transport records are signed upon acquisition (by the Consignor) and upon delivery (by the Consignee), and after that filed by the LSP (transporter).

Response: Dependent on the transaction circumstance.

CHAPTER SIX

Implementation, Demonstration and Evaluation

6.1 Phase C: The Information Systems Architecture

6.1.1 Proposed Information Architecture

The IA is an N-tier web Information Architecture application that is adapted through the process of re-appropriated as discussed in chapter two from DHIS2 and the Ethiopian E-services platforms which is fundamentally base on service oriented principles. Service orientation enables designing of interoperable, reusable and loosely coupled services. Moreover, it avoids functionality overlapping among services and enables single data accessing and manipulation in the system. The service oriented approach ultimately improves consistency and security of data within the system and add up to the scalability and maintainability of the system in general.

Collection of such services resulting from the project can easily be reused at enterprise level fostering the agility and flexibility to accommodate changes to business processes and implement new business processes by using services already designed.

System Architecture

The proposed IA solution will be built on layered-based architecture whereby client interface layer, business logic and data layer are separated as is conceptually shown in the figure 6.1 given below. In the proposed Architecture, Layers represent logical division of components and functionality without taking the account of physical components. There are many different ways to group related functionality into layers but here, we select ways that enable us to divide the application into separate layers that have distinct roles and functionalities to maximize maintainability of the code, optimize the way that the application works when deployed in different ways and provides a clear demarcation between locations where certain technology or design decision must be made.

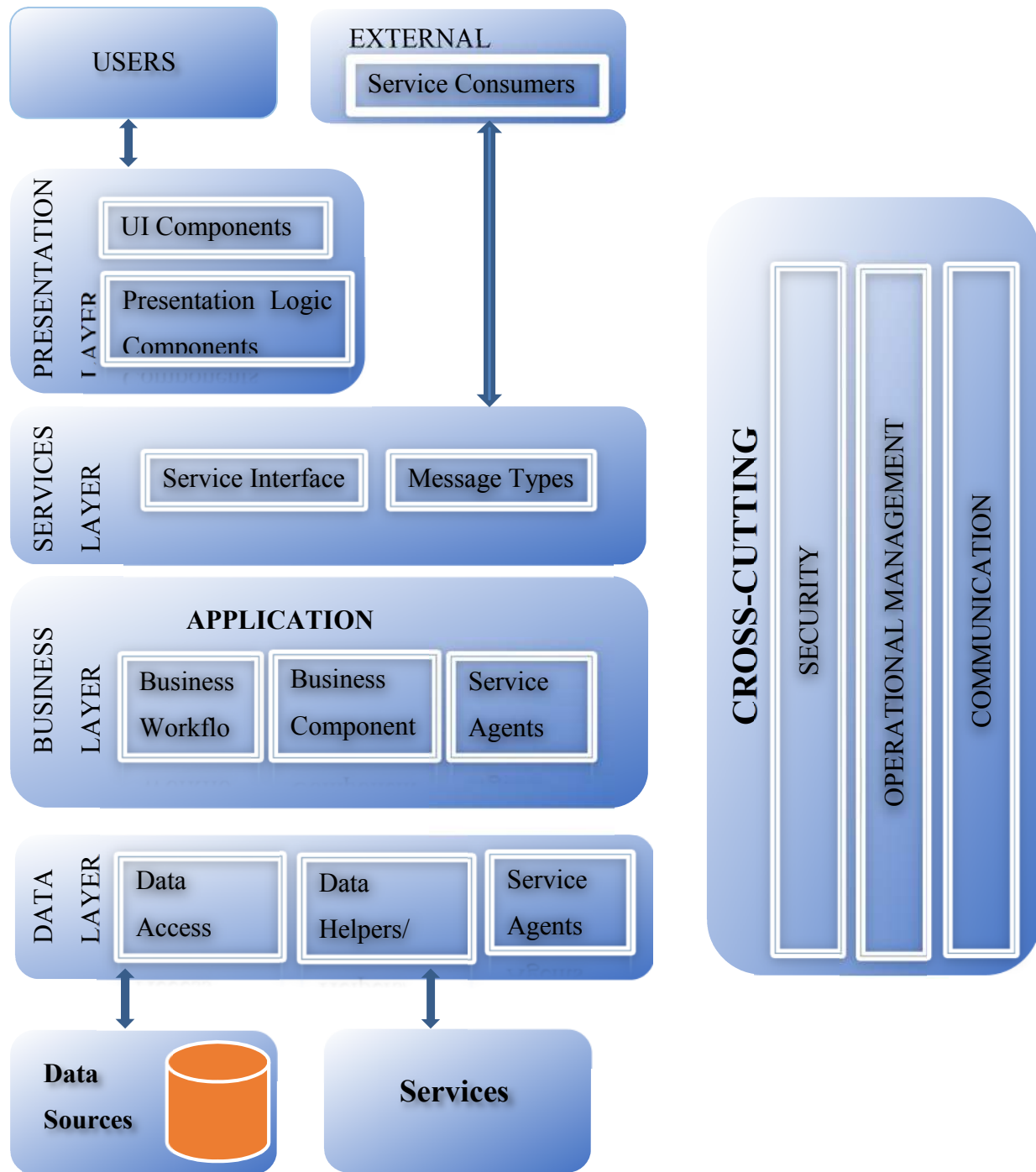


Figure 6.1 The proposed Information Architecture

- The presentation layer serves as a front-end of the application, provides a user interface to the end user of the application. It also controls the look-and-feel of the applications and responds to user events.
- The service layer provides APIs to connect the business layer to presentation layer (UI) and external systems.
- The business layer of the system maintains the business rules and processes required. This layer links presentation layer with data access layer. Our data access layer is purposed to give to the business logic components access to backend data sources.
- The data layer is used as a data repository for system, user, and transaction data for storage, retrieval, and reporting. It also supports data management functions.
- Crosscutting concerns represent key areas of the system design that are not related to a specific layer in the envisioned application.

6.1.1 Transaction Planning Sub-System

As per the discussion on the previous Section the Planning Sub-system has various application components. These are Plan Initiation, Need Collection, Need Reviews and Need Consolidation. senior

Plan Initiation component is major part of the Procurement Planning sub-system. This Component deals with the initial steps of Procurement Plan initiation. To see details about the component, refer to Appendix IV.

Need Collection component is a part of Planning sub system located in the middle layer of e-Logistics architecture. To see details about the component, refer to Appendix IV.

Need consolidation component is shared component as part of Workflow application component located in the middle layer of e-Logistics architecture. This Component is responsible for deciding if something will require approval and the ways to manage the next step *forward*. To see details about the component, refer to Appendix IV.

6.1.2 Service/Case Management Module

This module manages list of services by managing categories (create, update, delete, assign), managing sub-category (create, update, delete, assign), managing services (create, update, delete, assign). To see details about the component, refer to Appendix IV.

6.1.3 Organization Management Module

This module enables system administrators to manage organization, Organization units, teams, organization type, and related activities. It enables to create, update, display detail information, delete, activate and deactivate organization and organization type. To see details about the component, refer to Appendix IV.

6.1.4 Form Builder Module

This module enables creating dynamic and customizable user input forms for collecting organization based information. Actors of this module can create forms with different input controls by drag and drop on the panel specified. To see details about the component, refer to Appendix IV.

6.1.5 Service/Case Manager Module

The core component of e-Commerce Logistics Information Architecture is responsible for creating and handling logistics cases ordered by customers. The term case in this scenario is for transport and warehouse operations managements situations (Logistics situations). To see details about the component, refer to Appendix IV.

6.1.6 User and Role Management Module

This module enables a super User to Create, List, Edit and Delete Users. It also enables roles be assigned and removed from users. It allows certain Roles to be Created, Read, Edited and Deleted; and Privileges be assigned and removed from/to this Roles. To see details about the component, refer to Appendix IV.

6.1.7 Account Management Module

This module enables a User to change credentials and password, reset password and change email. To see details about the component, refer to Appendix IV

4.1.8 Authentication Module

This module enables User to login to system and access authorized resources within the system. To see details about the component, refer to Appendix IV.

6.1.8 Authorization Module

This module enables the system grants a user, access to a secure resource if he/she have the required privilege for that resource or denies him/her that access if she/he has not the right privilege. To see details about the component, refer to Appendix IV.

6.1.9 Customer Portal Module

This module enables customers to file cases (i.e. complaints, suggestions, inquiries and tips), track cases, and communicate with government organizations.

6.1.10 Service Productivity Module

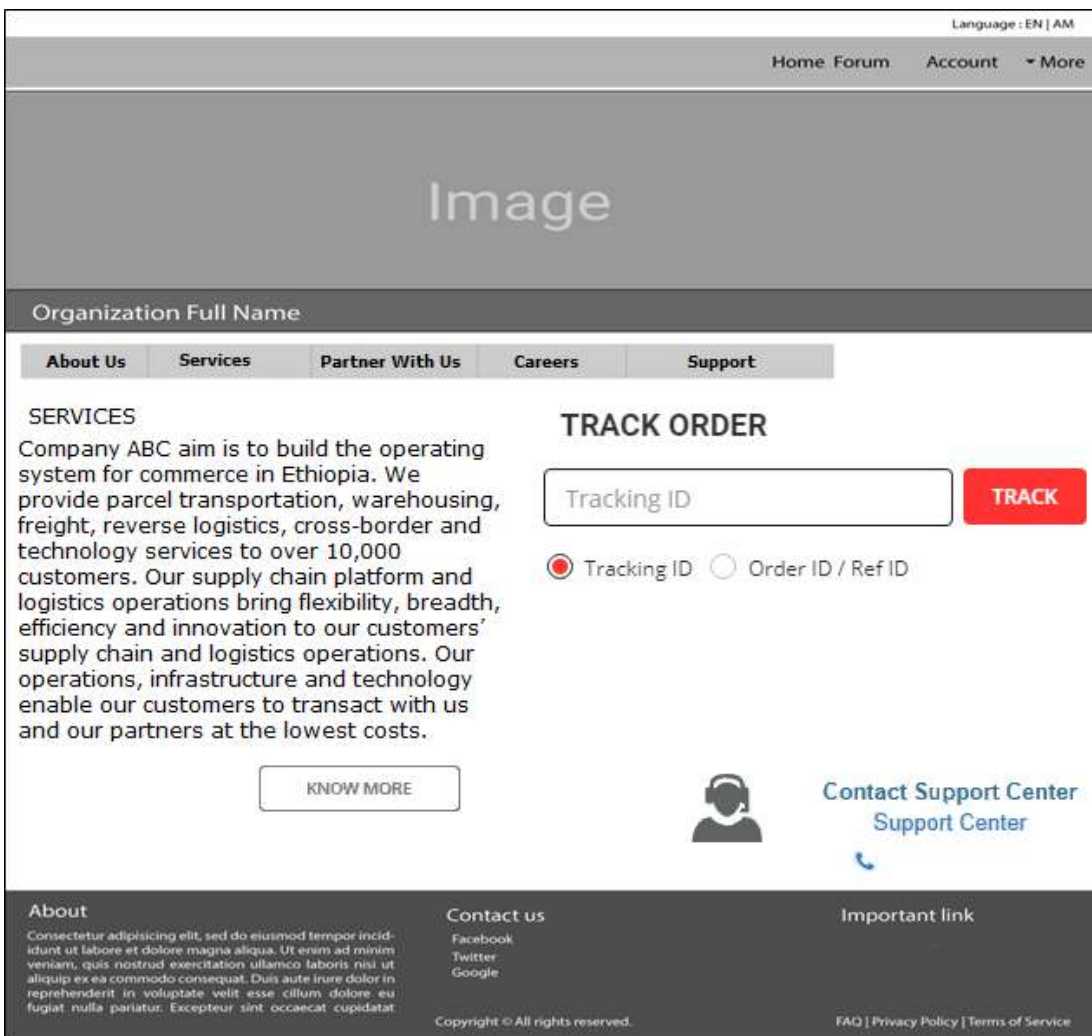
This module is used to manage service/case dispatching for each delegated service. Case dispatcher are used to set different rules for different delegated services for given organization. You can create new rules, edit, publish, reorder, activate/deactivate, clone or delete existing dispatcher rules for selected delegated service for further details see Appendix IV.

6.2 Data Design

In this Section, the persistent data management is presented as Entity-Relationship Model (ERM) diagram. ERM is an abstract and conceptual representation of data. In addition, E-R represents the conceptual database of the system. In all the E-R diagrams, the notation represents entities as boxes, and relationships as lines between the boxes. Different shapes at the ends of these lines represent the cardinality of the relationship (i.e., 1 or many). For ease of readability, the E-R diagram of the e-Logistics system is categorized and presented on the bases of logical relationship see Appendix IV.

6.3 Graphical User Interface Designs (Prototypes)

6.3.1 CUSTOMER PORTAL MODULE



Image

Organization Full Name

About Us

Services

Partner With Us

Careers

Support

Knowledge Base

Type *

Express delivery

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Integer ne.

Description*

Lorem ipsum dolor sit amet

Pick Up code

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Integer ne.

First Name

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Integer ne.

Last Name

Lorem ipsum dolor sit amet

Delivery Code

Lorem ipsum dolor sit amet

Submit



Contact Support Center
Support Center



How can i help you?

what should you prepare before you
come to our office?

About

Consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat

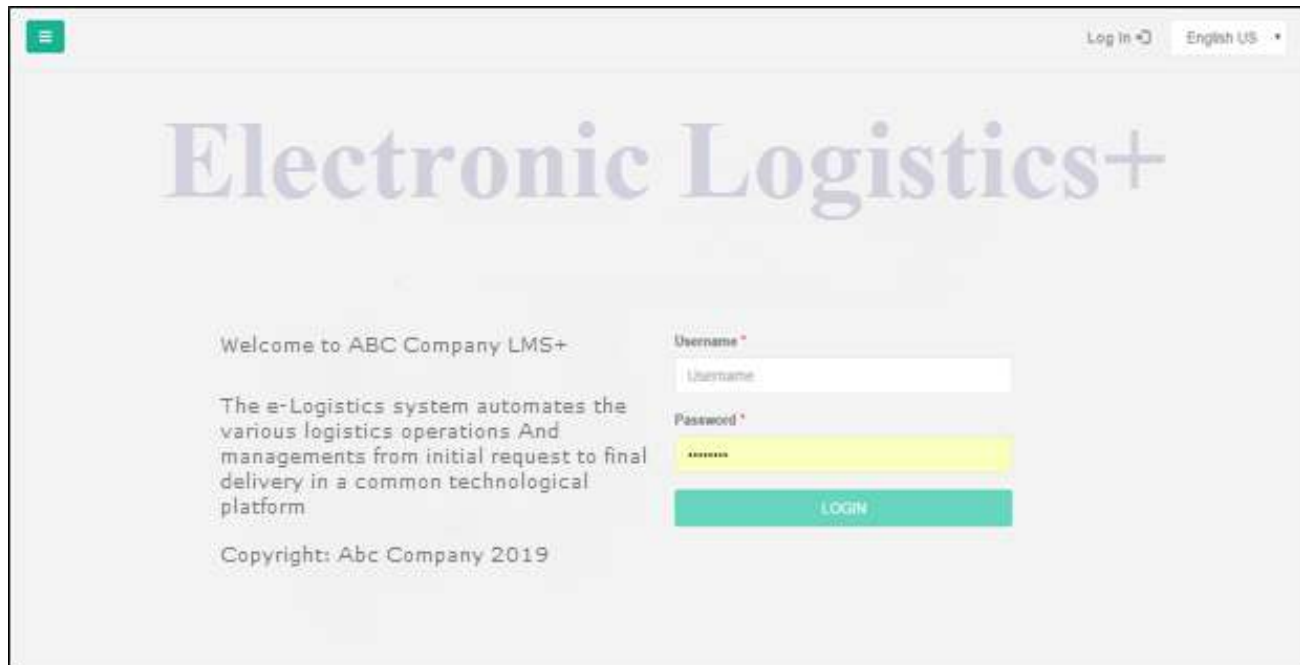
Contact us

Facebook
Twitter
Google

Important link

FAQ | Privacy Policy | Terms of Service

6.3.2 AUTHENTICATION MODULE



The screenshot displays the login interface for the 'Electronic Logistics+' system. At the top right, there are links for 'Log In' and 'English US'. The main heading is 'Electronic Logistics+'. Below this, the text reads: 'Welcome to ABC Company LMS+', 'The e-Logistics system automates the various logistics operations And managements from initial request to final delivery in a common technological platform', and 'Copyright: Abc Company 2019'. The login form includes a 'Username' field, a 'Password' field (masked with asterisks), and a green 'LOGIN' button.

6.4 Demonstration of The Artefact

A number of web application, components services features or (i.e., determinants, characteristics, heuristics) identified from preliminary phase, phase B, and phase C, are exhibited to measure the viability and value of these service features. For instance, the web service features acquired from phase B, are utilized to redesign various online services in phase C in order to advance the comprehension and perception of the information and service providers specialists of logistics organizations on the electronic data design. Phase D exhibits the manner in which the online IA as well promotes information exchanging and interoperability among e-commerce actors, employees of a particular company and with other logistics Agents. Thus, these research asses the effectiveness of the information architecture to improve interoperability and information exchanging practices.

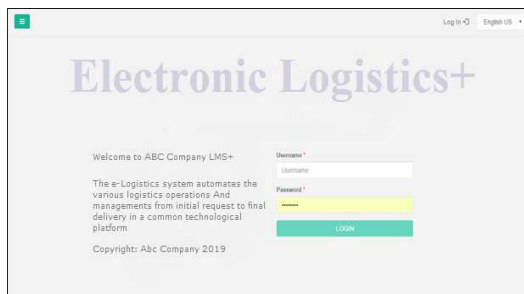
Different configurations of the web application where showed together with the configuration of certain service creation, this leads to an advice of which logistics service components should be implemented to solve each logistics company problems, which web application class should be implemented, and which design situation of web service should be selected. During the expert interviews, all the elements of the IA framework and the framework as a whole were compared to real world examples and were validated as correct. During the demonstration different execution

paths were shown and if necessary, possible changes were made when the expert point it out as necessary. Additional explanation was given on the possible execution paths of the framework. This explanation was focused on the limited implementation paths because of the low number of respondents.

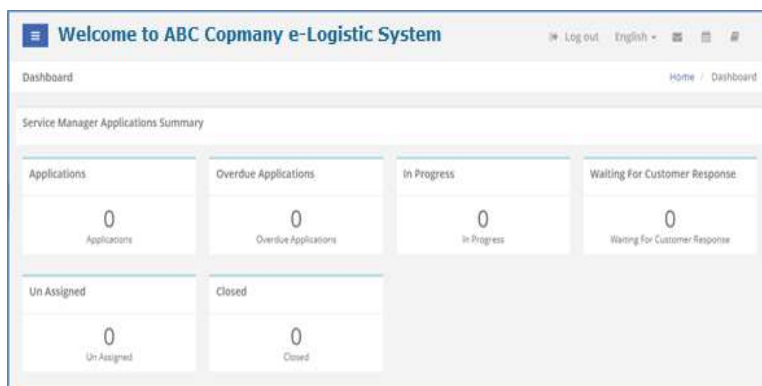
If the number of respondents is higher, the possibilities of the IA implementation scenarios should increase. The comments of the experts on the overall working framework were positive, and no major changes were proposed. This is due to the fact that the actual elements were validated in the evaluation section and this demonstration sole purpose was to demonstrate the working framework to the experts. The experts all agreed on the same strong and weaknesses of the correctness of the framework. The framework's weakness was mainly based on the lack of a high number of IA implementation cases. The experts stated when the IA implementation cases sample would increase the power of the IA framework would also increase. The experts complemented on the fact that such a large problem could be summarized in such a clear and useful tool to support the implementation of e-Logistics.

6.4.1 Service/Case Fulfillment Scenario Demonstration

A. User Login

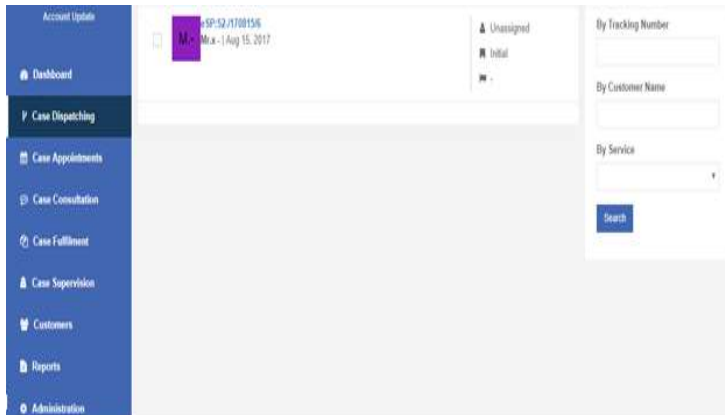


1. Open System
2. Type User Name and Password
3. Click login button. To get into the system. Then you will see a page just like the picture below



B. Case Dispatching

This module allows you to dispatch service requests to a unit of an organization



Who uses the module?

- A case worker with dispatcher role
- Prerequisite to use the Module
- Service request must be submitted from a customer

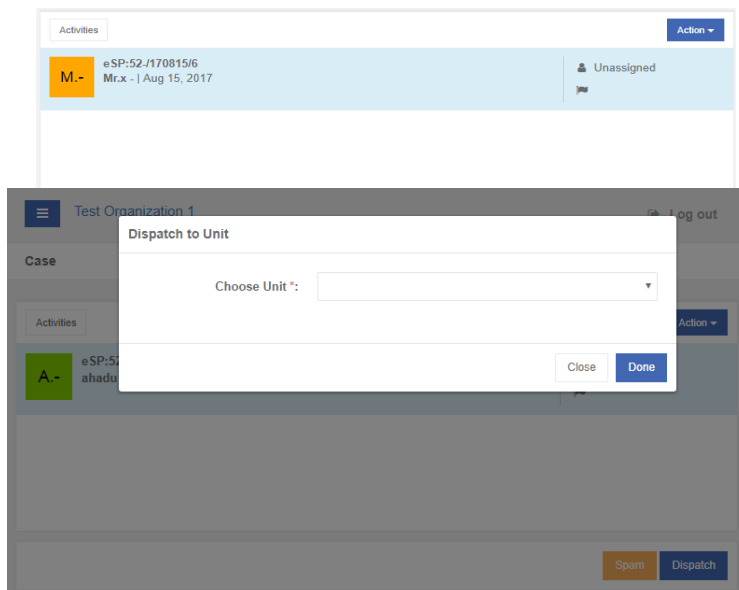
How to use Case dispatching module?

Dispatch a case

2. Then click on the case dispatching from the left side menu as shown above.

3. Then submitted cases will be displayed.

4. Then choose the submitted case you want to Dispatch



5. Then Click on the dispatch button.

6. Then you will see a modal with a list of units.

7. Select unit that you want to dispatch the case to by clicking in the combo box

8. Click **done**

C. Case Fulfillment

Purpose

This module is used to fulfill customer service request that dispatched to a specific service delivery unit. This module is starting point for case worker to do on customer service request. Case fulfillment contain the following operations:

I. Business Operations:

1. Form Based
2. Review - Actions: Adjust and Approve
3. Confirm
4. Drop-off Appointment
5. Notification and Track
6. Return Management

Who uses the module?

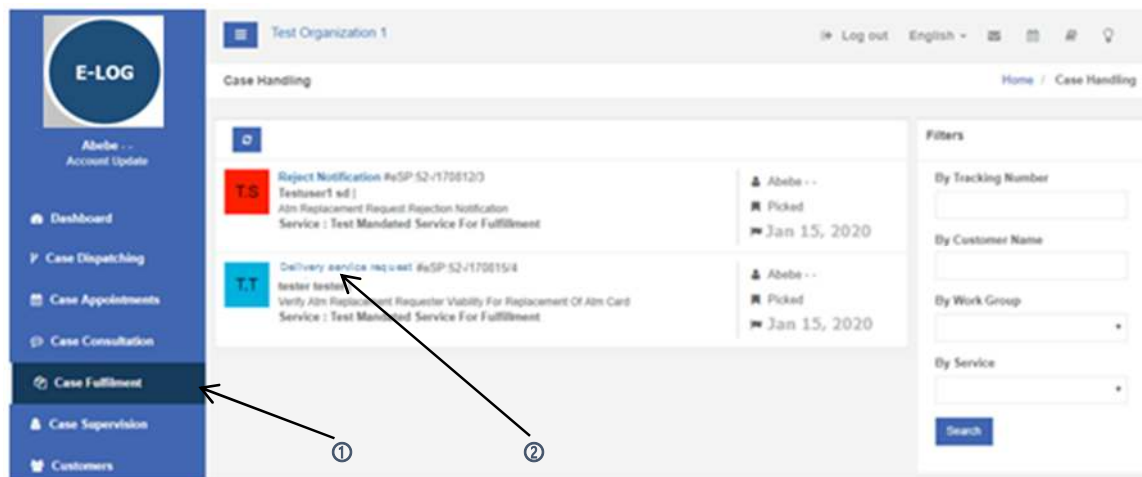
- Case worker

Prerequisite to use the Module

- Case has to be dispatched
- User name and password with caseworker role

How to use this module?

1. Login to the system
2. Select Case Fulfillment menu that is shown below picture that marked by ① and the system renders list of customer cases.



3. Click case title on the above picture that marked by ② and the system renders the following screen.

Completed Task

Search here Q

- 1 - Request
- 2 - Request Review

Current Task

T.T

 Abebe --
 Picked

Not Confirmed
Confirmed

Correspondence

A.--

Abebe -- | Jan, 15 2020

Moment 2.10.0 does not bring any new features, but the code is now written in ECMAScript 6 modules and placed inside src/. Previously moment.js

A.--

[Reply / Forward / Redirect to supervisor / Consult / Add Note](#)

①

②

③

④

A. Business Operations:

1. Form Based

Current Task

B.B.@.Gr

 Abebe --
 Assigned
 Jan, 15, 2020

Delivery Service Request | eSP:52-170817/60
bnvsdghsdfh@gmail.com | Aug 17, 2017
Transfer ATM Card Replacement

Customer Name

Purchase Item Order Number

Delivery Address

Request Agreement Detail

Save
Done

2. Review

As you see bellow picture, you have 3 option to do on this task namely:

- Adjust: This operation redirects the task to customer.
- Reject: This operation aborts and transfer the task to Notification operation.
- Approve: This operation transfer task to Confirm task operation.

The screenshot displays a task management interface. At the top, under 'Current Task', there is a task titled 'Request Review | eSP:52-170818/70' assigned to 'Testuser1 sd' on 'Jan. 15, 2020'. The task is assigned to 'Abebe - -' and is marked as 'Picked'. Below this is a 'Review Remark' section with a large text input area. At the bottom of the task section are three buttons: 'Adjust' (orange), 'Reject' (red), and 'Approve' (blue). Below the task section is a 'Correspondence' section with a purple header and a list of actions: 'Reply / Forward / Redirect to supervisor / Consult / Add Note'.

3. Confirm

As you see bellow picture, you have 2action button that used to do this task. These are:

- **Not Confirm**: this operation aborts the task and transfers the **Notification** operation.
- **Confirm**: this operation transfer task to next task

Current Task

T.S Verify Order Request | eSP:52-/170818/70
 Testuser1 sd | Aug 18, 2017

Abebe --
 Picked

Review Remark *

Not Confirmed Confirmed

Correspondence

A. -- --
 Reply / Forward / Redirect to supervisor / Consult / Add Note

4. Drop-off Appointment

As you see below picture, you set start date and end date and click Plan Schedule button.

Current Task

T.S Pickup Scheduling | eSP:52-/170818/70
 Testuser1 sd | Aug 18, 2017

Abebe --
 Picked

StartDate *

EndDate *

Plan Schedule

Correspondence

A. -- --
 Reply / Forward / Redirect to supervisor / Consult / Add Note

5. Notification

Current Task

M.-.- Reject Notification | eSP:52-/170818/81
ma -- | Aug 18, 2017
ATM Replacement Request Rejection Notification

Abebe - -
Picked
Aug 18, 2017

Subject *

Notification *

□

□

□

13□

□

□

□□

□□

□

6. Return Management

a. Click Forward link at step 3 picture marked by ③ and the system modify your screen as you see below.

Completed Task

1 - Request

2 - Request Review

Current Task

T.T Verify ATM Replacement | eSP:52-/170815/4
tester tester | Aug 15, 2017

Abebe - -
Picked

Not Confirmed
Confirmed

Correspondence

Abebe - - | Aug 15, 2017

Moment 2.10.0 does not bring any new features, but the code is now written in ECMAScript 6 modules and placed inside src/ . Previously moment.js

B
I
U
13
☰
☰
☰
CR
KB
File

Cancel
Send

[Reply](#) / [Forward](#) / [Redirect to supervisor](#) / [Consult](#) / [Add Note](#)

94

6.5 Evaluation of The Generic E-Logistics Information Architecture

The constructed generic web based IA is finally evaluated by experts both from the logistics sector and IT. These experts are web master, database administrators, information expert, logistics operation unit owners, IT team leader, technology experts and managers. The evaluations try's to identify the extent of users' acceptance of the web based IA which is designed in this study. The points raised to evaluate the created artifacts are the following [72].

- The generic web IA can help customers to quickly find relevant information on the web.
- The designed information content and e-Logistics information requirements are the same.
- The generic web IA is useful for user satisfaction.
- Generic web IA increases information exchanging by recommending services related to the ones being considered.
- Generic web IA is simple and easy to use.

Summary of evaluation of experts' acceptance testing result is presented below.

Evaluation of the Information Architecture		Strongly Agree(5)	Agree(4)	Neutral(3)	Disagree(2)	Strongly Disagree(1)	Average
1	The generic web IA help customers to quickly find relevant information on the web system.	5	3	1			4.44
2	The Constructed information content and e-logistics information requirement the same.	6	2	1			4.55
3	The generic web IA useful for user satisfaction.	4	1	4			3
4	The generic web IA enable to improve web site design and usability.	4	4	1			4.33
5	The generic web IA enable to improve service delivering system.	7	2				4.77
6	The generic web IA increase information exchange by recommending pages related to the ones being considered.	7	2				4.77
7	The generic web IA adaptive and easy to use?	7	1	1			4.66
8	The generic web IA enable information exchange between Employee.	7	1	1			4.66
Average							4.39

Table-6.1 Evaluation of the generic web based e-Logistics

According to the evaluation result obtained (see table 6.1 above), 4 .39 on average experts believe that the web based IA is useful. This clearly shows that the created web based IA improves information exchanging practice, helps users to quickly find relevant information on the web, increases service delivery system of logistics and improves interoperability.

6.5.1 Discussion of Results

The overall objective of this AI is create what information sharing elements are necessary in order to create a well-managed information exchange situation and design AI that could satisfy these situations in a manner that can have generification so as to serve general e-logistics industry. The means they implement it in order to reach

the aim differs in many respects such as, the specific industry firms are engaged in, the IT maturity level of the firms, skill-set that is found in each organization and governance are main environmental issues.

By highlighting the generative mechanisms of DHIS2 and E-Services Ethiopia and the surrounding ecosystem, we may discover what features of the HMISs and E-Services that are used to adapt the system towards the domain of e-logistics. First, the platform-like architecture of DHIS2 E-Services Ethiopia is examined and how the generative capacity is used to configure the system's core, create custom applications and enable end-users to meet the functional requirements of an e-logistics. Next, I evaluate how the heterogeneous actors involved in the projects have formed general relationships that support the re-appropriation process. By examining information contents that are required in e-logistics' information architecture according to business entities and internal work unit's requirement, I also highlight how IA can be utilized for implementation and how they form the design through participation. By combining the findings with supporting literature, I propose IA that captures the essence of the socio-technical re-appropriation process, together with a table showing evaluation summary of the user acceptance test results. All the process models of DSR along with TOGAF are considered in this IA, as they all show qualities that are beneficial to the e-logistics process.

Configuration of the Core

In the model presented by Roland and others, the generic core is said to have a low design flexibility, but high use flexibility [73]. This description matches well with the proposed IA. The core offers a high use flexibility by providing the metadata model, which makes the information system configurable to a large amount of settings. In addition, the source code is itself flexible and accessible as a FOSS, but changes in the code are far less accessible and significantly more complex than the flexibility offered by the metadata model. The case in two companies included a change in the source code of e-logistics IA. Yet, the programming was done. Changes in the code requires great insight in both the C# programming language and the core's general architecture. Thus, it is safe to say the design flexibility in the generic core is rather low. On the other hand, all cases involved have a great amount of metadata configuration, i.e. use flexibility. All demonstrations created a metadata structure that represented the domain of logistics, through configuration of data elements, indicators, categories.

End-user Development

Configuration of the core is a crucial phase of re-appropriation because it sets the assumptions for the outer layers. The e-logistics core's usage flexibility is reflected in the metadata model. On one hand,

a successful metadata structure is one that enables the implementation to meet the functional requirements, by allowing developers to create specific solutions on top of an architecture that is tailored towards the unique context or domain. On the other, a faulty configuration of the metadata model can lead to problems down the line. Thus, design choices made in the core are propagated to the outer layers and issues with the design often become imminent at a later stage of the implementation.

The complete IA was revealed to the experts during demonstration, all the working elements were demonstrated. Different configurations of the platform were shown together with the configuration of certain design problems, this leads to an advice of which method fragments should be implemented to solve the problems.

During the expert evaluation, all the elements of the IA and the IA as a whole were compared to real world examples and were validated as correct. During the evaluation different execution paths were shown and if necessary, possible changes were made when the expert point it out as necessary. Additional explanation was given on the possible execution paths of the framework. This explanation was focused on the limited execution paths because of the low number of respondents. When the number of respondents is higher, the possible number of the configuration and usefulness of the IA also increases. The comments of the experts on the overall working framework were positive, and no major changes were proposed.

CHAPTER SEVEN

Conclusion and Recommendation

7.1 Overview

This chapter discusses the research's output i.e. the artifact, main findings in a manner that answers the research questions and meets the objectives of the research and provides conclusions drawn from the research and the recommendations for future research.

7.1.1. Discussion

The core objective of this research is designing a generic web IA for e-commerce logistics industry to promote information exchange among different organs of the logistics supply chain, e-commerce platform providers and suppliers externally and at the same time between the units/departments of a single logistics companies. In order to achieve this objective, design science research, case study and TOGAF are employed in this research. The research was conducted on five logistics firms that are found in Addis Ababa.

Interviews were conducted with the Domain Expert respondents who were identified according to the actors defined by TOGAF. The interview identified the information requirements of the Departments of the Warehouse Management and operations units, Transport Management and operations units and ICT and technology units. On the basis of the requirements, Information architecture was designed and Architecture Vision and business architecture were analyzed. The business architecture showed the business capabilities of logistics industry, the major business process of logistics and the information used by each business process. The current information exchanging practice of most of the matured logistics enterprise is found out to be mostly manual. Hence, a generic web centered Information Architecture is designed to enable service users to access information through web system.

Conclusions are presented according to the research objectives and discussed in detail on the basis of research questions that are stated in chapter one. Therefore, three sub-objectives are defined to achieve the research objective. Thus, the result came up with the following conclusions for each research question as discussed below.

One of the issue raised in this study is identifying the key interoperability capabilities and information exchanging practices of the Ethiopian e-Logistics accordingly,

The interviews conducted with the Domain Expert respondents and the analysis of logistics services capability showed that the current business process of logistics industry in the country, interoperability and information exchanging practice and the way of service delivery method to customers is through documents, seminars, training. Thus, the problems identified in the current situation are: -

1. *Existing Systems Structures and Designs*: - The interview illustrated that the service capabilities of e-Logistics are delivered based on semi-automated and fragmented systems; for this reason, among others there is low quality of service, none existence interoperability among different stakeholders and low quality of data in addition data redundancy problems are common.
2. *Logistics Transaction Planning*: - Transactions Planning is the most essential element of e-logistics supply chain management, the current practices of the planning are unstructured and disorganized in most of the cases which doesn't have a predefined logical or physical processes structure.
3. *Service Delivery and process efficiency*: - Form the interview we identified information exchange among businesses and between internal business units of companies are largely manually there is no web based information exchanging - since there is no interactive and collaborative information sharing facility between internal business units in which the most of the activities are done manually that evidently create low quality of service and an information gap with in different business partners customers and within the sections of a specific business unit and with other units also.
4. *Performance Monitoring from End User Perspective*: - Currently there is no mechanisms to track and monitor works from the customer's side.
5. *Measure Service Ratings*: - Form the interview we identified that there are no gadgets for customers to measure the level of satisfaction by services they get form the organizations
6. *Automated Escalation – Process Traceability and Visibility and Early Handling of SLA Violations*:
- Even though all service provisions have specific service level agreements and contracts there is no means of early problem detection and handling mechanisms in place.
7. *Information Retrieval and Data Analytics*: - Accessing different information resources is very difficult to access easily i.e. most have either manual search mechanism or semi-automated and

fragmented organizational data structures. Thereby making it time consuming in case they need to see the old original document.

8. *Preparing Different Formats*: - Since there is a delay in exchanging reports as these passes through many levels, they are vulnerable to damage and quality problems which make it hard to prepare Report. It does take time to collect original documents and compile them for formatted report.
9. *Security and Control Problem*: - Currently All of the company's systems has little security. Each organization employees do not have a role based hierarchical access to information resources. Hence this situation leaves companies vulnerable to internal and external threat.
10. *The other advantage is provision of real-time logistics service information*: - Compared to legacy practices of obtaining logistics services information daily and manually from a multitude of agencies in the Logistics lifecycle, this connected and online look up is highly advanced and ensure seamless optimal price selection done automatically though the cycle across Agencies and Actors. These logistics services information should be aggregated online using a "logistics service information Look Up APIs" hosted by the Logistics Provider, so it is possible to get real-time logistics service information from a whole range of service providers, updated by the minute, hour or day. Automatic, Accurate and Real-Time Payments reconciliation also follows as a logical result of this connected eco-system. All in all, Rates and Payments no longer are an impediment to a seamless Delivery experience.
11. *The other key attribute of the proposed IA is facilitating Reverse Logistics*: - E-Commerce based Logistics IA as compared to traditional Logistics is the relative proportion of Returns. Depending on the commodity being sold on E-Commerce sites, returns tend to be an inevitability and any Logistics Ancillary Service Provider & System is in a position to adapt to reverse logistics.
12. *Audit Trails*: - Since the way to communicate between different internal directorates are manual, which results manual data exchange or by using external drivers it is big problem and it would be cause for data damage.

All these uncertainties are due to unavailability of right information. We identified important issues that cause for all the above problem by analyzed the e-Logistics business capabilities and business process decompositions and the research identified the requirement information for logistics services to efficiently and effectively e-Commerce. Then we tried to find out who own this information in the services and either each units have permission to access this information or not.

The other issue is delineating the logistic supply chain information contents that are required in e-logistics' information architecture according to business entities and internal work unit's requirement?

In order to find out the requirement contents of the logistics supply chain information in the case of e-logistics we were focused on logistics service capabilities based on warehouse capacity capability, Transport capacity capability and we created the functional decomposition diagram and presented the services capabilities of Logistics management and operations that are pertinent to the concern of an information architecture while we examined services capabilities of Logistics from a functionality standpoint, thus it is conceivable to rapidly create models so that logistics organizations perform this task without being dragged into extended debate on how to do it. Thus we showed the business processes and from the business process we identified the required information for the e-Logistics IA. In this study we attempt finally to design a generic Information Architecture for a Logistic chain in supporting e-Commerce.

The base for the generic IA is the requirements that is gathered from the respondents, business architecture analysis and state of the art literature review. This follows the TOGAF. The requirements identified from the interview with respondents from domain experts are used to design the architecture. Microsoft Visio/UML was used to visualize the architecture which is clearly discussed in chapter three. The business architecture shows different services capabilities that provided by a logistics companies and different business process respective to capabilities. Information architecture shows how the users access to the service.

7.1.2. Conclusion

This research has tried to reveal how an information architecture can be designed to meet functional requirements. Several authors write about generic information systems and how they are made to accommodate a collection of requirements from a wide range of organizations and contexts. As such systems grow, they turn into complex ecosystems with several levels of flexibility. One might argue that this flexibility makes such generic information systems adaptable not only to other organizations, but other domains entirely. Yet, the existing literature on this process of generification and re-appropriation were found rather limited among many other factors. By conducting a study on DHIS2, of the who and E-Services Ethiopia, I have examined how to design a generic IA for e-Commerce logistics information sharing. There are two main essential findings that are found critical for the successful investigate of this IA design.

- Technical enablers: The designing of the IA through re-appropriation process was achieved by designing the information system that have certain generative capacity that have similarity to the

ones that were mentioned earlier that include, a configurable core that is modified easily by the domain system experts, sophisticated end-user configuration tools and endorsement of best practices by the logistics industry experts and finally infrastructure that support the operation of IA.

- Social enablers: Assisting the technical enablers, the process also requires a diversity of heterogeneous stakeholders that participate in the process through aligned and mutual directedness, complementing each other's knowledge, permissions, social standing and resources. The information architecture must "grow" into use by the processes of cultivation and participatory design, in which the end users actively participate in the design process and are appropriately trained to meet the functional requirements of e-logistics.

The main limitations of this research is that the low amount of experts were used for validation of the IA. The IA is validated by experts in demonstration. However, to support a real world implementation, additional proof is needed that the IA is valid and correct. Nonetheless, the validation of the IA is performed in a controlled and rigorous way and can be seen as a contribution to the field.

One of the main limitations of this research is that the low amount of experts used for validation of the IA. Another limitation regards the actual working proof of the framework. The IA is validated by experts in demonstration. However, to support a real world implementation, additional proof is needed that the IA is valid and correct. Nonetheless, the validation of the IA is performed in a controlled and rigorous way and can be seen as a contribution to the field.

Lastly, this limitation regards the exploratory nature of this research concerning the use of situational artefact construction in an immature field. It is still not clear that using this technique is possible in immature fields and therefore possibly threats to validity could arise.

In an IA for logistics is important to clearly represent three main factors:

- Information flows: Movement of information from a generating entity to a receiving entity;
- Information sources: Internal process or units that generate data;
- Type of information: The characteristics of information to be exchanged.

Regarding the type of information, in general we can classify information in six categories: information related to the customer (i.e. information about service user), information related to Fulfillment (i.e. job completion, Job request, business units and resources), information related to

Service (i.e. information on specific service, service capability, service responsibility and service request information) are the general characteristics of the information to be exchanged.

7.2. Recommendation

On the basis of logistics requirement, the generic IA and the supportive information classification and information model has been developed. Still all the issues have not been addressed in this research. Thus the following research has been recommended.

1. The architecture proposed by this research is a conceptual architecture. So, there is lot more detail information necessary to adopt this kind of architecture. Like for example, what could be the detail technological specifications like capacity of servers, configuration of computers, speed of connectivity according to the access, what could be the financial requirements and so on. Thus, it is recommended to do the study on in depth analysis of requirements on the basis of the designed architecture.
2. On the basis of logistics domain experts' requirements, the generic IA and the supportive information classification and information architecture has been developed. The proposed IA will solve the problems mentioned in the current system if logistics companies implement the proposed architecture.
3. It is also necessary to provide training for employees working on the system to successfully implement the proposed architecture.
4. E-Commerce involves a lot of components that enables the core process, such as payment technological standards, legal frameworks and citizen readiness this research is only focused on the principal elements of logistics management, there still remains a vast area of work to be done in the above domains as well in the logistics itself to fully enable e-Commerce.
5. The IA to design aims at improving and optimizing ICT resources and to standardize the information exchange and promote interoperability.

Still all the issues that have been listed need scientific justifications and substantiate them with proper evidence. Thus, the above recommended researches especially no 4 and 5 in relation to e-Commerce interoperability capability and information exchanging in e-Commerce have been recommended for the future researches. It is also necessary to undertake research by implementing the proposed architecture and evaluate its effectiveness in the day to day information exchanging activities among the logistics and e-Commerce sector.

References

- [1] J. Abraham, S. Lone and Couenberg., "Ecommerce Report Portugal 2017," Ecommerce Foundation, Netherlands, 2017.
- [2] J. N. Florian, and J. Schröder, "Martin How Customer demands are reshaping last-mile delivery," in *McKinsey&Company*, 2016.
- [3] PCA Predict, "PCA Predict. Fixing Failed Deliveries: Improving Data Quality in Retail," in *PCA Predict A GBG Company*, 2017.
- [4] T. Netzer, J. Krause, L. Hausmann, F. Bauer, and T. Ecker , "The Urban Delivery bet USD 5 billion in venture capital," McKinsey and Company, 2017.
- [5] T. Vanelslander, D. Lieven and V. Dennis, "Commonly used ecommerce supply chains for fast moving consumer goods comparison and suggestions for improvement," *International Journal of Logistics Research and Applications*, vol. 16, no. 3, pp. 243-256, 2013.
- [6] A. Gurung, "A Survey of Information Technologies in Logistics Management," University of Texas at Arlingto, Texas, 2015.
- [7] L. Rosenfeld, P. Morville, and J. Arango, *Information Architecture: For the Web and Beyond*, 1005 Gravenstein Highway North, Sebastopol, CA: O'Reilly Media, Inc., 2015.
- [8] Information architecture Institute, "iainstitute," Information architecture Institute, 07 06 2020. [Online]. Available: www.iainstitute.org/what-is-ia. [Accessed 07 06 2020].
- [9] ITU report, "Measurin the Information Society Report Volume 1," ITU Publicnati, Geneva Switzerland, 2018.
- [10] GS1, "GS1 Logistics Interoperability Model Application Standard," 2018.
- [11] C. R. Moberg, B. D. Cutler, A. Gross, and T. W. Speh, "Identifying antecedents of information exchange within supply chains," *International Journal of Physical Distribution and Logistics Management*, vol. 5, no. 2, pp. 423-432, 2000.
- [12] D. J. Teece, *Managing intellectual capital*, New York: Oxford University Press:, 2000.

- [13] Z. Ali Bigdeli, M. Muhammad Kamal and S. deCesare , "Inter-Organisational Electronic Information Sharing in Local G2G Settings," in *A Socio-Technical Issue*, New York, 2000.
- [14] D. Fekadu, "Fikadu Debela Logistics in Ethiopia An Unpublished masters thesis," Unpublished, Addis Ababa, 2013.
- [15] A. Tiwana, " Platform ecosystems: aligning architecture, governance, and strategy. Newnes," 2013.
- [16] P. Nielsen and J. I. Sæbø , "Three strategies for functional architecting: cases from the health systems of developing countries," *Information Technology for Development*, vol. 22, no. 1, p. 134–151, 2016.
- [17] Z. Justin Ren, "Empirical Studies in Information Sharing," *Handbook of Information Exchange in Supply Chain Management*, , vol. 5, pp. 45-56, 2017.
- [18] A. Resmini and L. Rosati, "A Brief History of Information Architecture," *Journal of Information Architecture*, vol. 3, no. 2, pp. 33 - 78, 2011.
- [19] J. James , *The Elements of User Experience: User-Centered Design for the Web and Beyond*, Second Edition, Berkeley, CA: Garrett New Riders1249, 2011.
- [20] AXELOS, ITIL® Foundation ITIL 4 Edition, London: TSO (The Stationery Office), 2019.
- [21] ISO/IEC/IEEE, "ISO/IEC/IEEE Systems and software engineering – Architecture description, ISO/IEC/ IEEE FDIS 42010," International Organization for Standardization, Geneva, 2011.
- [22] M. Lankhorst, *Enterprise Architecture at Work: Modelling, Communication and Analysis*, Berlin, Heidelberg: Springer, 2017.
- [23] L. Bass, P. Clements and R. Kazman, *Software Architecture in Practice.*, Boston: Addison-Wesley, 2003.
- [24] M. Lankhorst, *Enterprise Architecture at Work: Modelling, Communication and Analysis.*, Berlin, Heidelberg.: Springer, 2009.

- [25] J. A. Zachman, "A framework for information systems architecture," *IBM systems journal*, vol. 26, no. 3, pp. 276-292, 1987.
- [26] The Open Group, TOGAF™ Version 9 – A Pocket Guide, Berkshire: The Open Group, 2009.
- [27] R. Hilliard, All about IEEE Std 1471. IEEE Recommended Practice for Architectural Description of Software Intensive Systems (IEEE Std 1471-2000)., New York: IEEE Computer Society, 2007.
- [28] C4ISR Architecture Working Group, C4ISR architecture framework version 2.0., 1997.
- [29] W. Chambers, J. W. Hopkins, P. L. Stenberg, "E-Commerce in United States Agriculture," *European Repository journal*, p. 36, 2001.
- [30] E. Turban, Electronic Commerce A Managerial and Social Network Perspective, New York Dordrecht London: Springer Cham Heidelberg, 2015.
- [31] Chou, "A structural analysis of business to business digital markets," *Industrial Marketing Managemet*, vol. 13, pp. 165-176, 2002.
- [32] S. Barret and B. Konsynski, "Interorganizational Information Sharing Systems," *MIS Quarterly*, no. Special Issue, pp. 93-105, 1982.
- [33] S. Bakos et.al, "The emerging role of electronic marketplaces on the Internet," *Association for Computing Machinery*, pp. 35-42, 2014.
- [34] Nabi, "Fasil Nabi Designing a Framework method for Secure Business Application Logic Integrity in e-Commerce Systems," *International Journals of Network Security*, vol. 12, no. 1, pp. .29-41, 2011.
- [35] J. Reynolds, Logistics and Fulfillment for e-business, New York: Focal Press, 2001.
- [36] Deborah L. Bayles, "E-Logistics and E-Fulfillment: Beyond The "BUY" Button," in *UNICTAD Workshop*, Curacao, 2002.

- [37] Lummus and Vokurka, "Defining supply chain management: a historical perspective a practical guidelines," *Industrial Management & Data Systems*, vol. 99, no. 1, pp. 11-17, 1999.
- [38] Singh, "E-Services and their role in B2C e-commerce," *Managing Service Quality: An International Journal*, vol. 12, pp. 434-446, 2002.
- [39] J. A. Cooke, "The Physical challenges of the virtual sale," *Logistics Management and Distribution Report Vol 39 No 10*, pp. pp 67- 73, 2000.
- [40] R. Starr, "Enterprise resilience: Managing risk in the networked wconomy," *Strategy and business Vol 30*, pp. 70-79, 2003.
- [41] Q. Tran, D. Huang, B. Liu, H. Md.Ekram, "A construction enterprise's readiness level in implementing e-procurement: A system engineering assesment model," *Systems engineering procedia*, vol. 2, pp. 131-141, 2011.
- [42] J. Razmi and S. Dehghan, "The role of IT in supply chain , its its application and implementation," in *First Conference in Supply Chain and Logistics*, Tehran Iran, 2004.
- [43] N. Pollock, R. Williams and L. D'Adderio, "Global software and its provenance: generification work in the production of organizational software packages," *Social Studies of Science*, vol. 37, no. 2, p. 254–280, 2007.
- [44] A. Gizaw, B. Bygstad, and P. Nielsen, "Open generification," *Information Systems Journal*,, vol. 27, no. 5, p. 619–642, 2017.
- [45] Y. Dittrich, "Software engineering beyond the project–sustaining software ecosystems," *Information and Software Technology*, vol. 56, no. 11, p. 1436–1456, 2014.
- [46] G. Fischer, E. Giaccardi, Y. Ye, A. G. Sutcliffe, and N. Mehandjiev, "Meta-design: a manifesto for end-user development," *Communications of the ACM*, vol. 47, no. 9, p. 33–37, 2004.
- [47] G. Fischer, "Rethinking software design in participation cultures," *Automated Software Engineering*, vol. 15, no. 3-4, p. 365–377, 2008.

- [48] O. H. Titlestad, K. Staring, & J. Braa, "Distributed development to enable user participation: multilevel design in the hisp network," *Scandinavian Journal of Information Systems*, vol. 21, no. 3, 2009.
- [49] M. Avital & D. Te'Eni, "From generative fit to generative capacity: exploring an emerging dimension of information systems design and task performance," *Information Systems Journal*, vol. 19, no. 4, p. 345–367, 2009.
- [50] S. Sahay, and J. [Jørn] Braa, "The dhis2 open source software platform: evolution over time and space. Global Health Informatics. Principles of eHealth and mHealth to Improve Quality of Care," in *Cambridge, MA: The MIT Press*, Masachuset, 2017.
- [51] M. o. I. a. T. (. Ethiopia, "Ethiopian eGovernment Implementation Strategic Plan 2020 of the Ministry of Communication and Information Technology (MCIT) Ethiopia 2015]," MiNT Ethiopia, Addis Ababa, 2015.
- [52] R. W. & L. D. N. Pollock, "Global software and its provenance: generification work in the production of organizational software packages," *SocialStudies of Science*, vol. 37, p. 254–280, 2007.
- [53] C.F. Grimm, *Inside a secret software lab: an ethnographic study of a global software package producer*, Edinburgh: Unpublished doctoral thesis, University of Edinburgh, United Kingdom, 2009.
- [54] M. Berg, "Rationalizing Medical Work: Decisionsupport Techniques and Medical Practices.," in *MIT Press, Cambridge, MA*, 1997.
- [55] M. Berg & E. Goorman, "The contextual nature of medical information," *International Journal of Medical Informatics*, vol. 56 , p. 51–60, 1999.
- [56] B. Kou, "Analysis and Evaluation on Logistics Service Quality for Online Network Ecommerce," in *Fifth International Conference on Instrumentation and Measurement, Computer, Communication and Control*, Shenyang, China, 2015.

- [57] B. Anu , L. Mervi, T. Markku, "E-Commerce Logistics: A Literature Research Review and Topics for Future Research," *International Journal of E-Services and Mobile Applications*, vol. 4, no. 1, pp. 1-22, 2012.
- [58] C. Yan, C. Jianfeng, S. Guolei, "A STUDY OF HETEROGENEOUS DATA INTEGRATION IN 4PLIS BASED ON WEB SERVICE AND MIDDLEWARE," in *ASCE The Eighth International Conference of Chinese Logistics and Transportation Professionals Logistics*, Dalian, 2012.
- [59] T. –. A. P. W. P. SERIES, "E-Commerce Trends and Challenges: A Logistics and Supply Chain Perspective," in *TLI – ASIA PACIFIC WHITE PAPERS SERIES*, Singapore, Volume 16-Nov-2016.
- [60] A. Hevner, "Hevner, March, Park, and Ram DESIGN SCIENCE IN INFORMATION SYSTEMS RESEARCH Alan R. Hevner, Salvatore T. March, Jinsoo Park, Sudha Ram," *MIS Quarterly* Vol. 28 No. 1, pp. 75-105, 2004.
- [61] A. Hevner, "DESIGN SCIENCE IN INFORMATION SYSTEMS RESEARCH," *MIS Quarterly*, vol. 28, pp. 75-105, 2004.
- [62] K. Peffers, T. Tuunanen, A. Rothenberger Marcus and S. Chatterjee, "A Design Science Research Methodology for Information Systems Research," *Journal of Management Information Systems*, vol. 24, no. 3, pp. 45-78, 2007.
- [63] I. Benbasat and R.W. Zmud, "Empirical research in information Systems: the practice of relevance," *MIS Quarterly*, vol. 23, no. 1, pp. 3-16, 1999.
- [64] G. Adomavicius, J.C. Bockstedt, A.Gupta and R.J. Kauffman, "Making sense of technology trends in the information technology landscape: a design science approach," *MIS Quarterly*, vol. 32, no. 4, pp. 779-809, 2008.
- [65] S.T. March and V.C. Storey, "Design Science in the Information Systems discipline: an introduction to the special issue on design science research,," *MIS Quarterly*, vol. 32, no. 4, pp. 725-730, 2008.

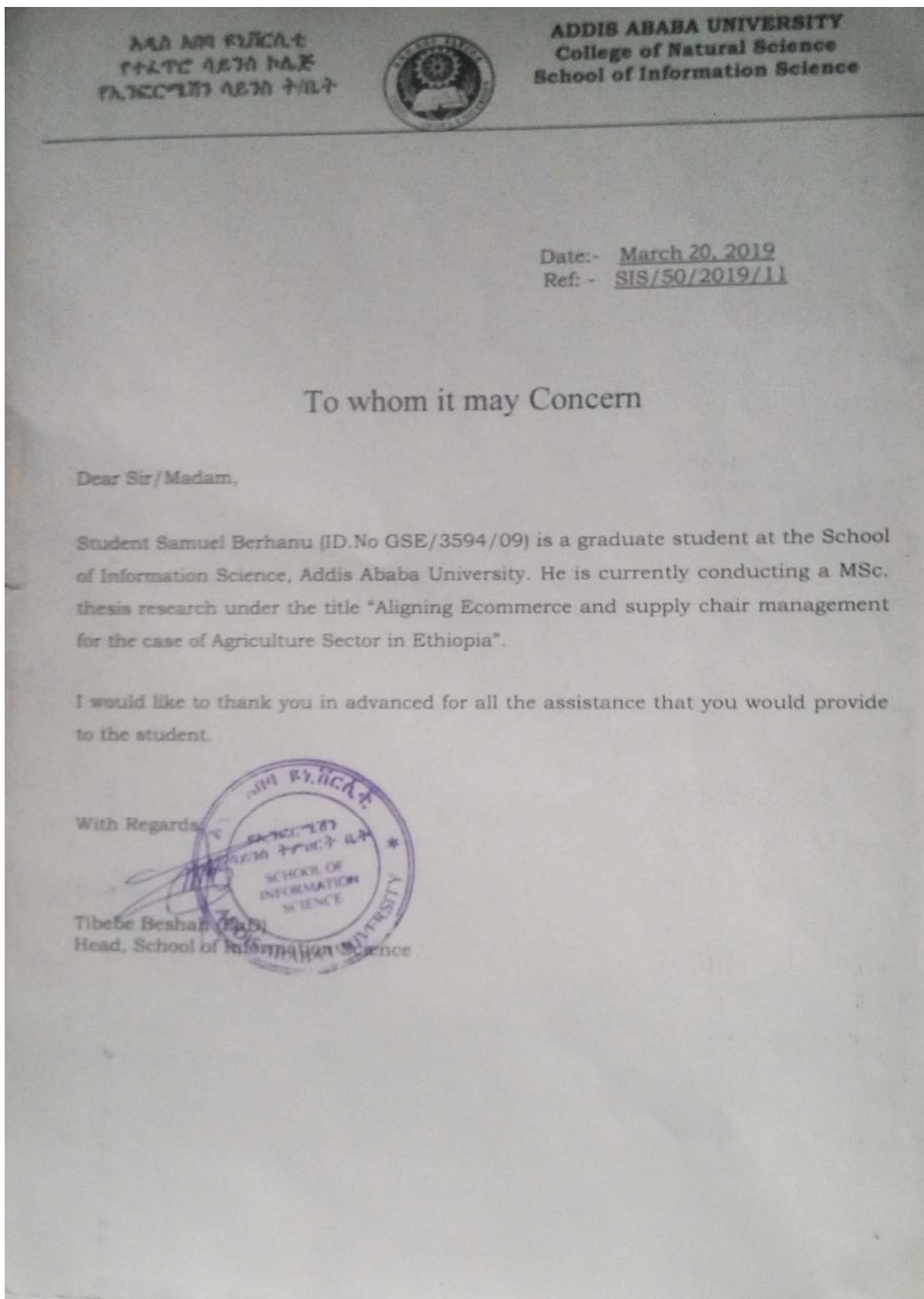
- [66] A. Hevner, S. Chatterjee, *Design Science Research in Information Systems*, Springer US, 2010.
- [67] J.R. Venable, "The role of theory and theorizing in design science research.," in *In Proceedings of the First International Conference on Design Science Research in Information Systems. 24th-25th February*, Claremont, CA., 2006.
- [68] J. Iivari, "A paradigmatic analysis of Information Systems as a design science," *Scandinavian Journal of Information Systems*, vol. 19, no. 2, pp. 39-64., 2007.
- [69] Webster, T. O. Group, *The Open Group Architecture Framework (TOGAF)*, New York: Webster, 2011.
- [70] TOGAF, *TOGAF, Togaf version 9e*, New York: The open Group, 2009.
- [71] K. Peffers, M. Rothenberger, T. Tuunanen and R. Vaezi Lee, "Design Science Research Evaluation," *DESRIST*, vol. LNCS 7286, no. Berlin Heidelberg, pp. 398-410, 2012.
- [72] A. Itay, *A Complete Guide to Quality Management Systems*, Boca Raton, FL: Taylor & Francis Group, 2017.
- [73] L. K. Roland, T. A. Sanner, J. I. Sæbø, and E. Monteiro, "P for platform. architectures of large-scale participatory design," *Scandinavian Journal of Information Systems*, vol. 29, no. 1, 2017.

APPENDICES

Appendix IV: Organizations' and resonant details

N.	Name of the institution	Business Address:	Name of the officer interviewed	Designation of the officer
1	Belay Trade and Logistics Service PLC	Addis Ababa, Bole Sub-city	Ermias G/medhin	General Manager
2	D.H.S. Transit PLC	Addis Ababa, Bole Sub-city	Kidist Shiferaw	Officer
3	Ethiopian Maritime transport and logistics service (COMET)	Addis Ababa, Akaki Kality Sub-city, Saris Abo	Haile Belay	Operation Manager
4	United Packers and Movers International PLC	Addis Ababa, Kirkos Sub-city	Amare Asefa	General Manager
5	Merha Transit PLC	Addis Ababa, Nifassilk Lafto Sub-city, Kadisco building	Ayalsew Mesfin	Operation Manager
6	C.L.S. Logistics Service	Addis Ababa, Bole sub-city	Neguse wabela	Shipping coordinator
7	Ethiopian Postal service Enterprise	Addis Ababa, Kirkos Sub city	Belesty Esubalew	Marketing and Business Development Manager
8	DHL Worldwide Express Ethiopia	Addis Ababa, Bole sub city, near Imperial hotel	Senay Lemma	HR Manager
9	Mugad Trading PLC	Addis Ababa, Kirkos Sub city, wereda 8	Alemayehu Kedid	Assistant manager
10	Ethiopian Airlines	Addis Ababa, Bole sub city	Ato Solomon	Corporate Communication Officer

Appendix: II – Letter of Support Request



Appendix: III - Interview Questions

Addis Ababa University

COLLEGE OF NATURAL AND COMPUTATIONAL SCIENCES SCHOOL OF INFORMATION SCIENCE

Research Questionnaire:

This table is left blank for researcher's use only

Questionnaire Code			
Department			
Issuance Date			
Return date			

Dear Prospective Participant,

This survey is aimed at collecting data and information from a cross section of logistics and logistics companies in Ethiopia related to development of a strategic alignment guide for E-Commerce in the country. The aim is to assess the readiness of the logistics and transportation sector in the country to support e-commerce and to evaluate gaps that may be currently existing and to help in the development of the most appropriate framework, strategies, policies and programs that must be undertaken in order to prepare the logistics and transportation sector in support of e-commerce.

General Instructions to Respond the Questionnaire:

Please carefully read the following notes for proper understanding of the items/questions of this data collection instrument. The data collected from individual respondents would be kept confidential and would be aggregated to draw important inferences and conclusions.

Should you require any further information, want feedback on the study or need to contact the researcher about any aspect of this study, please contact me using the following address—(Samuel Berhanu Balcha Mobile No. +251-911884098; Email samb2975@gmail.com).

Thank you for scarifying your precious time in advance!

1. Name of the Institution: _____

2. Business Address: _____

3. Name of the Officer filling the form: _____

4. Designation of the Officer: _____

5. Yours last year Revenue in Birr (Tick that applies)

- Less than 5 million Birr
- 5 - 15 Million Birr
- 15 - 25 Million Birr
- 25 - 35 Million Birr
- 35 - 50 Million Birr
- Excess of 50 Million Birr

6. How many full time employees for you have (Tick that applies)

- Less than 50
- 50-100
- 100-500
- More than 500

7. What is the nature of your business (Tick that applies)

- National Transporter / Trucker for movement of goods
- Regional Transporter of goods
- Parcel Services for businesses / individuals
- Domestic Courier service
- International Courier services
- National Warehouse Operator
- Cold Chain Operator
- None of the above
- Others:

8. What is the geographical coverage of your operations?

- Local (within the city)

Specify the names: _____

- Regional

Specify the regions within Ethiopia: _____

- National

Regional within Africa

Specify countries: _____

International

9. What is your product coverage? (Tick what applies)

Industrial and Engineering Products

Raw materials for construction industry

Raw Agriculture Produce in bulk

Raw Agriculture Products in packages

Processes Agro Products

Coffee / tea

Raw Leather

Leather Products

Textile and Clothing

Food Products

Consumer Durables / Electronics

Perishable Commodities

Other consumer products: _____

10. Physical Infrastructure: How many offices you have and where?

How many warehouses you have and where?

11. Transport and material handling equipment including trucks, vans and others that you have:

SN	Name of Equipment	Numbers	Specifications

12. If you handle perishable products like food, fruits and vegetables do you have specialized resources for transporting and storing such products like air conditioned vans and warehouses. (Tick what applies)

- Yes, we have
- No, we do not but will have soon
- No, we do not have
- None, does not apply

13. Do you employ information technology and computer systems for managing your logistics business? (Tick what applies)

- Yes some computers for routine office work
- Fleet Tracking Systems
- Delivery Tracking Systems
- Warehouse Management Systems
- Customer Relationship Management Systems
- External Web Portal Interfaces to Customers to track Deliveries
- Internal Web Portal Interfaces to internally manage aspects of your Logistics Business
- Mobile Apps or Mobile Handheld Devices for Goods Checking-In and Checking-Out at any point in the Logistics Chain
- Yes, we are subcontracting ICT work to outside companies
- No, we do not use IT

14. If you employ information technology and computer systems for managing your logistics business is your systems integrated with the systems of your business partners?

- No our ICT system is standalone
- Yes our system is web based integrated system – we allow our Business Partners to access our system for various fulfillment touch points like Delivery, Customer Contact etc.
- Other: _____

15. What technologies and IT standards are you employing for your ICT systems?

- In House Developed (Windows)
- In House Developed (Open Source)
- Licensed Logistics / ERP Third Party Product installed In-House

(Please specify Product Name): _____

- Licensed Logistics / ERP Third Party Product installed externally and managed by a third-Party Vendor (Please specify Product information)

SaaS or Cloud based Logistics / ERP Product (Please specify Details)

16. What business policies if any do you follow on such matters like customer service, refund and insurance claims and others?

- Do not have any policies
- Yes, our Business carries Insurance against damages and other exigencies – paid for by us.
- Yes, Insurance is mandatory for Customers to purchase for their orders with us – we have Insurance Partners for our Logistics Business which our Customers can buy when they place orders with us.
- We do not have agreed service levels in writing with Customers
- We have agreed service levels in writing with Customers – with Penalties
- We have agreed service levels in writing with Customers – without Penalties
- We offer Reverse Logistics Services
- We do not have a dedicated Customer Service Team
- We have an in-house dedicated Customer Service Team
- We have an outsourced dedicated Customer Service Team
- Yes, reverse logistics is mandatory
- Others (specify)

17. Are there any specific government or legal requirements that apply to your industry with regard to conduct of your business or any mandatory regulations?

- No. There are no requirements or regulations
- Yes. There are (specify) _____

18. Are you providing logistics and transportation services to any e-commerce company?

- No, we do not serve any e-commerce company
- Yes we do serve

(Specify Name and business of your partner that you serve at present) _____

19. Do you think your company is ready for supporting e-commerce in the country? If not can you tell what should be done to make logistics companies in Ethiopia ready to support e-commerce development in Ethiopia from the following aspects? (tick that applies and give details)

Manpower Skilling and Availability – for easier access to workforce who can contribute to a fast growing eCommerce oriented market

Legal Regulations – What would like to have improved or changed to enable better business, especially to allow you to compete in a competitive eCommerce market?

Tax Regulations – What would like to have improved or changed to enable better business, especially to allow you to compete in a competitive eCommerce market?

- Technology Ecosystem like
- Broadband Internet Availability & Accessibility
- Broadband Internet Speed
- Data centre Availability
- Mobile Phone Signal Coverage
- Mobile Data Availability and Accessibility
- Mobile Data Speed
- Support from Government on Logistics Automation with discounted ERP / Tracking / Fulfillment Systems

Please provide further details:

Section II: Questions regarding information sharing

1. What is the communication format that you use to share data with the logistics sector?

2. What type of information is considered to be crucial in your organization?

3. What information provided by your directorate is useful for the logistics sector?

4. Does the department know what information its users need to access? _____ If yes, what are they?

5. Is it known the information your organization needs to create and capture in the first place? _____
If yes, what are they?

6. What do you think should be adapted in the future to share information?

7. What are the drawbacks of the current information sharing system?

8. Is the information stored digital or in paper?

9. If it is digital, is that online system? _____ if yes, how do you manage the system?

10. If it is in paper, how do you update and manage?

11. Is information always stored in corporate rather than personal spaces? Yes /no _____

12. Are the information requirements associated with the workflow of the process in the units in identified the form of standards, handbooks, procedures? Yes / no _____

13. Are technologies, skills and infrastructure for storage, maintenance processing and retrieval of information available? Yes / no _____

14. What do you say about providing information to the logistics sector online?

Section III: Organization's opinion on access to information

1. What do you say about providing information to the logistics sector online?

2. Is there any policy which allows easy access to information to logistics sector?

3. Is there any difficulty in linking and sharing data among your organization's employees?

4. What will be the benefit if centralized database is created, linked and shared with each other? Should there be any access restriction to some of the information----for the privacy of the data? It means privacy of the data.

6. Anything else you want to add please?

Section IV: required for service delivery

1. What are the major functions of your organization?

2. Do you have any role in the service delivery of your organization?

5. How are the services delivered to the user (process for service delivery)?

a. Are there any systems that support the operation of the service delivery?

b. What applications /devices/systems are used to deliver the service?

6. What is the information you require to provide those services?

7. How do you get that information?

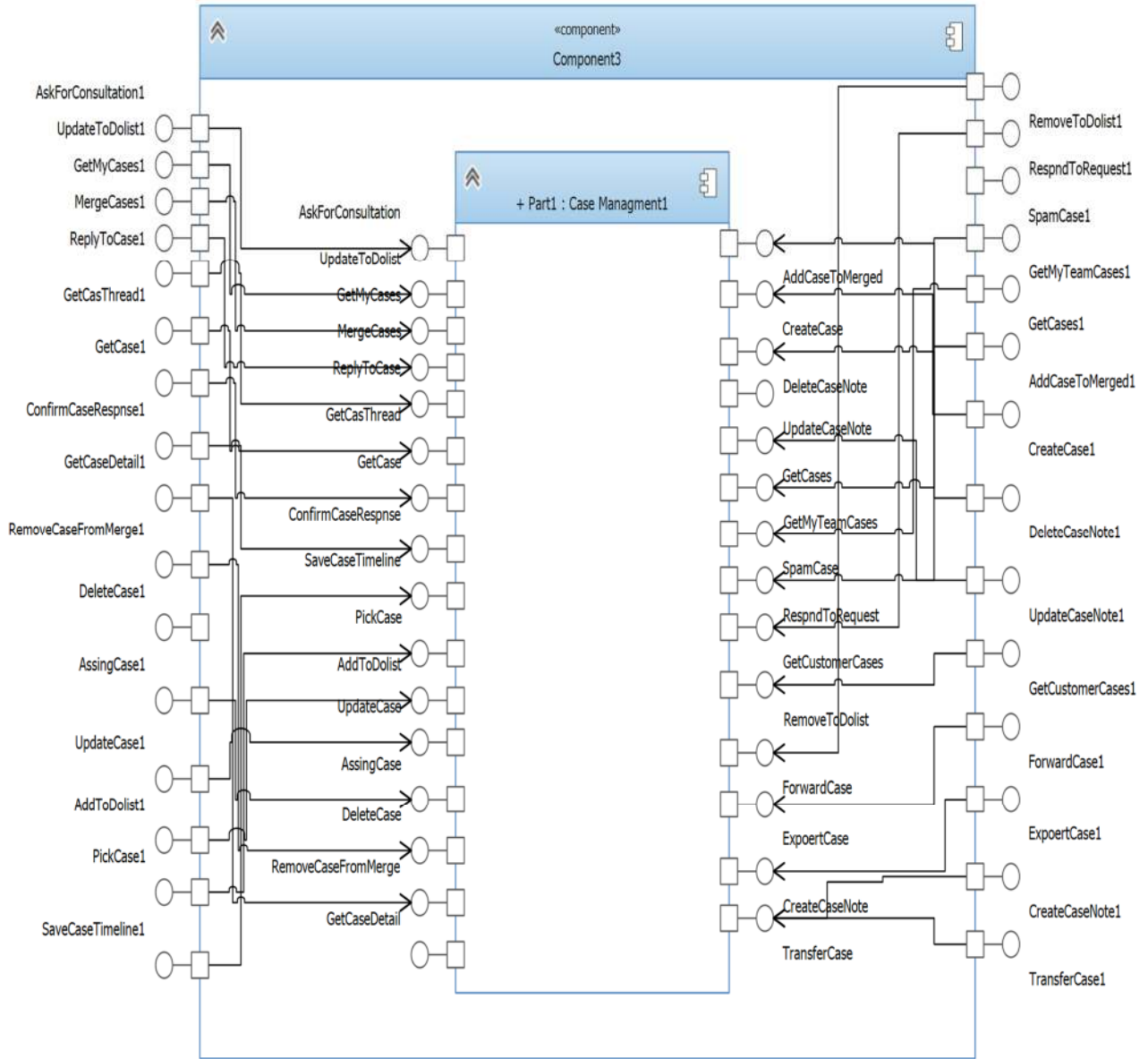
8. Are there any difficulties to get information?

9. How do you minimize those difficulties?

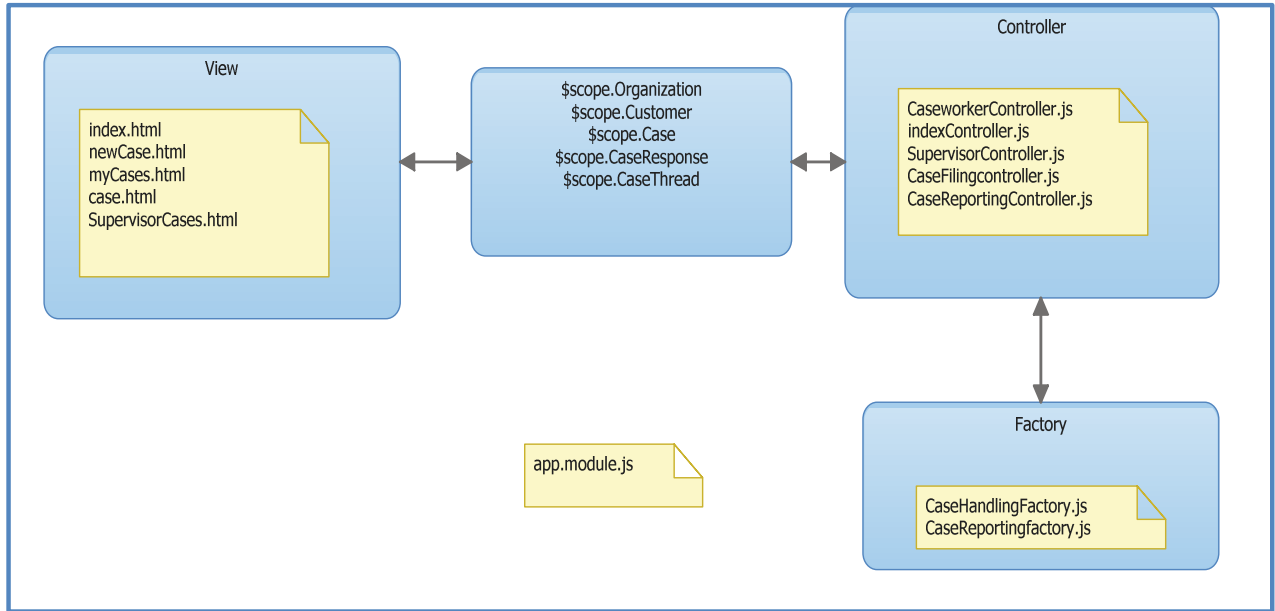
10. Will it be beneficial if web based IA is implemented for your organization services?

Appendix: IV Design Details

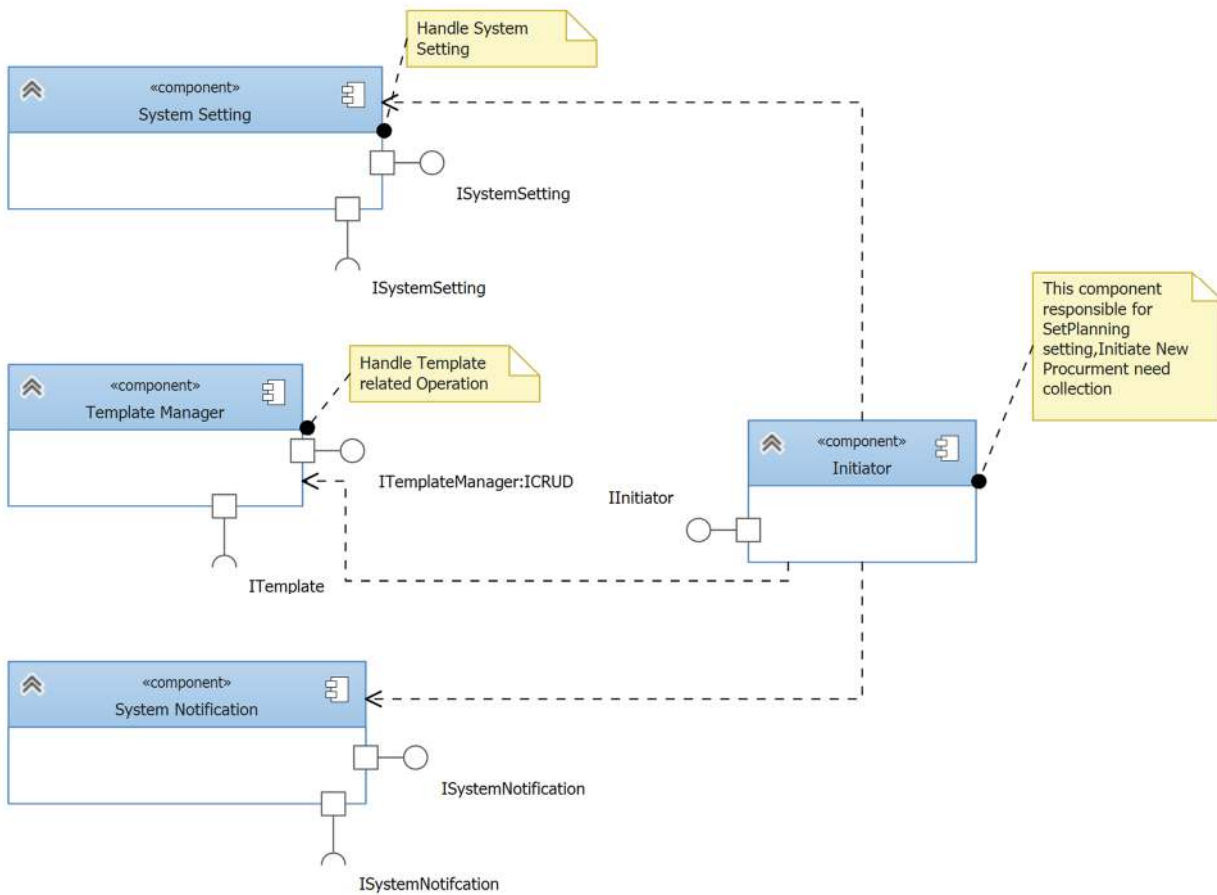
A. Core/Back-end Components



B. Front-end Components

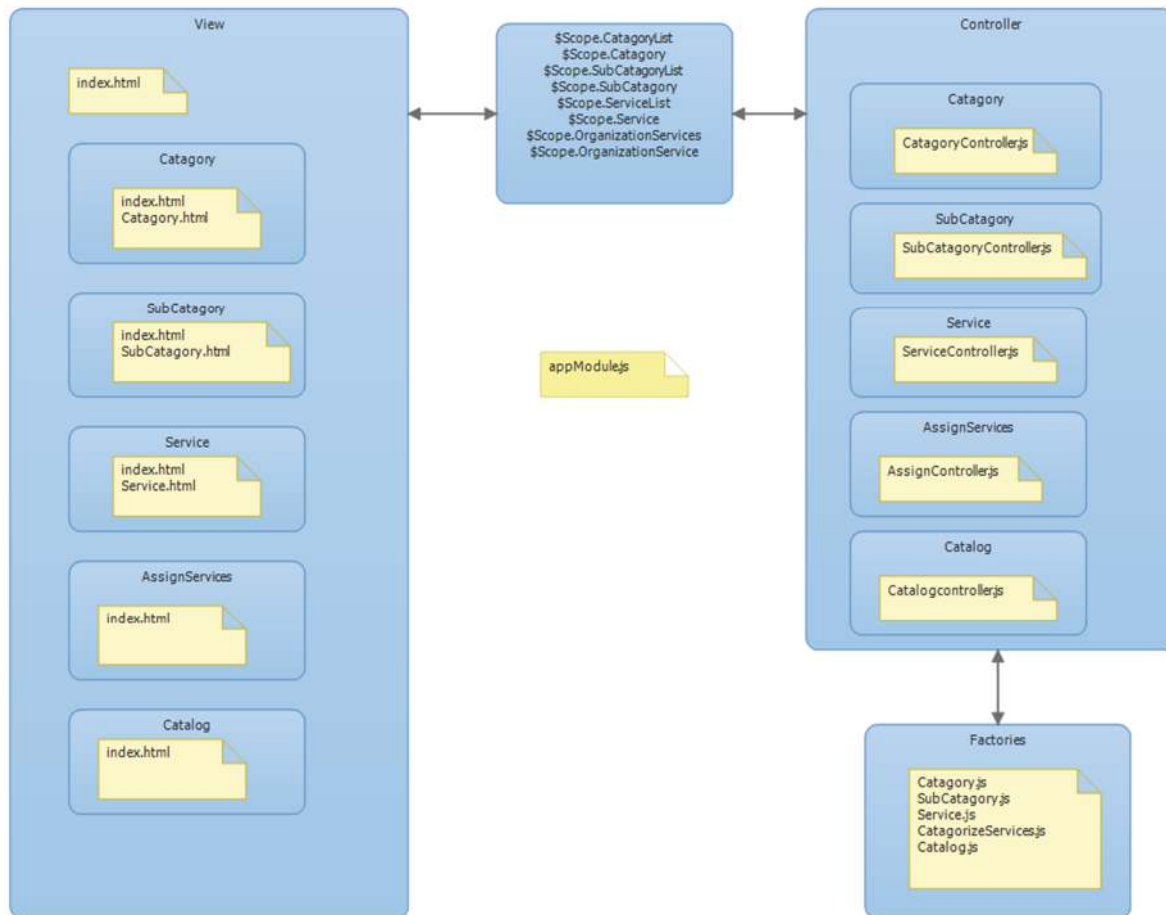


6.1.1 Transaction Planning Sub-System

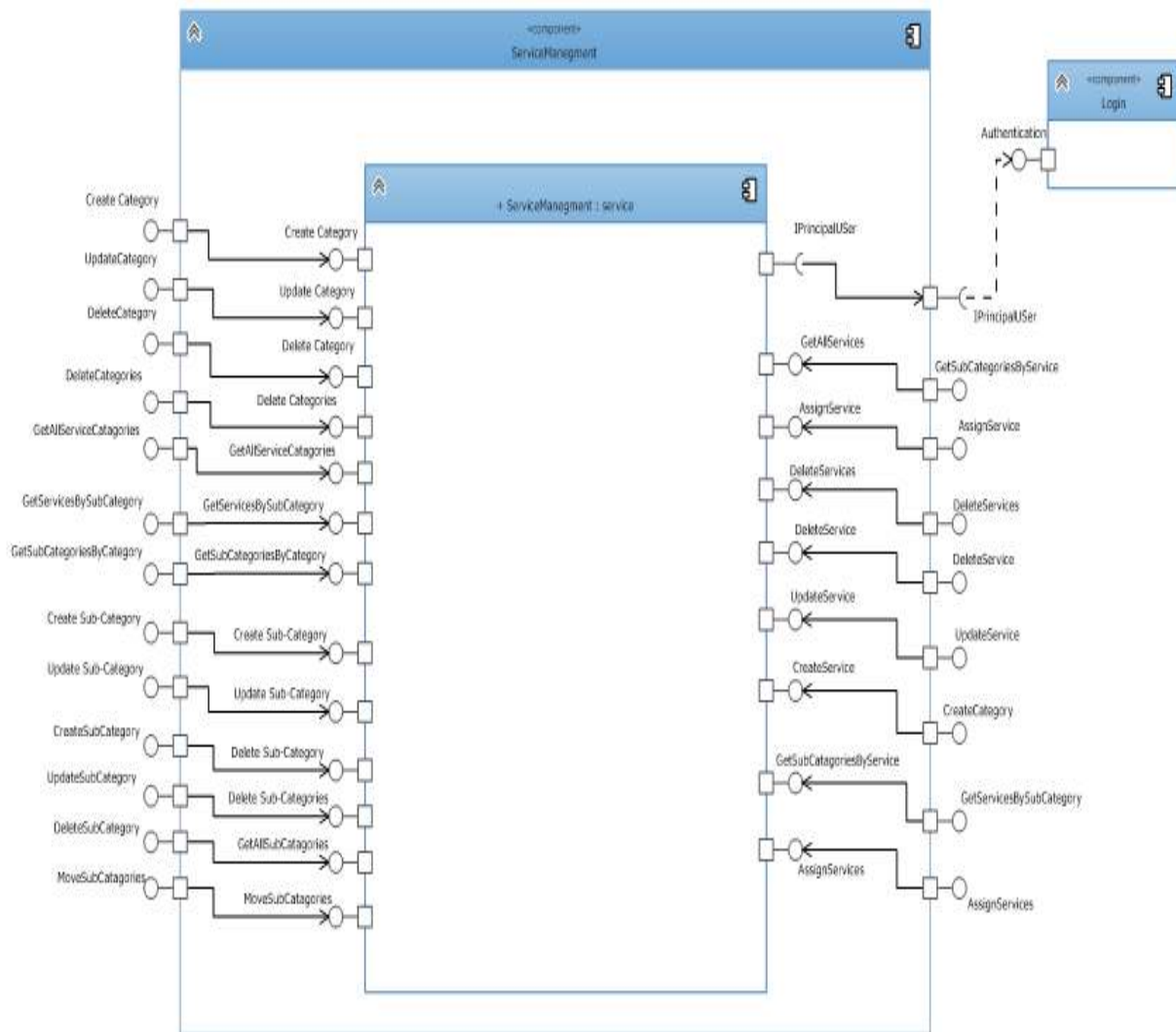


6.1.2 Service/Case Management Module

Front-end Components



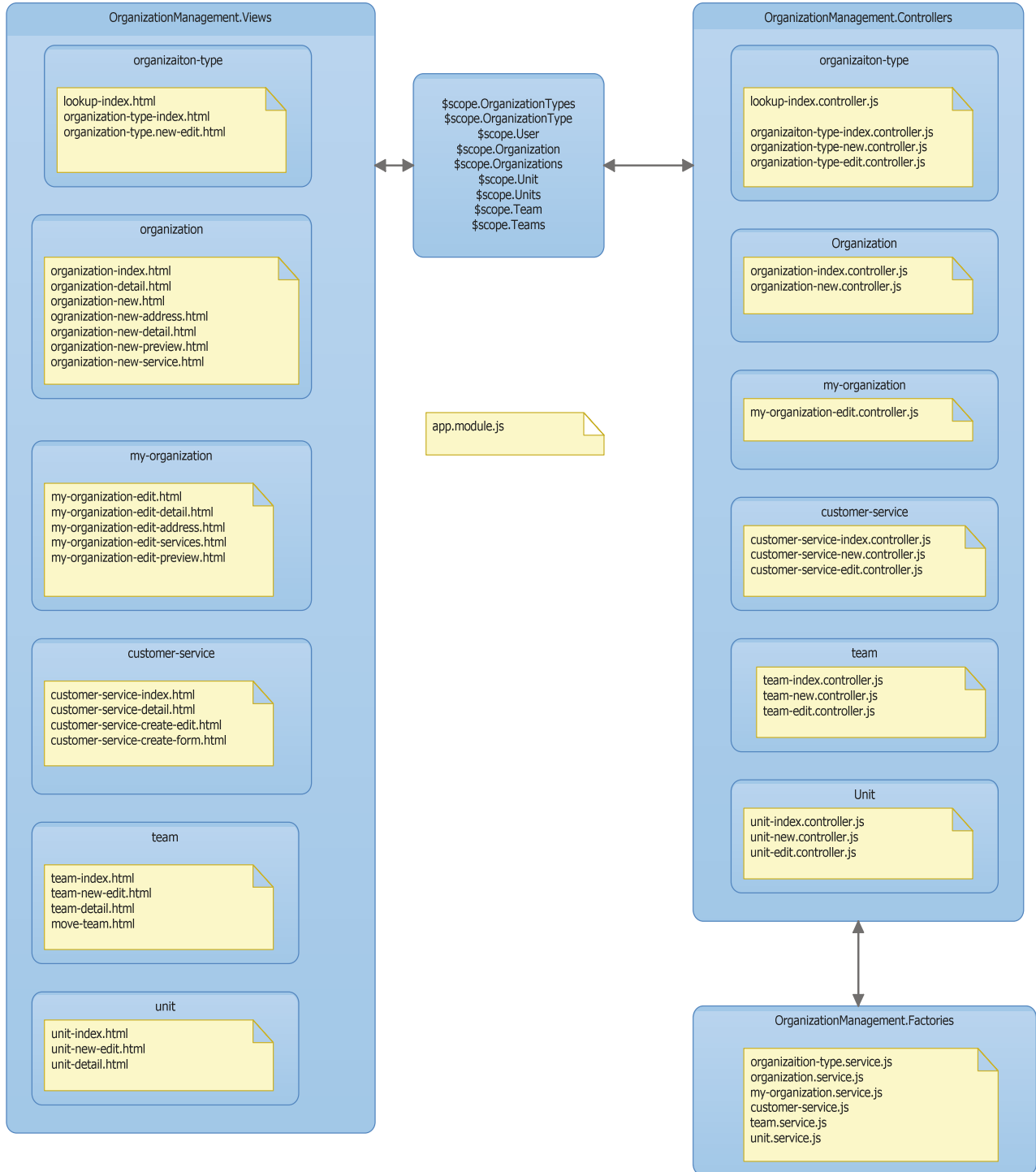
Back-end Components



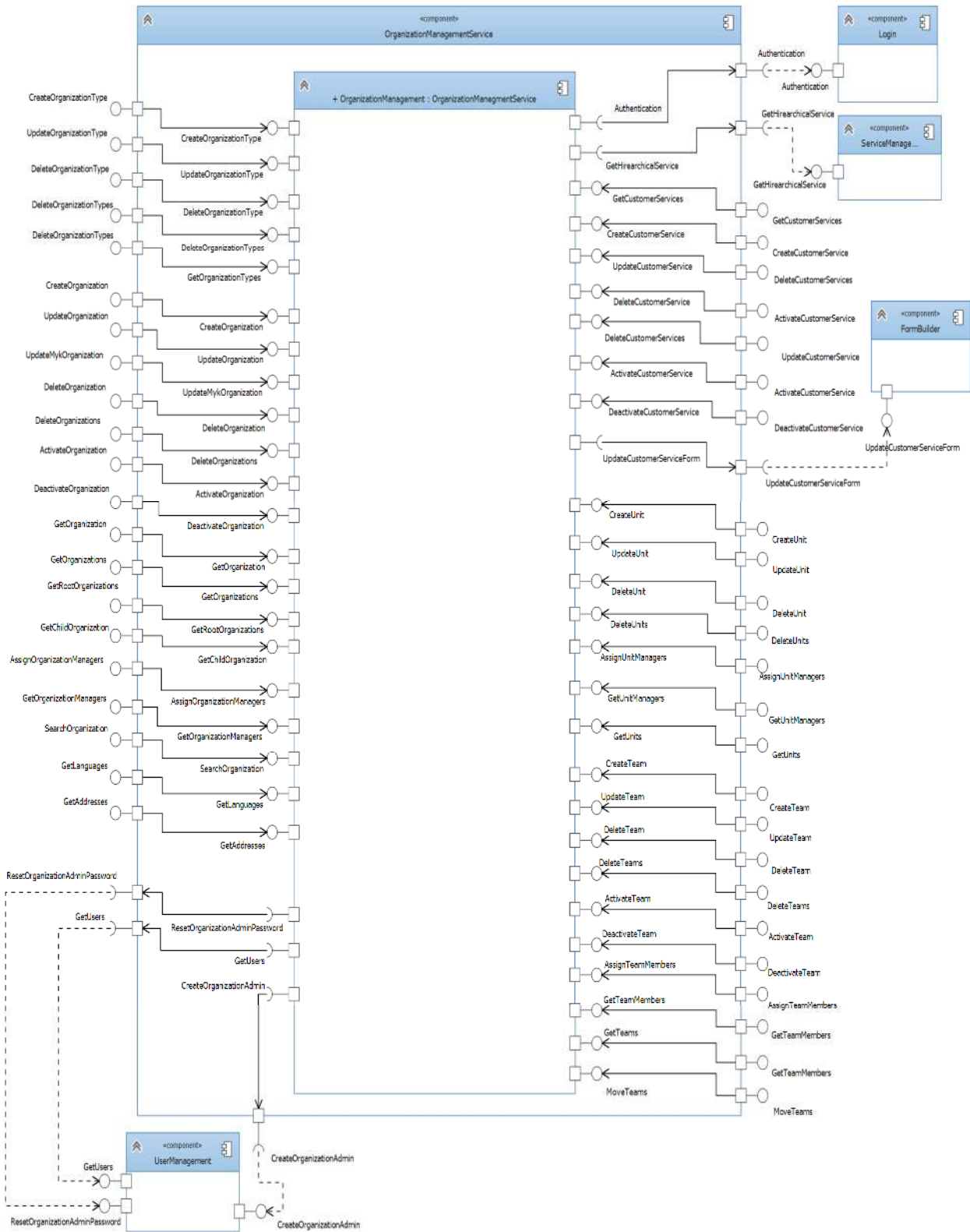
6.1.3 Organization Management Module

Component Decomposition

Front-end Components



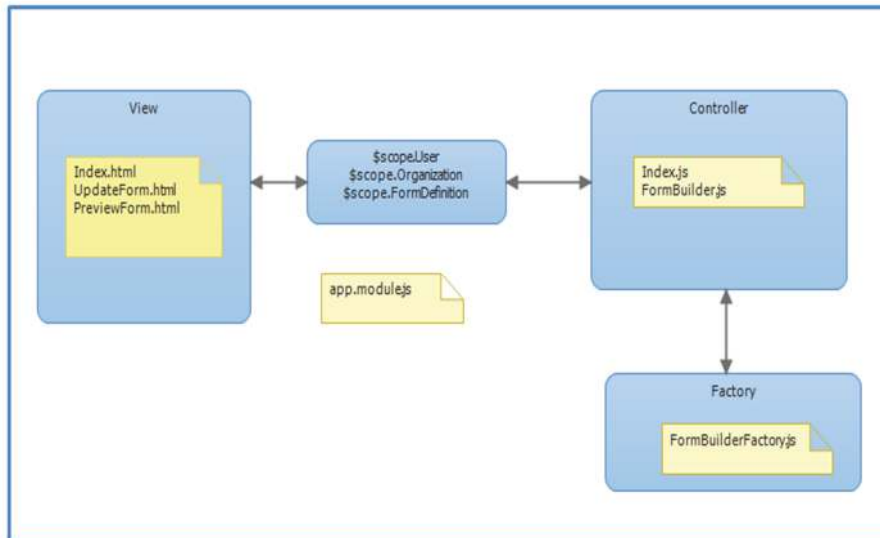
Back-end Components



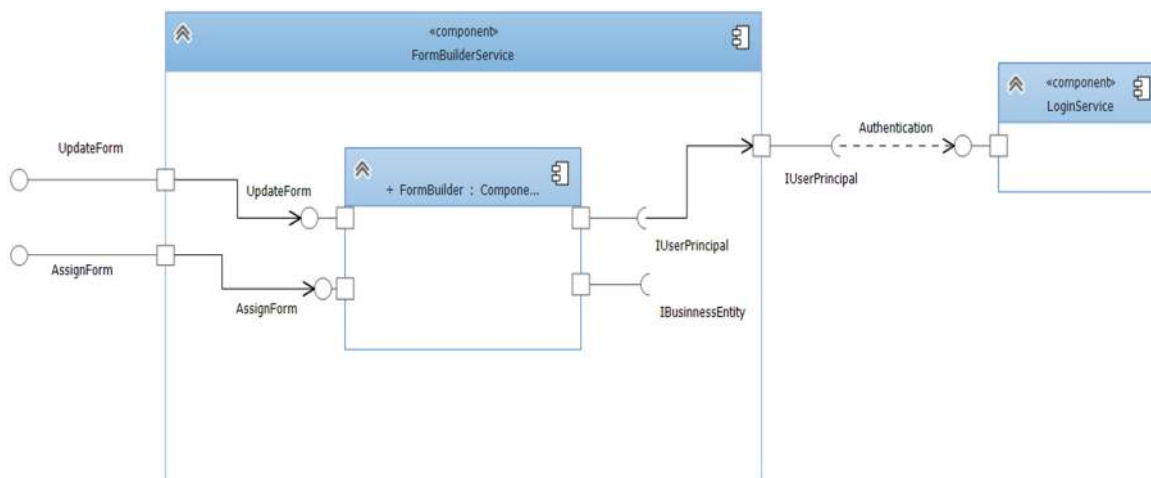
6.1.4 Form Builder Module

Component Decomposition

Front-end Components

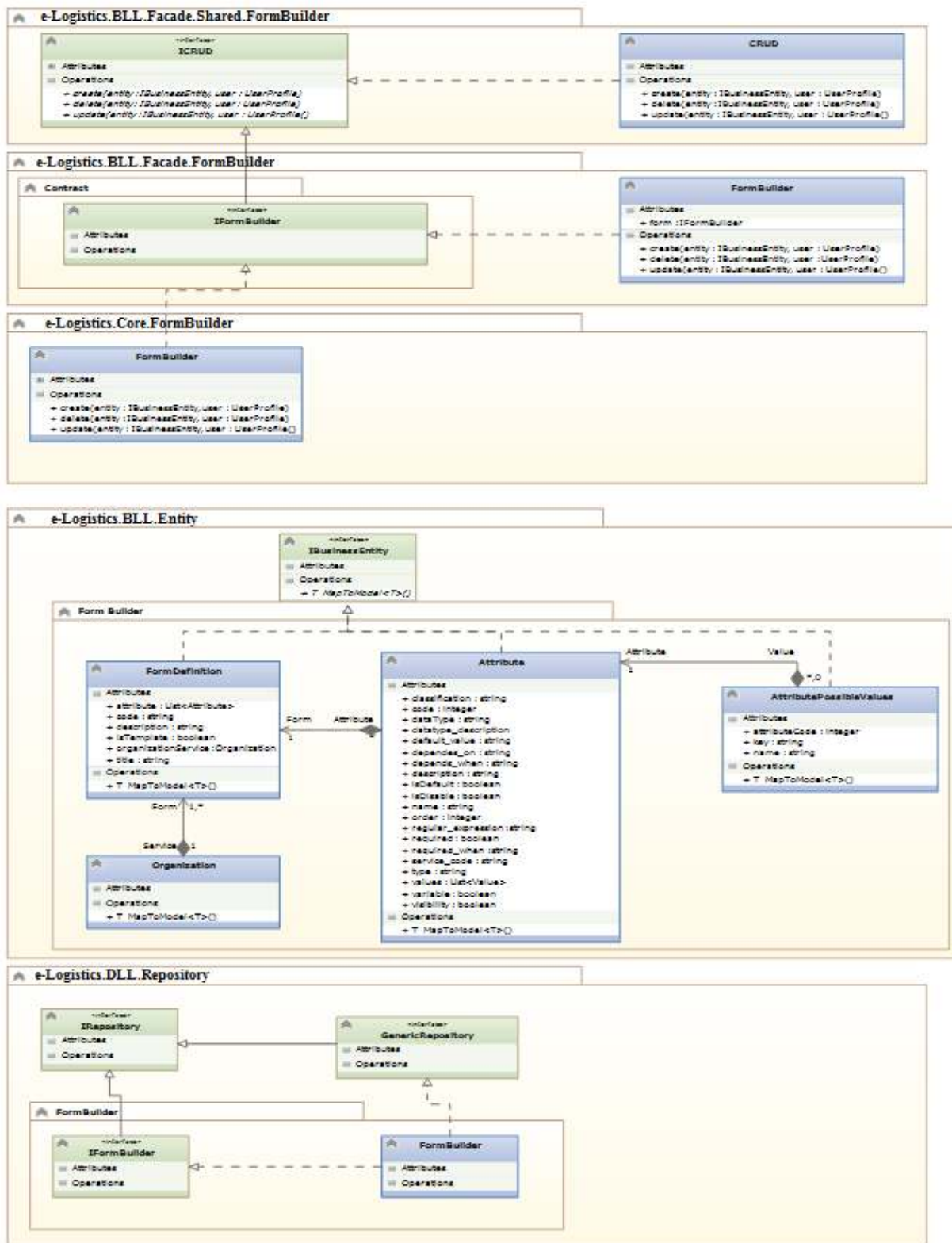


Back-end Components



Pseudo Code / Algorithms

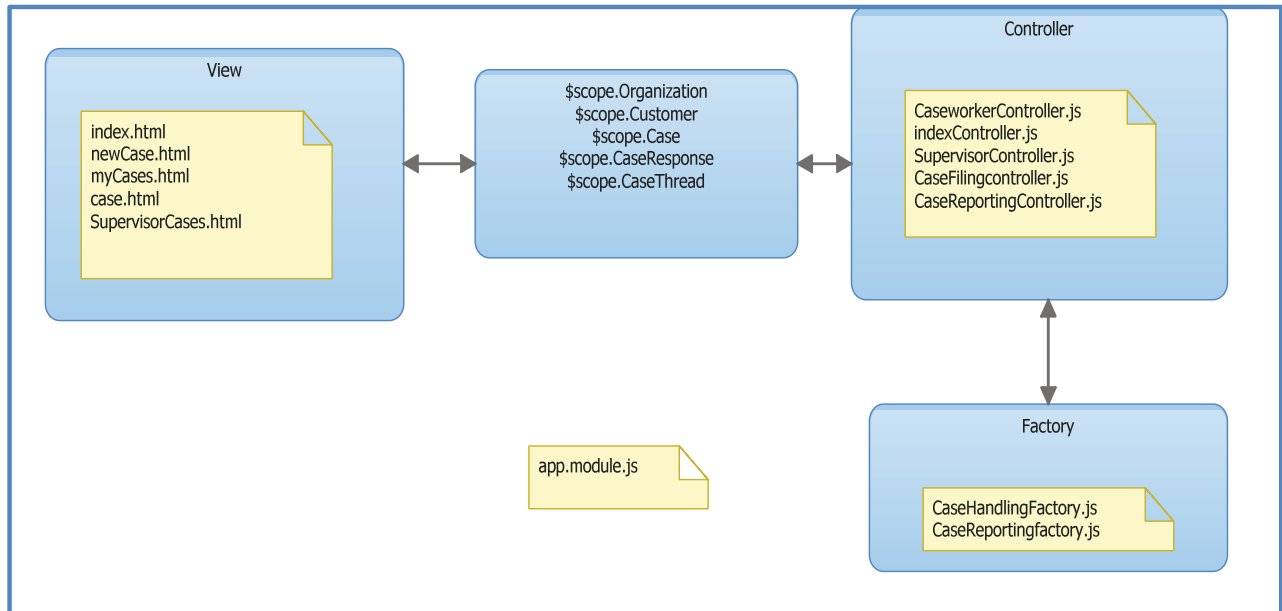
Class Diagram



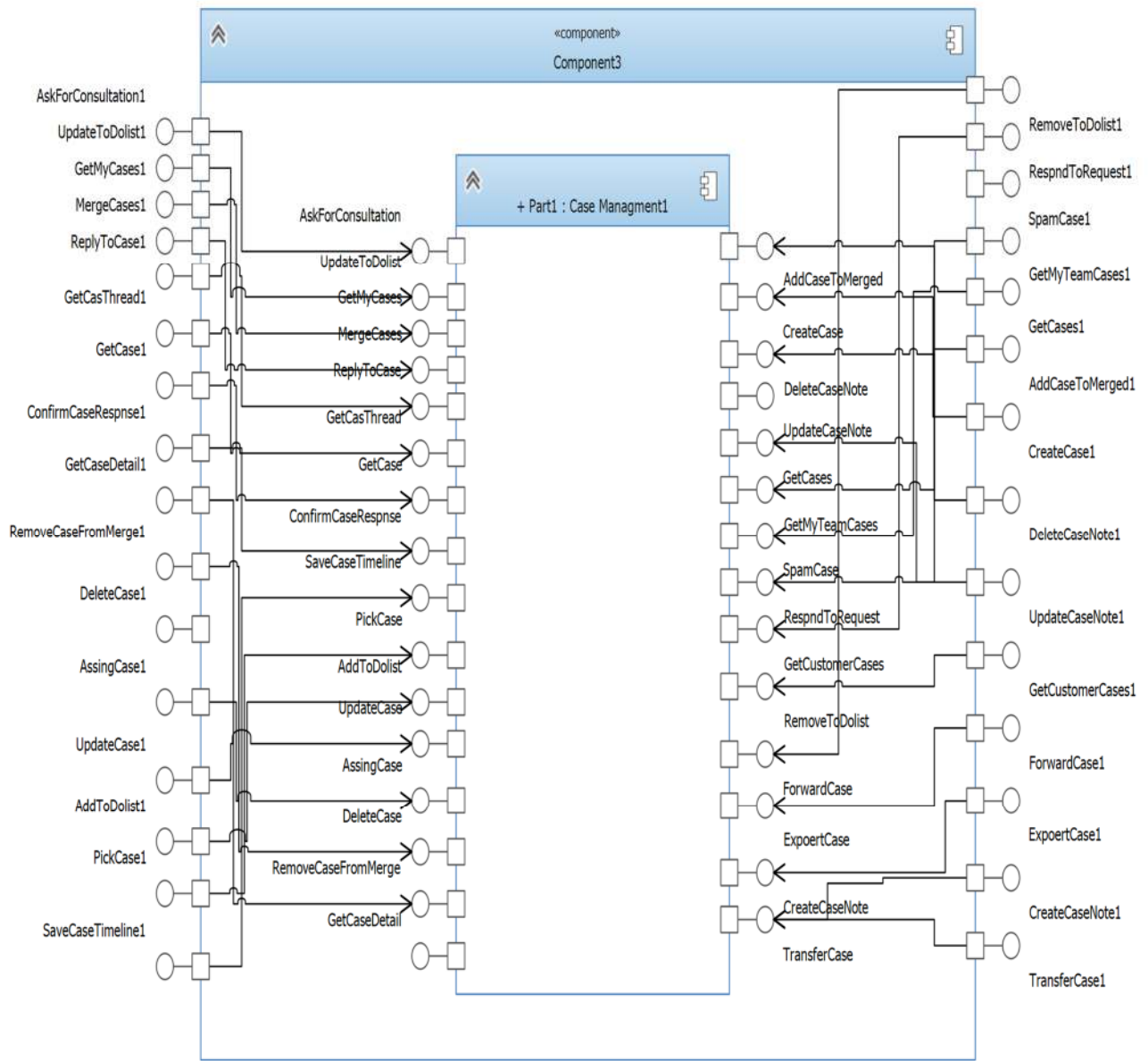
6.1.5 Service/Case Manager Module

Component Decomposition

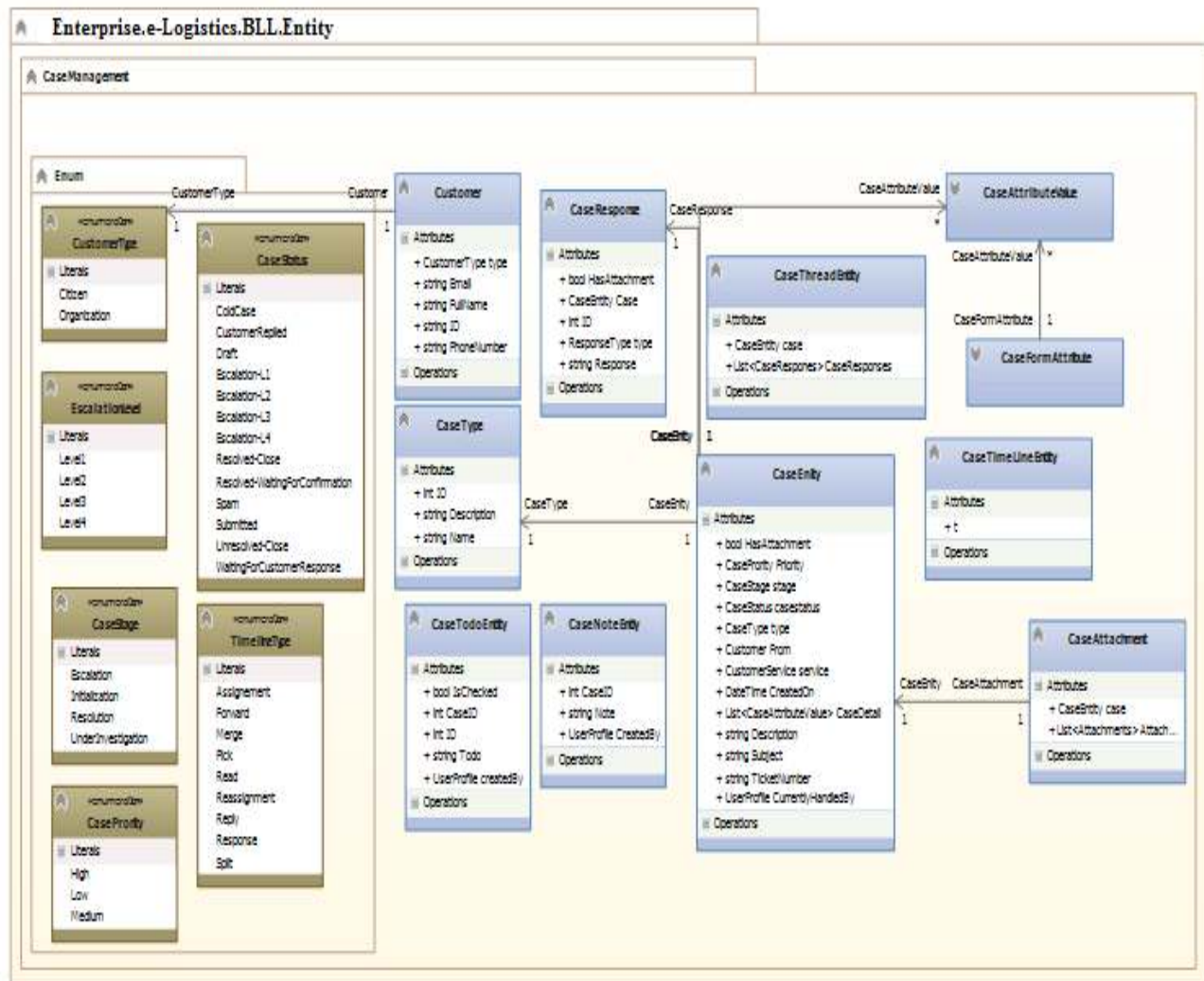
Front-end Components



Back-end Components



Class Diagram



CaseOperation

- Attributes
- Operations
 - + BaseEntity Remove...
 - + CaseEntity AddCase...
 - + CaseEntity GetCase...
 - + CaseEntity MergeCa...
 - + CaseEntity SpamCa...
 - + CaseResponse Reply...

CaseFiling

- Attributes
- Operations
 - + BaseEntity DeleteCa...
 - + byte[] ExportCase(C...
 - + CaseEntity CreateC...
 - + CaseEntity Confirm...
 - + CaseEntity GetCase(...
 - + CaseEntity UpdateC...
 - + CaseResponse Resp...
 - + CaseThread GetCas...
 - + List<CaseEntity> G...

CaseHandling

- Attributes
- Operations
 - + BaseEntity AssignCa...
 - + BaseEntity AskForC...
 - + BaseEntity DeleteCa...
 - + BaseEntity Forward...
 - + BaseEntity PickCase...
 - + BaseEntity Transfer...
 - + BaseEntiyt SaveCas...
 - + CaseNote CreateCas...
 - + CaseNote UpdateCa...
 - + CaseToDo AddToDo...
 - + CaseToDo RemoveT...
 - + CaseToDo UpdateT...
 - + List<CaseEntity> G...
 - + List<CaseEntity> G...

Contract

```

interface
    ICaseHandling
    Attributes
    Operations
        + Search() AssignCase(CaseID() case, UserProfile assignedTo, UserProfile assignedBy)
        + Search() AskForConsultation(CaseID() case, Team team, UserProfile askedBy)
        + Search() DeleteCaseInfo(CaseInfoID() info, UserProfile deletedBy)
        + Search() ForwardCase(CaseID() case, UserProfile forwardedTo, UserProfile forwardedBy)
        + Search() PickCase(CaseID() case, UserProfile pickedBy)
        + Search() TransferCase(CaseID() case, Team transferTo, UserProfile transferredBy)
        + Search() SaveCaseTimeline(CaseID() case, TimelineInfo info)
        + CaseInfo CreateCaseInfo(CaseInfoID() info, UserProfile createdBy)
        + CaseInfo UpdateCaseInfo(CaseInfoID() case, UserProfile updatedBy)
        + CaseToDo AddToDoList(CaseToDo todo, UserProfile createdBy)
        + CaseToDo RemoveToDoList(CaseToDo todo, UserProfile removedBy)
        + CaseToDo UpdateToDo(CaseToDo todo, bool isChecked)
        + List<CaseID()> GetMyCases(UserProfile user)
        + List<CaseID()> GetMyTeamCases(UserProfile user)
    
```

```

interface
    ICaseOperation
    Attributes
    Operations
        + SearchEntity RemoveCaseFromMerge(CaseID() mergeCase, CaseID() case, UserProfile m...)
        + SearchEntity AddCaseToMerge(CaseID() mergeCase, CaseID() case, UserProfile m...)
        + CaseID() GetCaseDetail(CaseID() case, UserProfile createdBy)
        + CaseID() MergeCase(List<CaseID()> cases, UserProfile mergedBy)
        + CaseID() SplitCase(CaseID() case, UserProfile user)
        + CaseResponse ReplyToCase(CaseID() case, CaseStatus status, UserProfile respondedBy)
    
```

```

interface
    ICaseFiling
    Attributes
    Operations
        + Search() DeleteCase(CaseEntity case)
        + Entity[] SplitCase(CaseEntity case)
        + CaseID() CreateCase(CaseID() case, Customer cust)
        + CaseID() ConfirmCaseResponse(CaseID() case, ConfirmationType confirmation)
        + CaseID() GetCaseFiling TrackingNumber()
        + CaseID() UpdateCase(CaseID() case, CustomerEntity cust)
        + CaseResponse RespondToRequest(CaseResponse response)
        + CaseThread GetCaseThread(CaseEntity case)
        + List<CaseID()> GetCustomerCases(CustomerEntity cust)
    
```

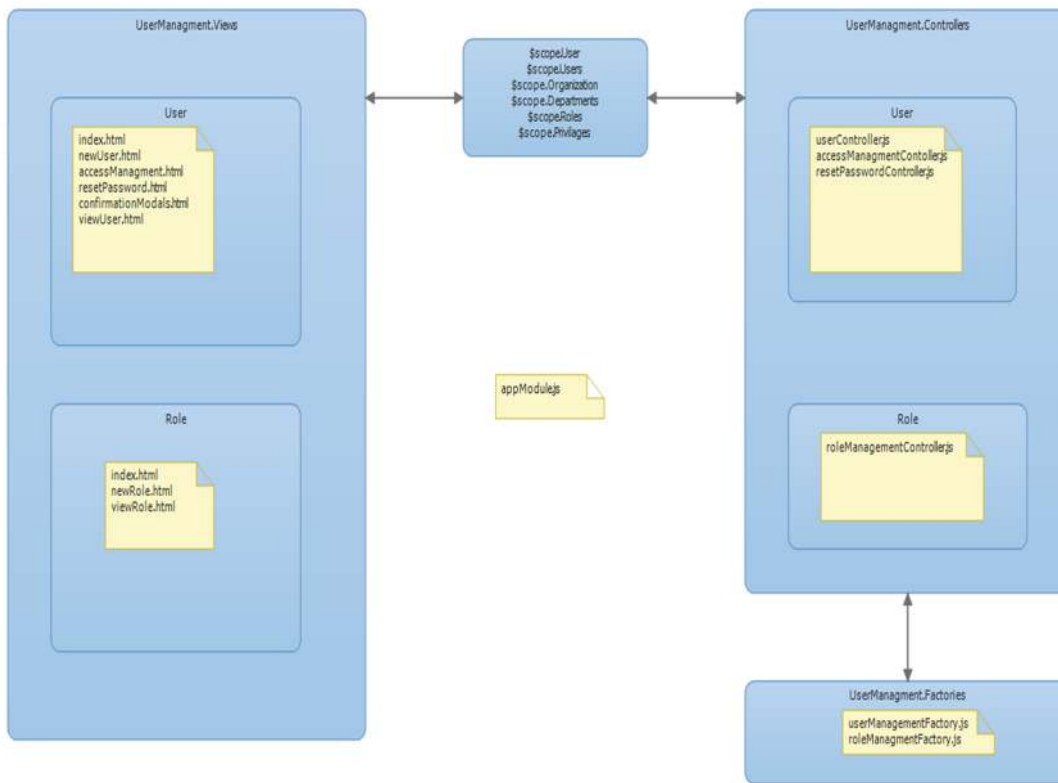
```

CaseManagement
Attributes
    + ICaseFiling caseFiling
    - ICaseHandling caseHandling
    - ICaseOperation operation
Operations
    + SearchEntity AssignCase(CaseID() case, User ...
    + SearchEntity AskForConsultation(CaseID() ca...
    + SearchEntity DeleteCase(CaseEntity case)
    + SearchEntity DeleteCaseInfo(CaseInfoID() i...
    + SearchEntity ForwardCase(CaseID() case, Us...
    + SearchEntity PickCase(CaseID() case, UserP...
    + SearchEntity RemoveCaseFromMerge(CaseID() ...
    + SearchEntity TransferCase(CaseID() case, Te...
    + SearchEntity SaveCaseTimeline(CaseID() case...
    + Entity[] SplitCase(CaseEntity case)
    + CaseID() CreateCase(CaseID() case, Cust...
    + CaseID() AddCaseToMerge(CaseID() mergeCase...
    + CaseID() ConfirmCaseResponse(CaseID() ...
    + CaseID() GetCaseFiling TrackingNumber()
    + CaseID() GetCaseDetail(CaseID() case, U...
    + CaseID() MergeCase(List<CaseID()> case...
    + CaseID() SplitCase(CaseID() case, User...
    + CaseID() UpdateCase(CaseID() case, Cust...
    + CaseInfo CreateCaseInfo(CaseInfoID() i...
    + CaseInfo UpdateCaseInfo(CaseInfoID() i...
    + CaseResponse ReplyToCase(CaseID() case,...
    + CaseResponse RespondToRequest(CaseResp...
    + CaseThread GetCaseThread(CaseEntity case)
    + CaseToDo AddToDoList(CaseToDo todo, User...
    + CaseToDo RemoveToDoList(CaseToDo todo, U...
    + CaseToDo UpdateToDo(CaseToDo todo, bool...
    + List<CaseEntity> GetCustomerCases(Cust...
    + List<CaseEntity> GetMyCases(UserProfile us...
    + List<CaseEntity> GetMyTeamCases(UserProf...
    
```

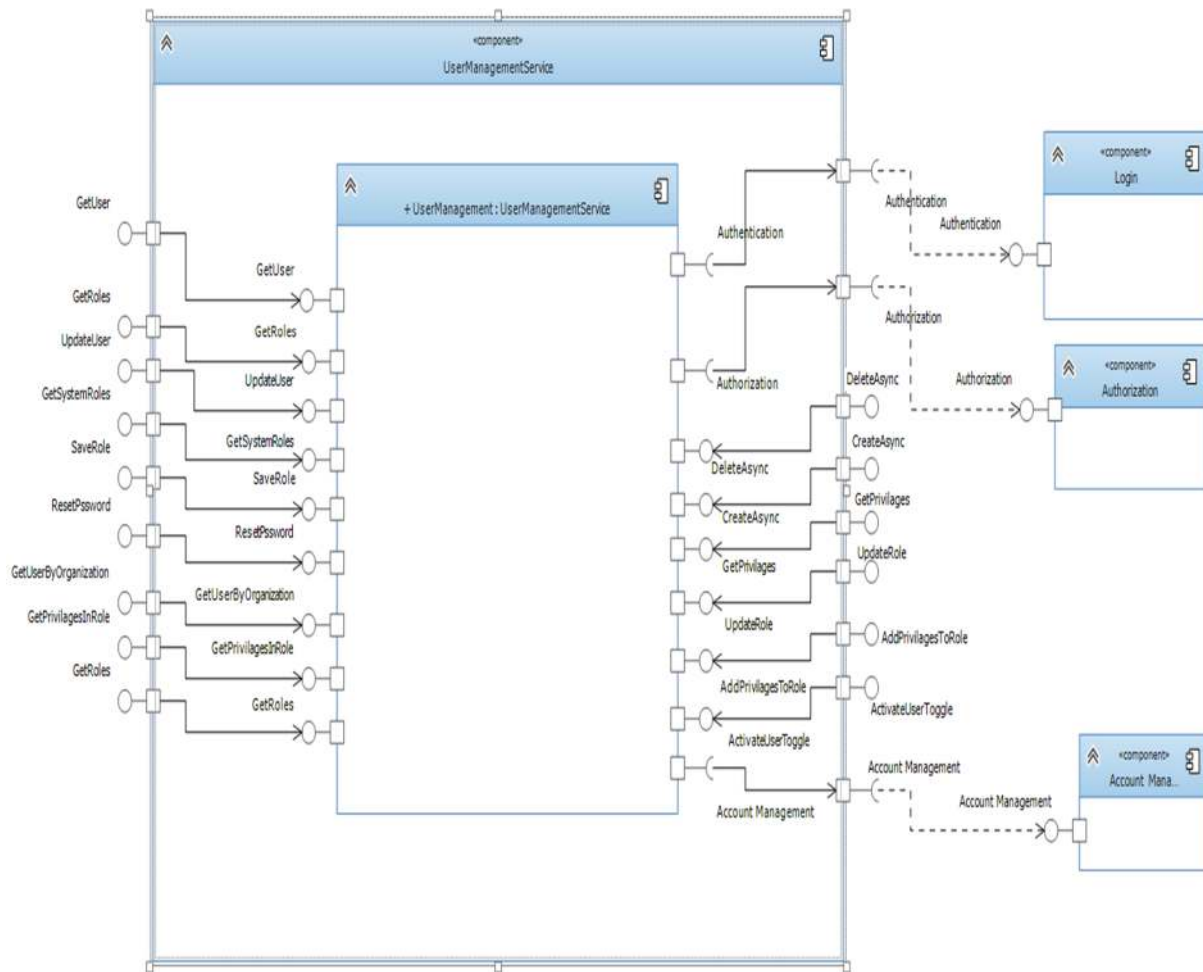
6.1.6 User and Role Management Module

Component Decomposition

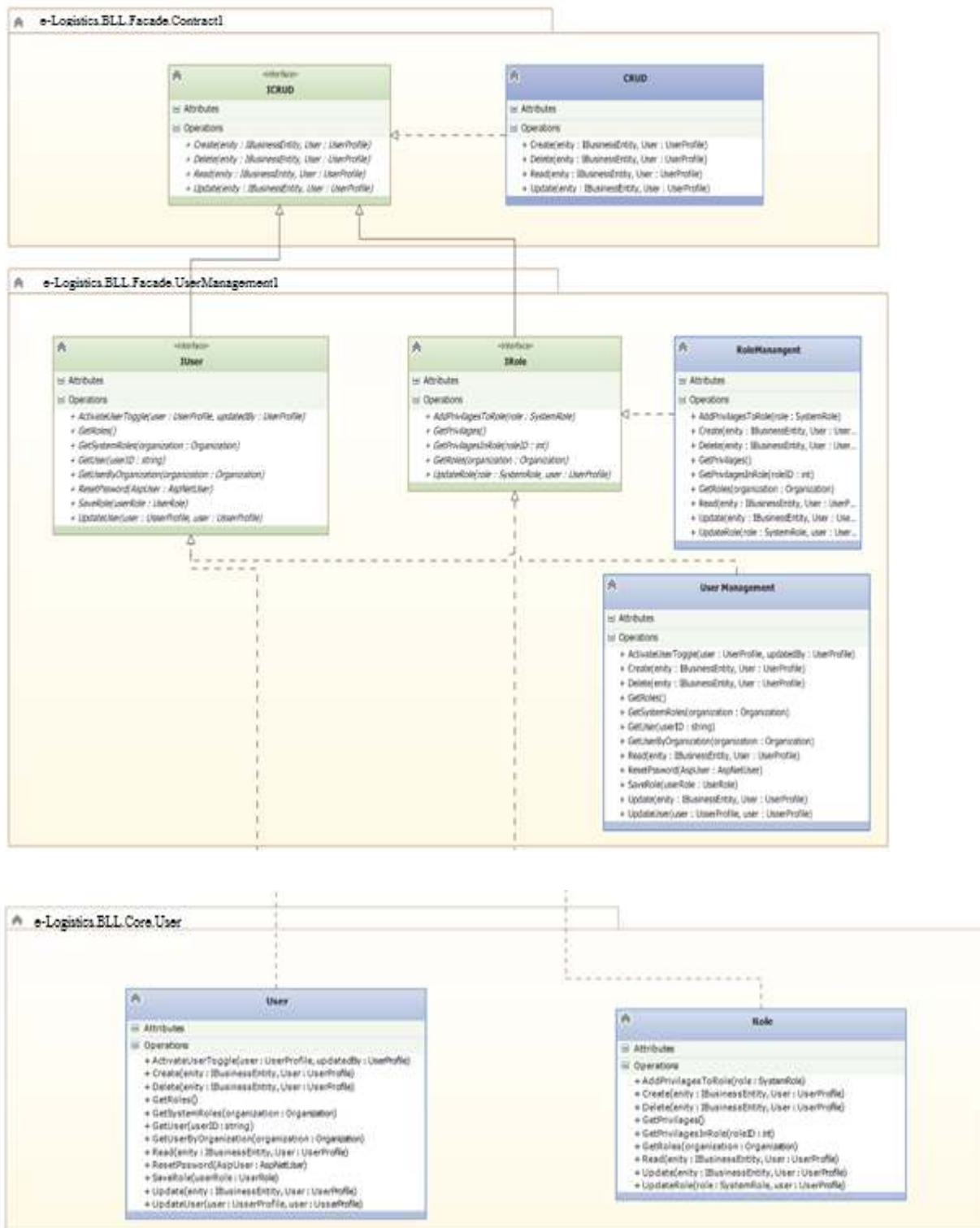
Front-end Components

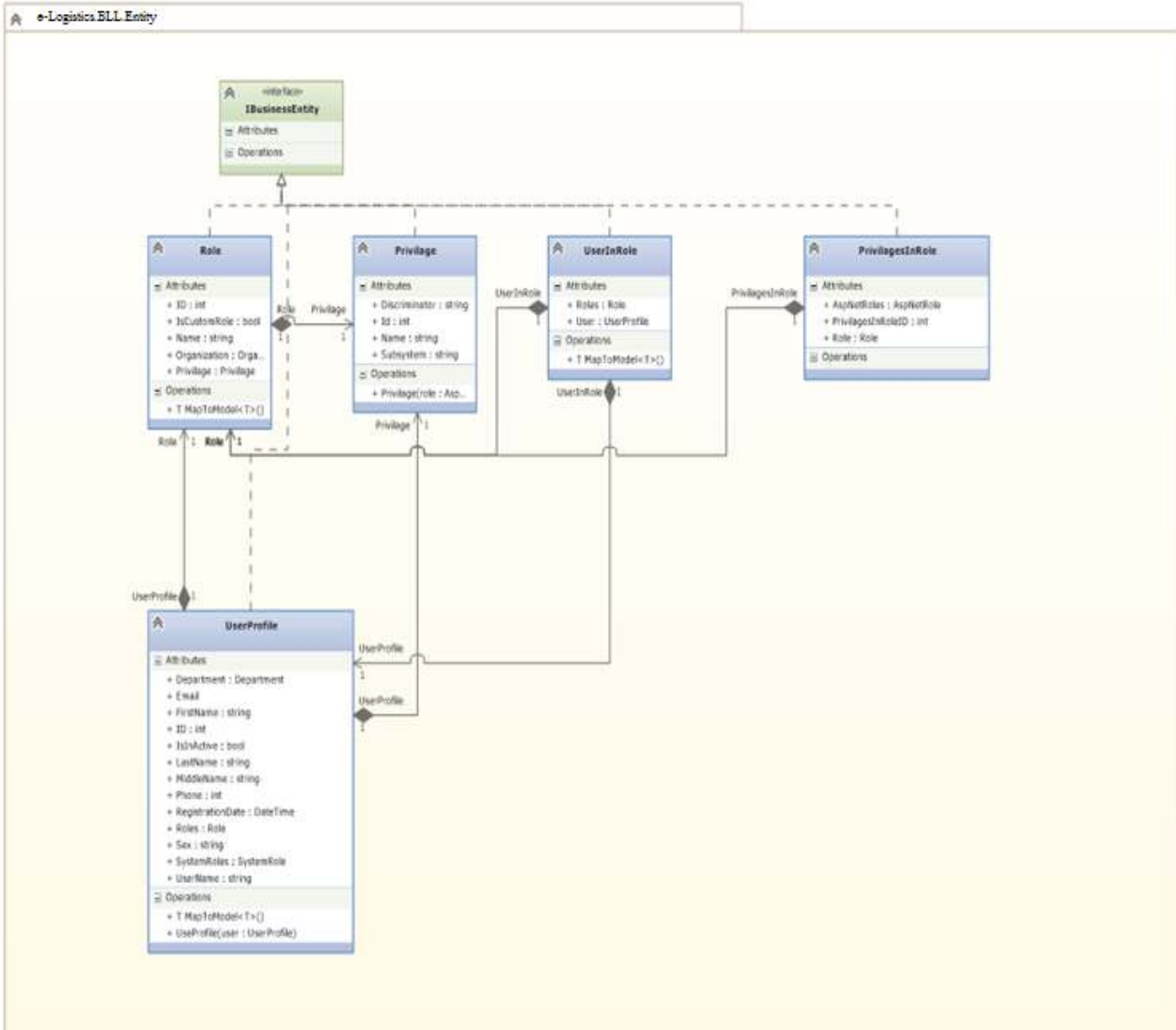
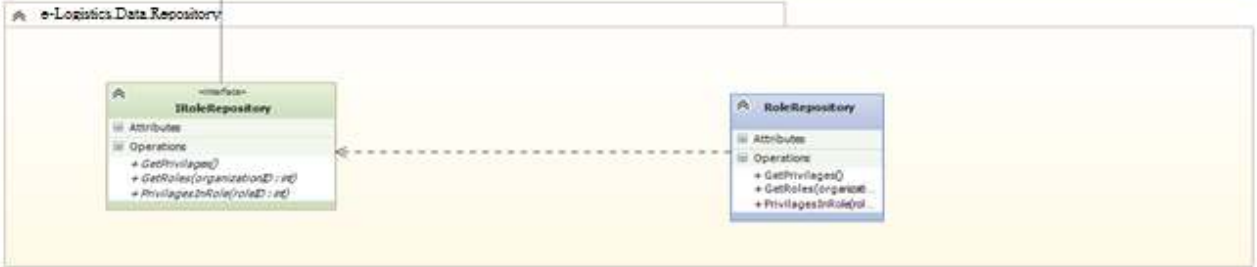


Back-end Components



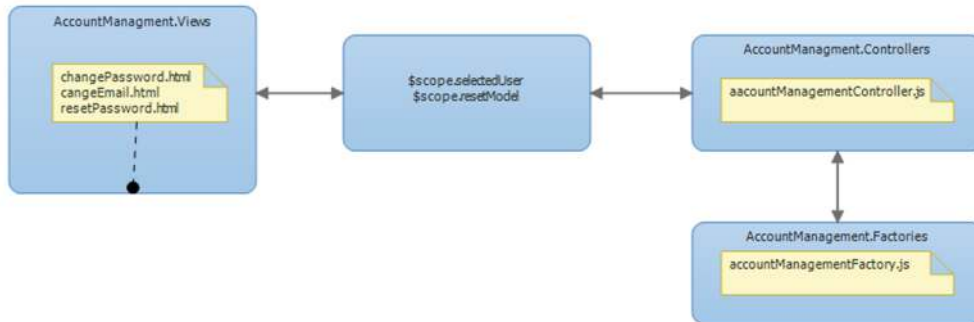
Class Diagram





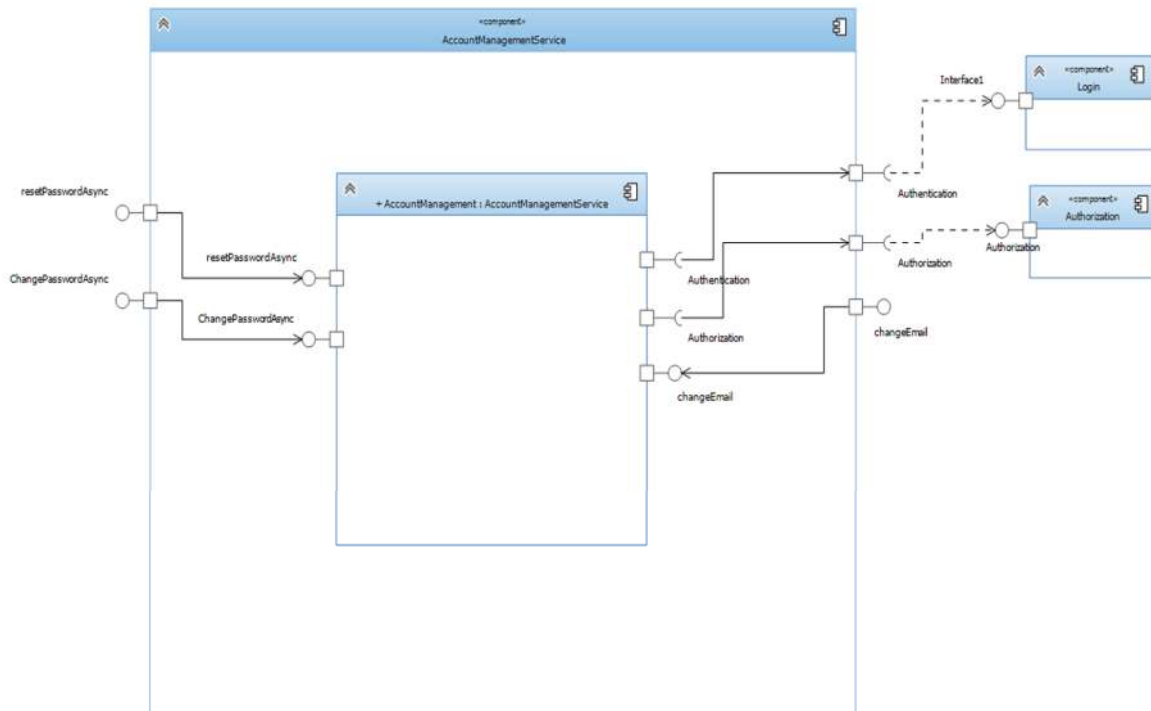
6.1.7 Account Management Module

Component Decomposition

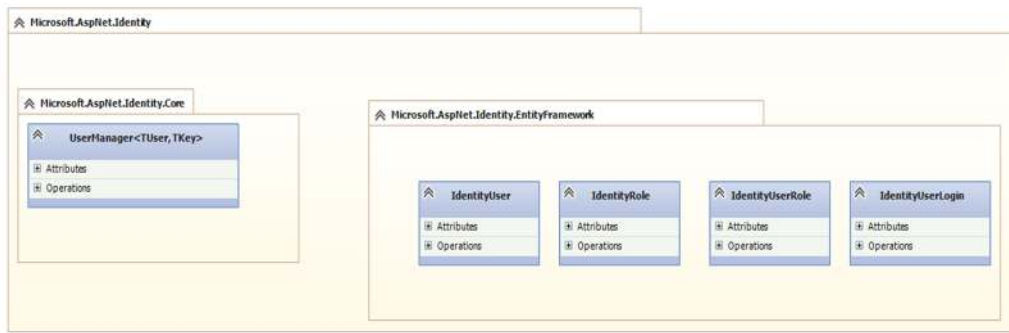


Front-end Components

Back-end Components

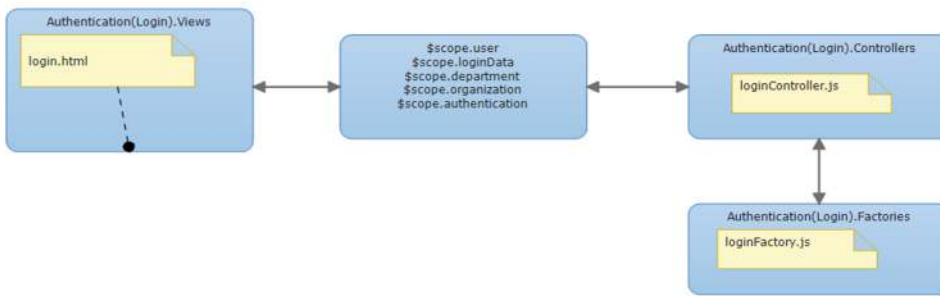


Class Diagram

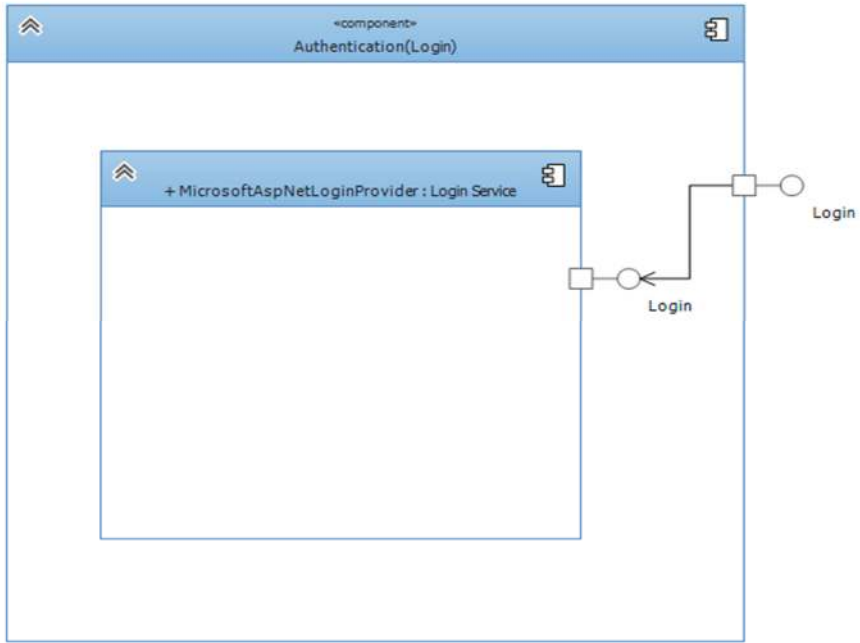


Component Decomposition

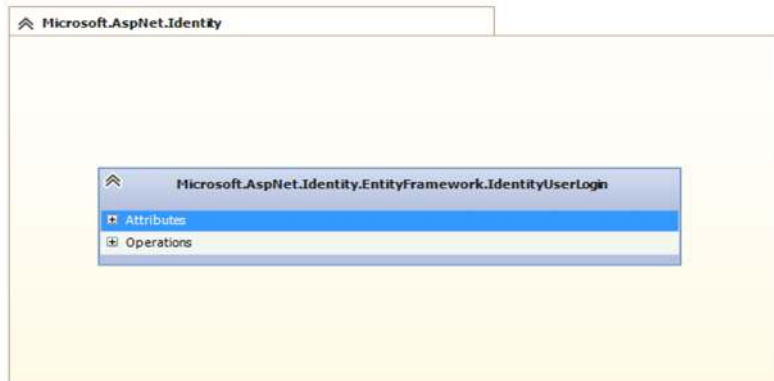
Front-end Components



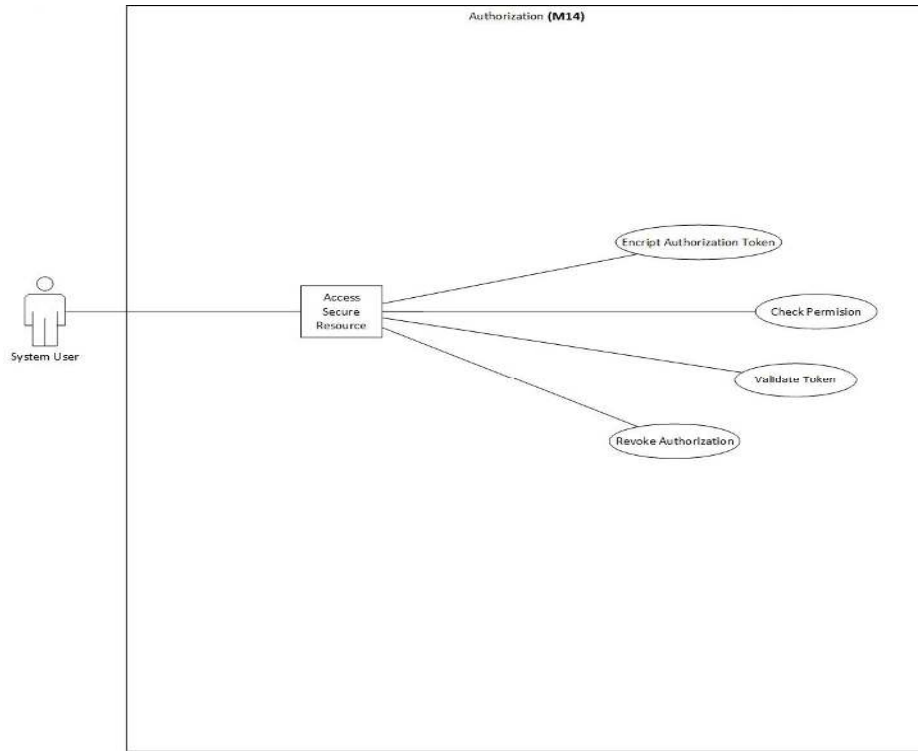
Back-end Components



Class Diagram



6.1.8 Authorization Module

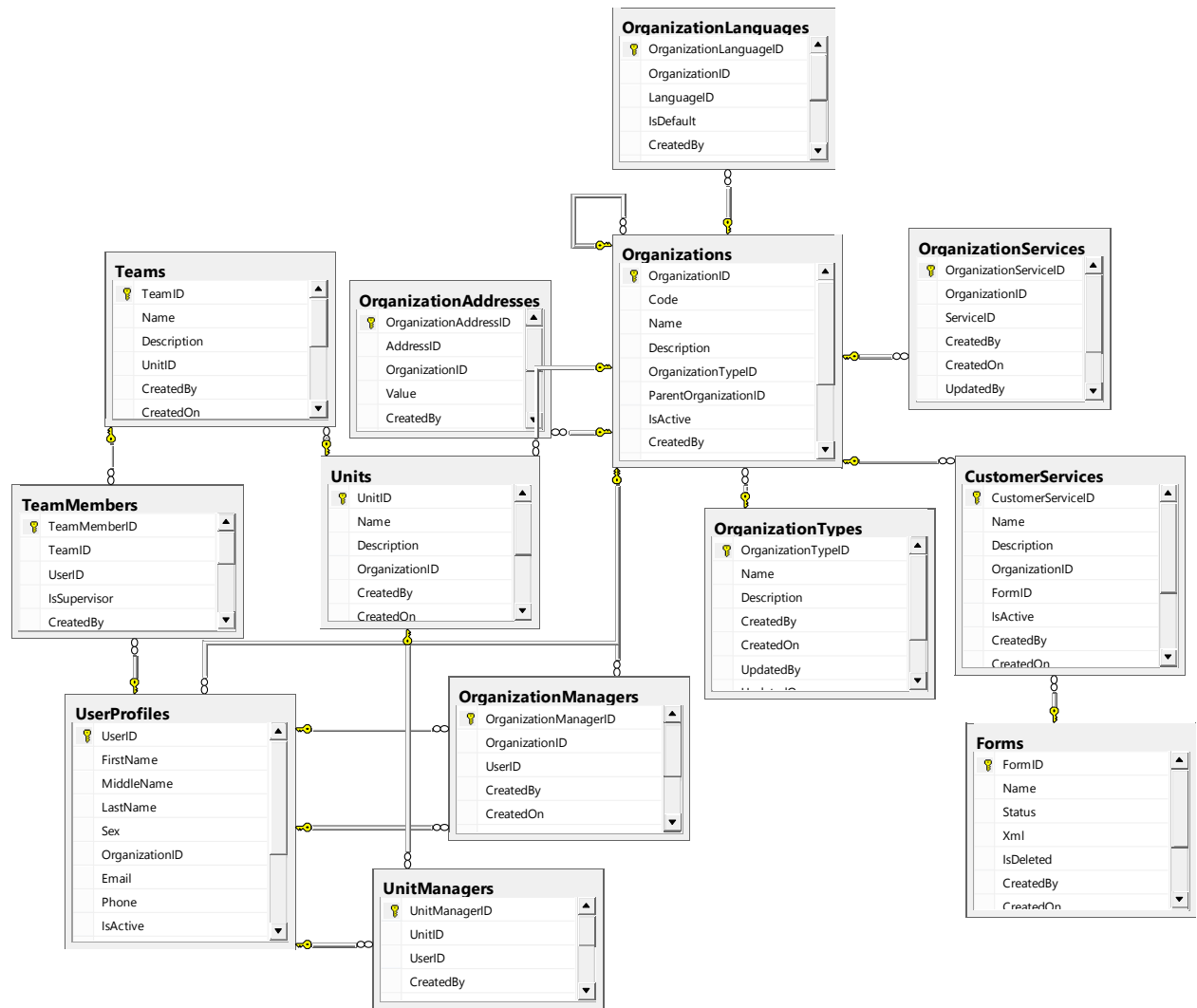


6.2 Data Design

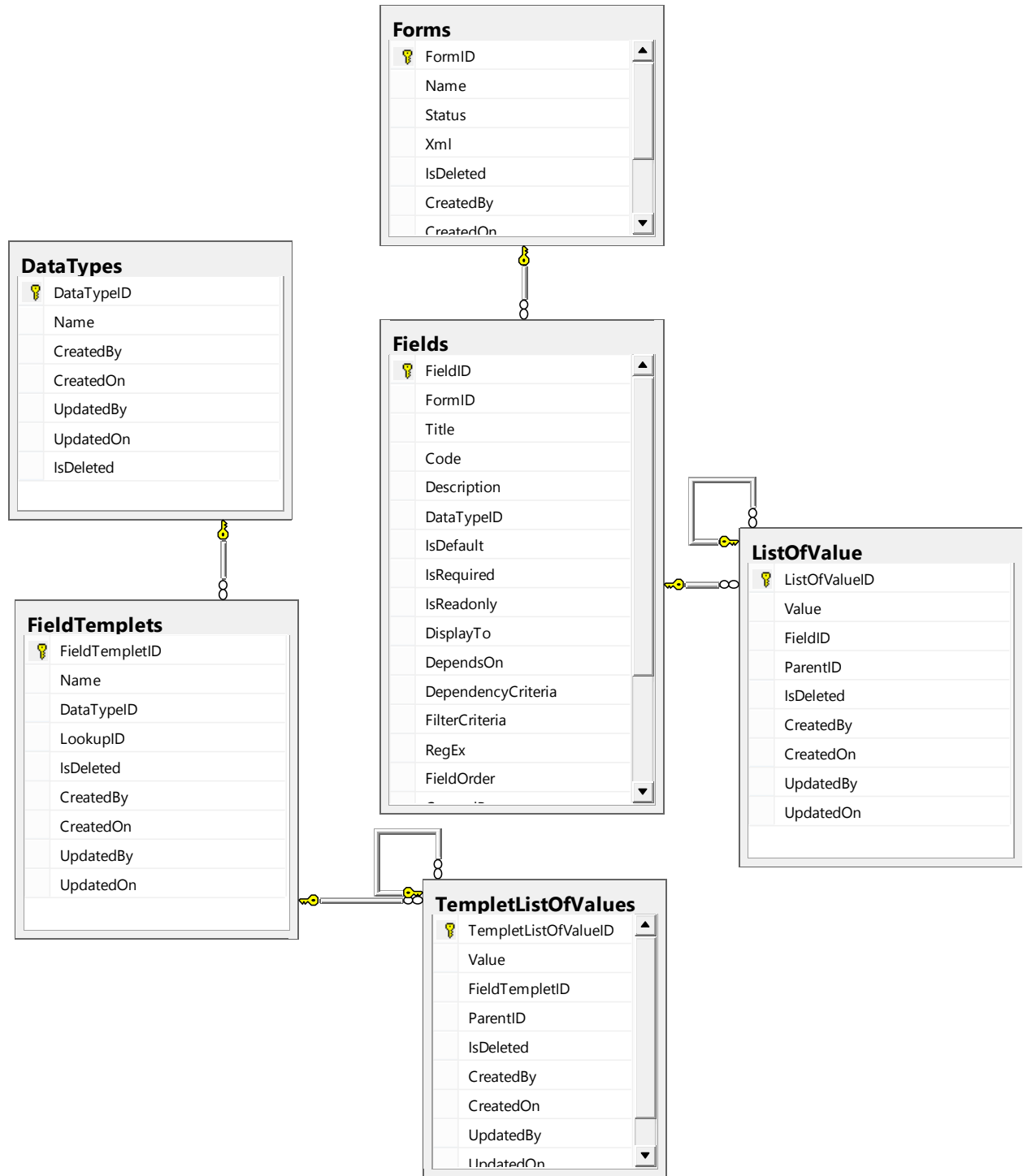
6.2.1 Service/Mandate Management Module



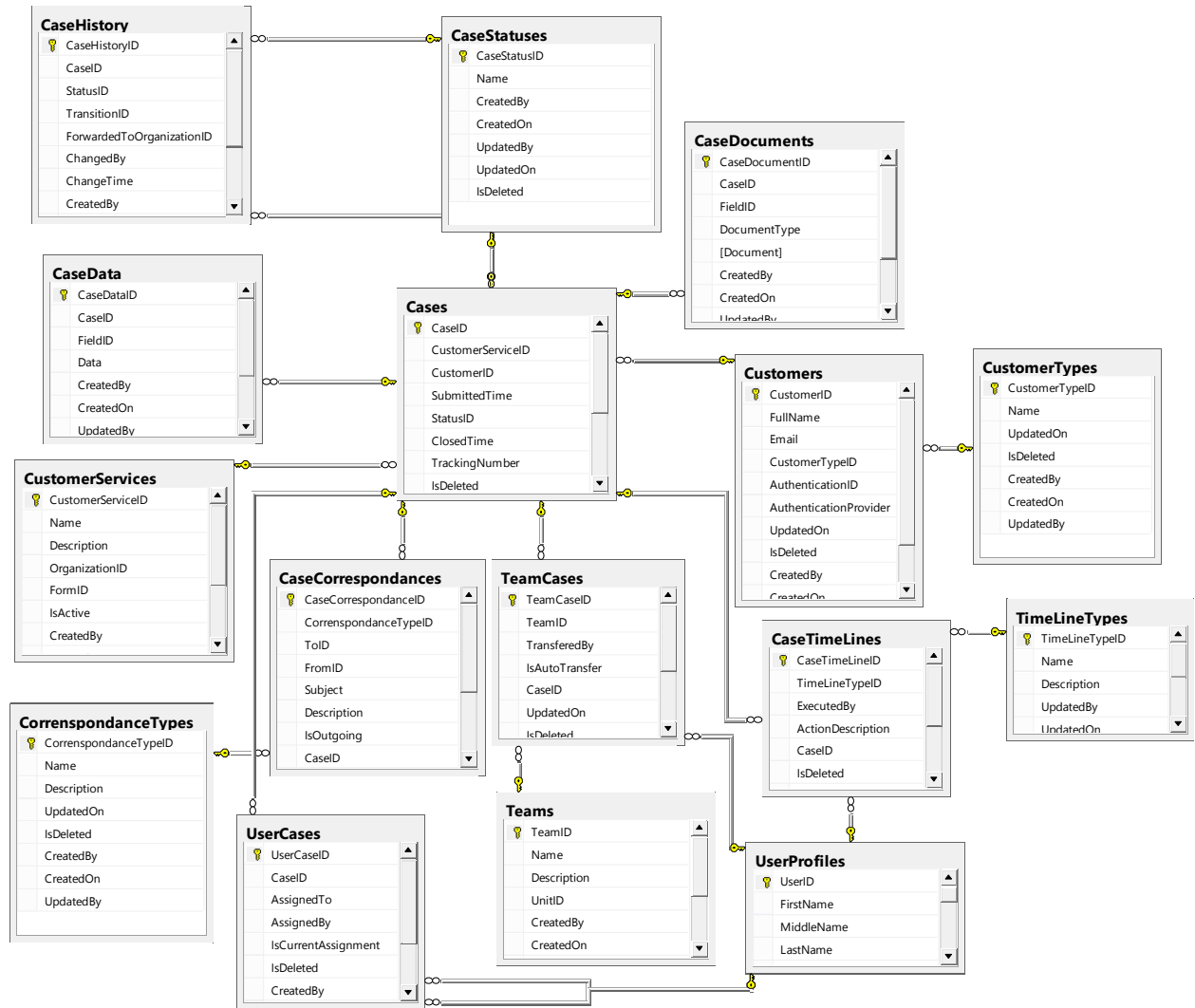
6.2.2 Organization Management Module



6.2.3 Form Builder Module



6.2.4 Service/Case Manager Module



6.2.5 User and Role Management Module

