PROVIDING WEB-BASED PUBLISH-ON-DEMAND SOFTWARE WITH A NETWORKED BUSINESS STRATEGY

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ABSTRACT

Publish-on-demand solutions for marketing resource management have gained ground the last few years, with a more efficient workflow for the creation of documents and publications. Software companies are facing challenges within a business network to expand their business network, and distribute their software through partner organizations.

This thesis proposes guidelines for software companies to provide their web-based publish-on-demand software to partner organizations, and enable the partner organizations to autonomously deploy that software for their customers.

Through the development of an analysis framework for the proposal of organizational requirements for a software providing organization, the required activities and responsibilities between the focal- and partner organizations have been identified. The activities identified are used to look into the value offering by the focal organization, and how the value offering should be adapted.

With a requirements analysis, focusing on functionality and quality, the actual web-based publish-on-demand software is analyzed and a number of requirements are proposed. Combined with the identified activities these requirements are used to identify and propose partner tools, to allow the partner organizations autonomous deployment of the software.

The general findings in this thesis have been elaborated in a case description of an actual publish-on-demand software and services provider, proposing specific activities and partner tools for that organization.

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PREFACE

This thesis describes the results of a Master of Science project for the study of Business Information Technology, in both the School of Management and Governance (MB) and the faculty of Electrical Engineering, Mathematics, and Computer Science (EWI). This project has been carried out as final assignment of this master study from March 2008 up to October 2009.

I would like to express my gratitude to everyone who helped me in any way to complete my thesis and present you this end result. I want to thank both supervisors from the University of Twente, Ariane von Raesfeld-Meijer and Luís Ferreira Pires, for their help through fruitful discussions, encouragements and other help I received.

Furthermore I would like to thank my supervisors from Cordeo, Cyril Reijnen and Miriam Woestenenk, for their support and patience. Especially, I would like to thank Miriam for her direct support, critical eye, and concrete suggestions throughout the development of this thesis.

I had a great time at Cordeo and am grateful that I now can stay there, no longer as intern but as employee. It is a grand company to work for, and thank you for letting me take my cycling trip to New Zealand in January and February 2010.

I would also like to thank my family, and my (ex-)flatmates for their emotional support throughout the long time span of this project.

Eddo Kloosterman

Enschede, 25th September 2009

"There are tourists and then there are travelers, and travelers know the feeling that no matter what adventure we go on, when it's over there is a void left inside, a void we don't know how to fill because we don't know what it is that we are missing. Travelers are searchers, and again, we aren't even sure what it is we're searching for. It could perhaps be described by some as finding oneself, but the problem with finding oneself in travel, is that some day, when the journey has ended the void returns."

Ben Horton, photographer and explorer
From: http://tinyurl.com/l6vbdo

"They say that the journey can be more important than the destination.
In mountainbiking there is no destination.
Just a bike, a rider, and a place to ride."

Jamie Houssian, film director
From The Collective's film "Roam"

1. INTRODUCTION

This chapter presents the focus, motivation, objectives and structure of this thesis, which includes the relevance for both the principal and academic research. The result of this chapter is a clear and complete structure and approach for this thesis.

This chapter is further structured as follows: section 1.1 introduces the motivation and focus of this thesis, section 1.2 states the objectives of this work, section 1.3 describes the research questions, section 1.4 presents the approach adopted in the development of this thesis, and section 1.5 outlines the structure of this thesis by presenting an overview of the chapters and their relations to one another.

1.1. Motivation

A number of years ago the 'paperless office' was on everybody's mind, especially how convenient and environment friendly that would be. Nowadays though, this paperless office has not become reality yet. The usage of paper in companies has even increased instead of decreased [SH01].

Companies are using more paper today than 20 years ago; this includes the usage of paper-based promotional and customizable documents. For quite some time, print-service suppliers were facing obstacles for printing documents with variable data, and printing a small number of documents was expensive. Advances in information technology identified a need to create software solutions that allowed for variable data printing and printing in smaller batches. Innovative companies are currently trying to bridge the gap between the end-users –who have a need for customizable documents– and print-service suppliers. Communication over the Internet between the print-service supplier and the customer has enabled print-on-demand companies to create more efficiency within the printing process [Spr91].

With the progress information technology has made and the Internet enabling other strategies for organizations, the creation and maintenance of relations between organizations shows differences with the traditional business network. This development enabled organizations to create business-to-business (B2B) relations in other ways than the traditional value chain [GF89]. Organizations could become a *matchmaker* within their business environment, bringing organizations together, but also a *market maker* shaping

their business environment [BEP03]. Figure 1 shows the different roles that can be performed by an organization based on the economic coordination and the model of interaction.
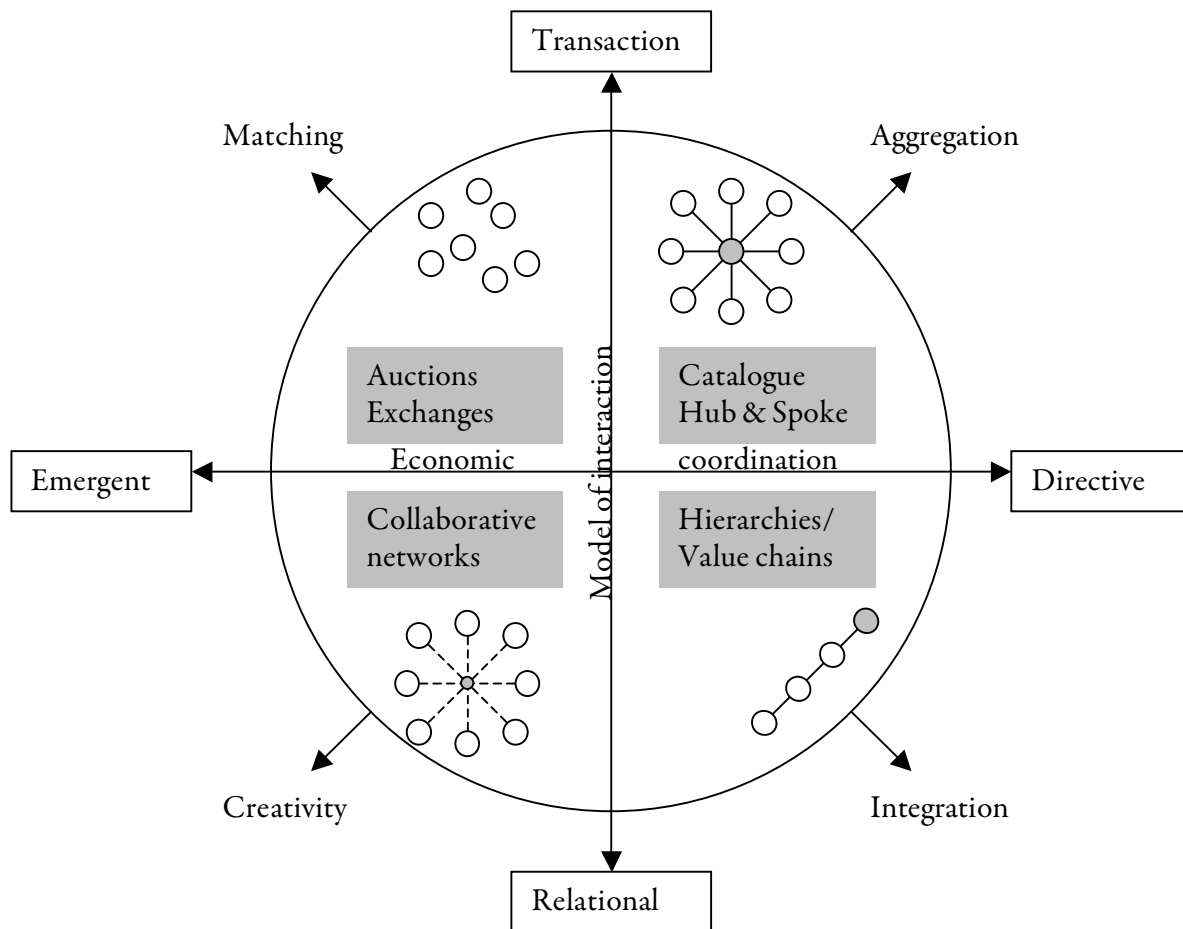
Figure 1. Internet-enabled B2B configurations [BEP03].

The position of intermediary within a business network, together with the advances in information technology, initiated the development of new organizations that focus on the publication of documents in many different forms and within a short timeframe, which is known as publish-on-demand. This process of publishing is performed with a software solution provided by the publish-on-demand solution providers. Through the positioning within a business network the publish-on-demand solutions providers can create new business opportunities to provide their products and services. Intense relations between the intermediary and other organizations are transformed, to create new partner relations and to allow the partner to offer the products and services of the intermediary to their own customers. However, with this development a number of complications and issues for providing such products and services to partner organizations arise.

Publish-on-demand (POD) solution providers perform varying business processes based on the focus of the specific organization. Processes that can be identified are *consultancy*, *software deployment*, *software development*, *marketing and sales*, and supportive processes such as *procurement*, and *human resource management* (HRM). To show a general overview of these processes, each one of them has been described below.

The consultancy process focuses on solving customer issues concerning the document creation, document management and document ordering processes. Solutions offered

within this consultancy process in many cases address a software-based publish-on-demand solution. This triggers the deployment process once the customer accepts the solution that is offered.
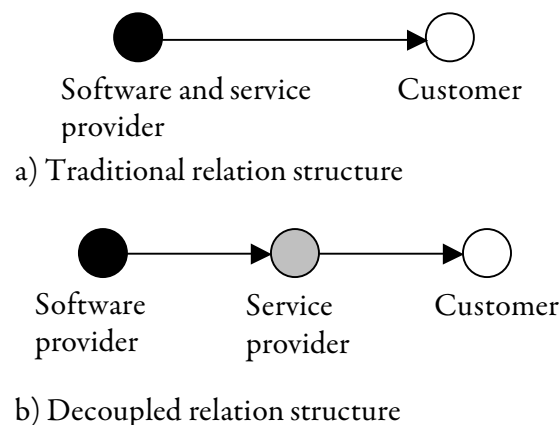
The *deployment* process is concerned with the actual deployment of the POD software solution for the customer. This includes the configuration and rollout of the software according to the specifications and agreements that have been accepted by the customer.

Software *development* focuses on the creation of a software product, which involves the design, implementation and testing. Within this business sector not every organization develops its own software, but in many cases software is bought from other organizations.

Marketing and sales processes establish relations with new customers for the consultancy or deployment processes. These are essential processes for organizations that want to expand their customer base.

Supportive processes aid each of the specific business processes to acquire and manage resources, such as personnel, infrastructure and technology, allowing the specific business processes to focus on their core competence.

As the structure of how software products are delivered is changing [AMV06, CC07], the relation structures between organizations are impacted. Initially a single organization was creating and selling software to its customers, however the current development is that *software creation* and *service offering* are separated. This approach has been depicted in Figure 2, where the separation can be between departments, but also inter-organizational.

Software and service provider   Customer

a) Traditional relation structure

Software provider   Service provider   Customer

b) Decoupled relation structure

Figure 2. Relation structures.

Figure 2 shows the organizations and their inter-organizational relations, where Figure 2a shows a single organization supplying both the software and end-user services and Figure 2b shows a decoupling between software supplier and customer services, showing that these services are provided by separate organizations.

This development shows similarities with intermediation, where an intermediate organization enables relations between suppliers and customers (Figure 3). Through intermediary organizations both suppliers and customers can reduce the number of business relations between each organization [Ros99]. In traditional supplier-customer relations, suppliers have multiple relations with different customers. The intermediary allows a reduction of those business relations through handling the business relations, where suppliers and customers then only have to handle with the intermediary. Suppliers

create relations through intermediaries within their business network according to their networked business strategy.
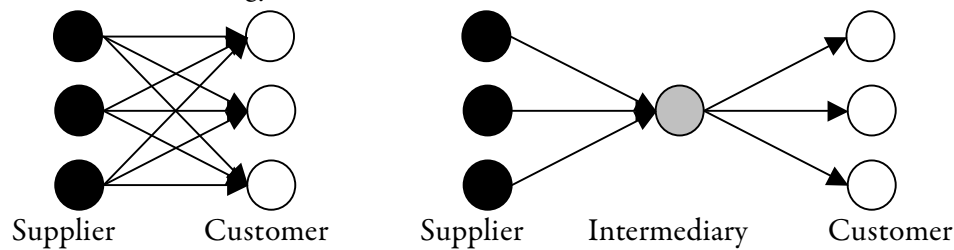

Figure 3. Reducing relations between organizations through an intermediary structure [Ros99].

Expansion through a business network is not a new phenomenon in the theoretical and actual business world, but the relation between a networked organization and the offering of web-based publish-on-demand software has not been discussed yet. For a focal organization that intents to provide its publish-on-demand software through intermediaries, the intermediaries should be able to autonomously deploy the software and provide support to customers. The activities that need to be performed by the intermediary should be supported by the software provider in such a way that autonomy remains for the intermediary. By addressing these activities through software, the software provider does not require to reserve additional human resources for this.

In this thesis the terms 'focal organization' and 'partner organization' are used to respectively depict the software provider, and the intermediary.

1.2. Objectives

The main objective of this thesis is to identify the impact on the focal organization in case web-based software should be autonomously supported by partner organizations. This impact is twofold: (1) the focal organization should adapt to fit the development of delivering the software for autonomous deployment by the partner organization, and (2) the delivered web-based software has to fit the business processes.

The first objective identifies the impact on the focal organization of a change in structure and relations within the business network. Through this analysis of its business processes and relations, an answer can be found, also providing criteria for the product that is offered by the organization.

The second objective identifies the software requirements and design for web-based POD software that can be autonomously provided by partner organizations.

The analysis of the objectives and how these are connected within this thesis has been graphically depicted in Figure 4. The focus will be on the requirements for the new situation for both the organization and its software solution. To identify the organizational requirements an analysis framework will be developed in this thesis, based on theoretical concepts of the networked business organization.

Focus: What is needed for offering web-based publish-on-demand software to a partner organization, which should autonomously provide the software to its customers?

Organization

Sources

Theory: Elaboration of business model [OP04] (ch. 2)

Theory: Analysis framework for organizations... (ch 2)

Case: Current + new situation Cordeo & XLdoc (ch 3)

Elaboration

Step 1: Theory: Guidelines based on theories in framework (ch. 3)

Case: Separation of Cordeo & XLdoc (ch. 3)

Software requirements

Sources

Theory: Elaboration of functional and quality requirements (ch. 4)

Case: Supportive activities to be provided... (ch. 3)

Elaboration

Step 2: Theory: Requirements for software to be provided... (ch. 4)

Case: Requirements for XLdoc software (ch. 4)

Software design

Sources

Theory: Elaboration of software design (ch. 5)

Elaboration

Case: Functional design of supportive partner tools (ch. 5)

Case: Architectural design of XLdoc + partner tools (ch. 5)

Case: Infrastructure design of XLdoc + partner tools (ch. 5)

Step 3: Theory: Functional design guidelines for software (ch. 5)

Step 4: Theory: Architectural design guidelines for software (ch. 5)

Conclusions: Guidelines for providing web-based publish-on-demand software to partner organizations that autonomously offers it to their customers.
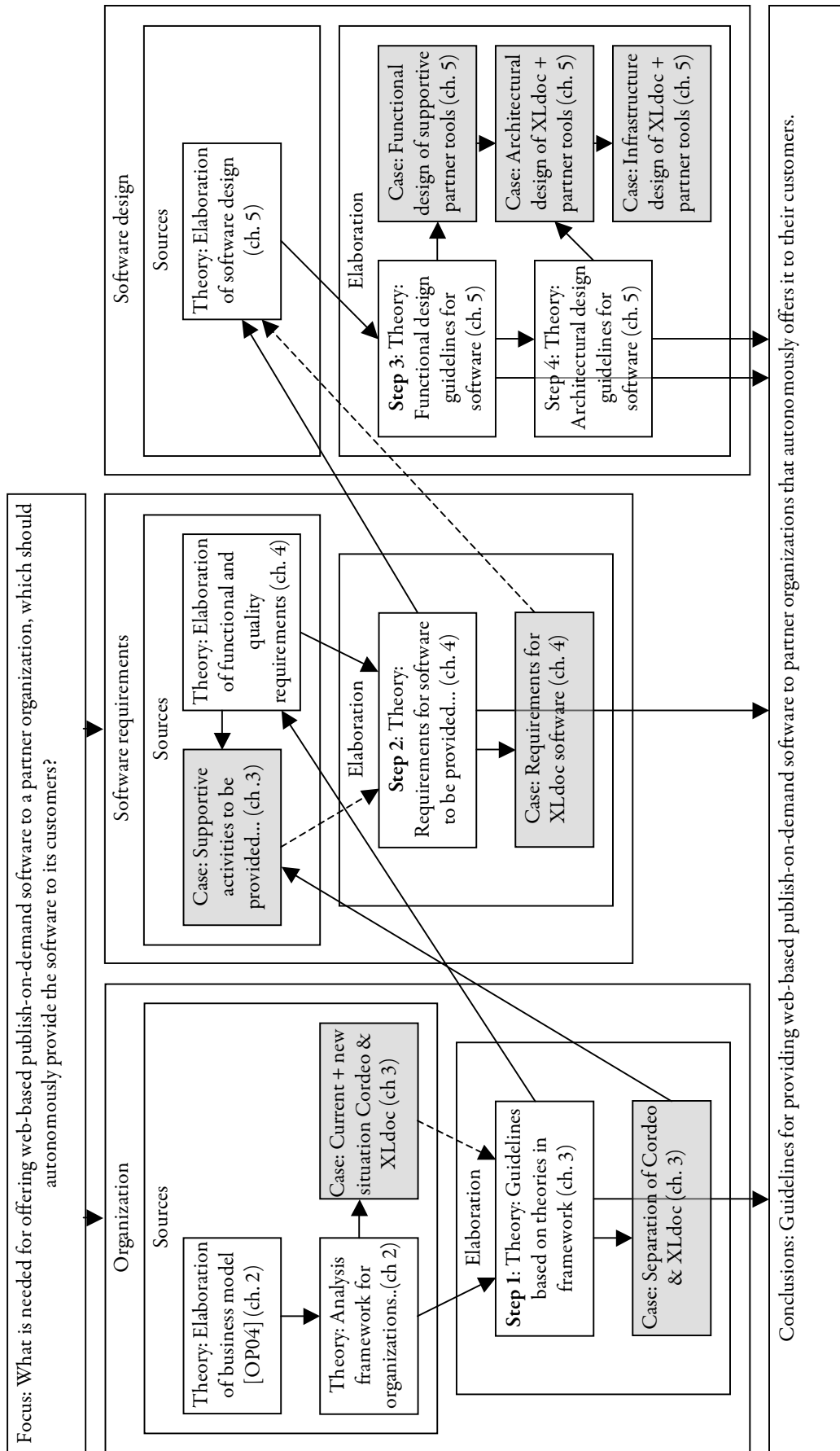
Figure 4. Detailed structure of research elements and their subsequent flow.

1.3.   Research questions

This thesis answers the following main research question:

"How should organizations with a networked business strategy provide a standardized and highly configurable web-based software solution that should be autonomously deployed by partner organizations in the business network?"

This question focuses on both the organizational and technical aspects. In order to answer the main research question a number of sub-questions have been formulated as follows:

1. Which networked business strategies can be identified in literature?

2. How to define a framework to define organizational requirements from a business model?

3. What are the organizational requirements for a web-based software solution provided by an organization with a networked business strategy?

4. What are the technical requirements for a web-based software solution provided by an organization with a networked business strategy?

5. Can a general structure or architecture be given for web-based software solutions, to be used autonomously by partner organizations?

6. Which tools should be provided to partner organizations in the business network, for autonomous deployment and support of a web-based software solution?

7. How should such tools be provided to partner organizations in the business network?

1.4.   Approach

This section shows the approach adopted in the development of this thesis, by describing the general steps taken in this thesis and the scientific methods applied in these steps. The approach is depicted in Figure 4, showing the flow of information from step to step.

The approach followed is based on the engineering cycle designed by Bosworth [Bos95], which defines a clear structure for a design in software engineering.

1.4.1.   Organization

To establish a clear research basis a thorough problem investigation has been performed by means of a literature study on networked business organizations and their business model. Based on the different elements within a general business model [OP04], different elements of an organization are identified, and analyzed through applicable theoretical concepts. These theoretical concepts have been used to develop an analysis framework, in order to identify organizational requirements for an organization to enable partner organizations to autonomously provide web-based software.

The developed analysis framework has been applied in a case study, considering an actual organization that applies a networked business strategy, and resulted in the identification of general and specific organizational requirements.

The principal in this research is Cordeo BV, which is an exemplary organization that provides a web-based publish-on-demand (POD) software solution, called XLdoc, to its customers. Currently the company is developing a new version of their POD software,

which is to be provided to partner organizations. These partner organizations should autonomously deploy XLdoc software solutions for their customers. Together with this new version, Cordeo BV intents to split the organization, applying a decoupled network structure. The software development and the marketing competences will be decoupled in two organizations: XLdoc BV to develop innovative software, and Cordeo BV to focus on marketing solutions based on the XLdoc software. Organizational changes thus have to be made to support this separation, which also has its impact on the software and servicing applications. XLdoc BV is the focal organization for further analysis within this research, and Cordeo BV will be an example of a partner organization.

By using the analysis framework that was developed, the organizational requirements for a general focal organization are identified (step 1), as well as for both Cordeo BV and XLdoc BV. This results in the design of a business model for XLdoc BV, identifying its activities, relations and value creation.

1.4.2. Software

As the different activities of the organization affect the functionality of the product that is offered to customers or partner organizations, the web-based POD software provided by Cordeo & XLdoc is also affected. This functionality is addressed through requirements for the software, from both the view of functionality and quality. According to the ISO X.641 framework [ISO X.641] the software should be able to perform its functions at a certain quality level. This requirements analysis results in a number of general guidelines for functionality and quality requirements that should be addressed by web-based POD software (step 2).

These findings are applied to the XLdoc-case and its web-based POD software, identifying functionality that is currently missed.

Both the general and specific requirements are used to create a software engineering design in different perspectives: functional design and architectural design. Each of these perspectives will be addressed in a general view and a specific view based on the case.

The last phase of this thesis contains the conclusions, where the output of each of the four steps is used to propose an answer to the main research question. This answer is given in the form of guidelines for providing web-based publish-on-demand software to partner organizations that autonomously offers it to their customers.

1.5. Structure

The structure of this thesis reflects the order in which issues have been dealt with throughout the research process. The thesis is structured as follows:

Chapter 2 explores theoretical concepts for networked business organizations, providing the context for the creation of an analysis framework that identifies organizational requirements for a networked business organization.

Chapter 3 discusses the case study with the organizational developments of the principal. With the analysis framework developed in chapter 2 organizational requirements are identified and applied to the new situation.

Chapter 4 translates the new organization situation to functional and quality requirements for the value offering by the focal organization and its partner organizations within the business network.

Chapter 5 discusses the design of the functionality identified in the requirements. Within this design stage the functionality, software architecture, and infrastructure architecture are discussed and designed.

Chapter 6 present and discusses the overall conclusions of this research by elaborating on the contributions, the discussion of the limitations, and the presentation of topics for future work that is inspired by this research.

The specific solutions for Cordeo and XLdoc are used throughout this thesis as examples to illustrate the general findings.

2. NETWORKED BUSINESS THEORY

Within this chapter a number of applicable networked business theories are presented, with the goal to develop an analysis framework for the assessment and development of organizational requirements for networked business organizations.

The developed analysis framework is based on several concepts found in contemporary literature. In order to show the essence of each of those concepts and be able to apply them, each concept needs to be handled in this chapter.

In this chapter an answer is formulated for the first couple of research questions:

- Which networked business concepts can be identified in literature?
- How to define a framework to define organizational requirements from a business model?

Each of these questions is explicitly answered in the conclusion of this chapter.

Section 2.1 discusses the elements of a business model, section 2.2 describes organizational relations, section 2.3 identifies structures within the external business environment, section 2.4 discusses the internal organization of business activities, section 2.5 analyzes the different relations and structures within a business network, section 2.6 discusses the value-creation within e-business, and section 2.7 combines the elements within an analysis framework. The framework will be applied to analyze an existing organization in the following chapter.

2.1. Business model and elements

Businesses can be described based on their actions to create value for both the shareholders and other business stakeholders. Osterwalder and Pigneur [OP04] have established a business model that is based on nine specific building blocks, each describing a specific concept of an organization (shown in Table 1). Each of these building blocks is based on one of the four pillars: product, customer interface, infrastructure management, and financial aspects. Together, these four pillars are essential to the business model of an organization.

The 'product' pillar addresses the overall products and services that are provided by the modelled organization; the focus here is on the value offering by the organization.

The 'customer interface' pillar addresses the relationship between the modelled organization and its customers, including the direct or indirect transfer of value to the customer.

The 'infrastructure management' pillar focuses on the activities and competences of an organization, including the business network of cooperative organizations (the partner network).

The 'financial aspects' pillar discusses the costs and revenues of an organization. For any organization, the cost structure and revenue model should be made clear in order to comprehend the viability of the business model in the real world. The building blocks describe the costs and the revenues of the activities employed and resources used.

Table 1. Building blocks of a business model [OP04].

Pillar	Business model building block	Description
Product	Value offering	Gives an overall view of an organization's bundle of products and services.
Customer interface	Target customer	Describes the segments of customers an organization wants to offer value to.
	Distribution channel	Describes the various means of the organization to get in touch with its customers.
	Relationship	Explains the kind of links an organization establishes between itself and its different customer segments
Infrastructure management	Value configuration	Describes the arrangement of activities and resources.
	Core competence	Outlines the competences necessary to execute the organization's business model.
	Partner network	Portrays the network of cooperative agreements with other organizations necessary to efficiently offer and commercialize value.
Financial aspects	Cost structure	Sums up the monetary consequences of the means employed in the business model.
	Revenue model	Describes the way an organization makes money through a variety of revenue flows.

This business model of an organization has included every element that an organization should handle, which are gathered in the pillars of this model. Each of these building blocks describe how an organization should act, making it suitable to describe an organization.

However, when looking at this business model from the networked business perspective the building blocks can be categorized differently. The external environment of the focal organization is modelled through the building blocks of *target customer*, *distribution channel*, *relationships*, and *partner network*. Through the external environment the organization reaches customers, competition and legislative institutions [Por85], which includes the forming of relation structures within the business network. In the scope of the business

networks, the relations are considered to be the most important asset of an organization [FGH06].

Besides the external environment of an organization, also the internal organization has to be regarded within the business model, describing how an organization creates value. The *core competence* describes in essence what the organization is good at, and can be identified by a combination of its mission, and the activities in which it excels. Any discrepancies between the core competence and the business model call for a reconsideration of either the business model or the core competence. The *value configuration* describes the structure in which competence is used to actually create value within the organization, and basically this is the organizations strategy to make a *value offering* to its customers.

The creation of value in many cases also means the expense and return of monetary funds for resources used and products or services provided respectively. This is defined within the business model by the cost structure and the revenue model, where the latter should adhere to the *mission* and *value configuration*.

In the elaboration of each building block of the business model, we notice that building blocks influence each other. How an organization creates value within a business network is quite complex, as each of the elements in the business model contribute and affect the organization and its activities. The elements described in the business model forms the basis of our analysis framework. This thesis does not consider the financial aspect in our analysis framework, as it falls outside the scope of this research.

2.2.   Organizational relations

For an organization that adopts a networked business strategy, the most important assets are considered to be its organizational relations. The organization itself is not isolated and independent, through its activities the organization interacts with other 'interdependent organizations' [FGH06]. This is a specific view from the Industrial Marketing & Purchasing (IMP) perspective, regarding business not be "islands within an ocean of other businesses". In this section the relationship and partner network elements that have been identified by Osterwalder and Pigneur [OP04] are handled.

According to the IMP perspective, a relation can be categorised in two dimensions: what is affected and who is affected [HS95]. The former dimension, called the *substance* of a relation, focuses on the elements of an inter-business relation. The latter dimension focuses on the *purpose* of the relation between organizations.

2.2.1.   Relation elements (substance)

The actual links within a relation, or substance, can have three different elements: (1) activity links, (2), resource ties, and (3) actor bonds [HS95] (Figure 5).
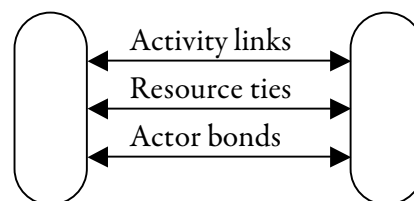

Figure 5. Relation substance between organizations.

Håkansson and Snehota [HS95] identify that relations consist of connected internal activities of two organizations. Linking internal activities of two organizations has its effects on how the organizations perceive each other, therefore affecting their relation. For instance, if there are difficulties with the collaboration between the two organizations, the relation is negatively affected.

The second element considers the resources that can be connected through the relation between organizations. Resources that can be made accessible for the organizations involved can vary from tangible (materials, technology) to intangible (knowledge) resources. The implication is that related organizations can use and exploit each others resources for their own benefits.

The last element in a relation is the actor bond, which considers that within a business relation actors of the involved organizations create a bond between them (i.e., a social relation). The actor bonds affect how the actors perceive, evaluate and treat each other [HS95]. As individuals of both organizations participate in a relation, the relation between two actors influences the relation between the organizations.

Håkansson and Snehota identify that the substance depends on the existence, type and strength of each of the elements (activity links, resource ties, and actor bonds).

2.2.2.   Network effects (relation purpose)

Håkansson and Snehota [HS95] identify three different *functions* of business relations: (1) for the combination formed through the relation, (2) for each involved organization individually, and (3) for third-parties, which are organizations that have a relation with either involved organization [HS95, FGH06] (Figure 6).
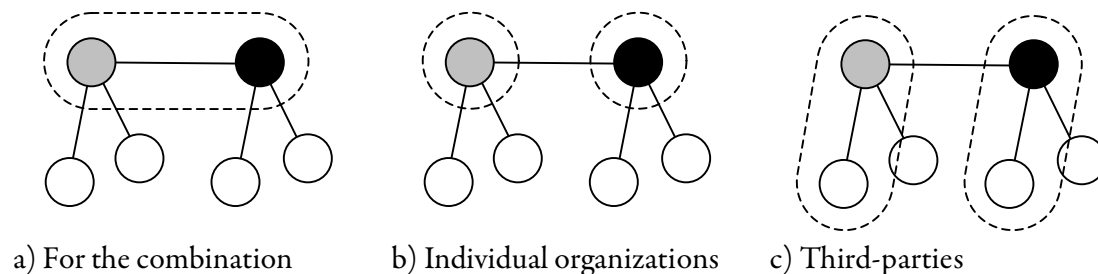

a) For the combination   b) Individual organizations   c) Third-parties

Figure 6. Relation functions.

The first function (Figure 6a) focuses on the inter-organizational cooperation on three different levels, business activities, resources and actors (i.e., the elements of a business relation). The inter-organizational combinations that can be made based on the substance may have unique outcomes and unintended effects for the organizations involved.

The second function (Figure 6b) focuses on the effects external relations can have on the internal functioning of the company. Relations that a company has realized with other companies can have its feedback on the internal organization, as this can drive new business opportunities [FGH06].

The third function (Figure 6c) shows that existing relations of organizations influence the forming of relations with other organizations (i.e., third parties). Each relation is a piece in the larger business network, and can affect the whole structure. The influence of each relation depends on its strength, and the strength of the direct relation.

These functions occur in almost every relation, and to analyse a business relation each of the functions has to be considered. The combination with the relation elements and the functions characterizes how an organization has established itself within a business network, and where the focus points for improvement of each relationship are.

2.2.3. Direct and indirect relations

Another view focuses on how relations are structured, which has its background in the economical transaction theory, where exchanges between two organizations occur only when both organizations see some kind of benefit. The requirement of such an exchange is that at least one of the organizations involved must be better off, without the other organizations to be worse off (Pareto efficiency) [Ros99].

This economic concept can be related to the structure of intermediaries in business networks. Through an intermediary, organizations can reach a wider audience of possible customers without a lot of additional effort in the expansion of the network. In a situation where the number of organizations involved remains nearly the same, the number of transactional relations goes down by using intermediary organizations (Figure 3). The number of transactions through these relations can increase, as other organizations are easier reachable.

Reducing direct relations between suppliers and customers, as based on an intermediary, is consistent with the social network view of Burt on business relations [Bur95]. Burt has identified that within a business network *redundancy* can occur based on *cohesion* and *structural equivalence*. As information is driving business relations, one can see that multiple relations with the same group of organizations is no better than to have a single relation with that same group.

Relation redundancy by cohesion is based on the assumption that a group of interconnected actors (or organizations) with strong relations share information between each other, and that each eventually has all information available (Figure 7a). In this case another actor does not have to connect with all of these actors inside the group in order to gain information, as connecting to one actor would be sufficient to benefit from the information gain.

For redundancy by structural equivalence, the focus is not on the direct contacts, but on the indirect contacts (white nodes in Figure 7b). The white nodes form a close interconnected group of actors or organizations, which have each the same information. As the black nodes (the direct contacts) each connect to the group, each of the direct contacts benefit from the same information. For the focal organization (grey node) it is thus not needed to connect to each of its three direct contacts, as no additional information benefits can be gained.
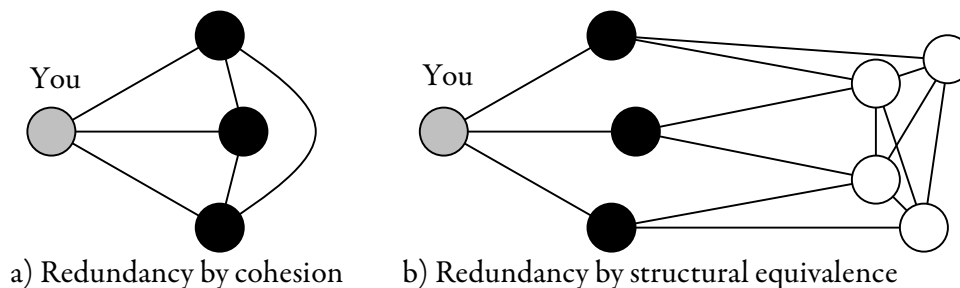

a) Redundancy by cohesion   b) Redundancy by structural equivalence

Figure 7. Relation redundancy within a business network [Bur95].

Burt [Bur95] has identified that two principles determine how well a company copes with the redundancy for an optimized business network: *efficiency* and *effectiveness*. Efficiency focuses on maximizing the benefits through non-redundant contacts, and keeping down the cost of maintaining a business network.

Effectiveness distinguishes direct and indirect contacts, in order to concentrate resources on maintaining relations with direct contacts. Direct contacts have to be seen as gates to the benefits an organization can get from the indirect contacts. The direct contacts become an intermediary to access the rest of the network.

The decision to focus on such an efficient and effective network of business relations, impacts the relations of the organization. Organizations in the relation have to consider other existing relations that can advice against additional relations, as it may create redundancy. However, for a commercial organization that wants to address a market, it would want as many (potential) relations as possible to sell its product(s) or service(s).

This section has identified how each relation between organizations is built up and has shown differences between direct and indirect relations. An organization only enages in creating relations with another organization when there is some sort of value transferral between the organizations involved, and from which both organizations benefit [Ros99]. These benefits can be in the form of additional value for the organization, new business opportunities or positive network effects. Each of the different network effects has their influence on how an organization creates value.

2.3.   Structures and functions in business networks

Business relations are not only influenced by their elements and effects within a business network, the difference between direct and indirect relations already indicates this. More complex structures can be formed that each has its benefits and drawbacks. This section identifies and analyzes specific relation structures within a business network, in which the concept of intermediaries remains a central pivot point. These business network structures focus on the partner network of the focal organization, which stems from the business model of Osterwalder and Pigneur [OP04].

2.3.1.   Relational structures for intermediaries

An intermediary as discussed earlier can be in different relational structures. Gould and Fernandez have identified that intermediaries can participate in six different relational structures and roles, where the differences are based on alliances between organizations [GF89]. These alliances affect the awareness of each organization in the relation-chain of other organizations that are indirectly related.
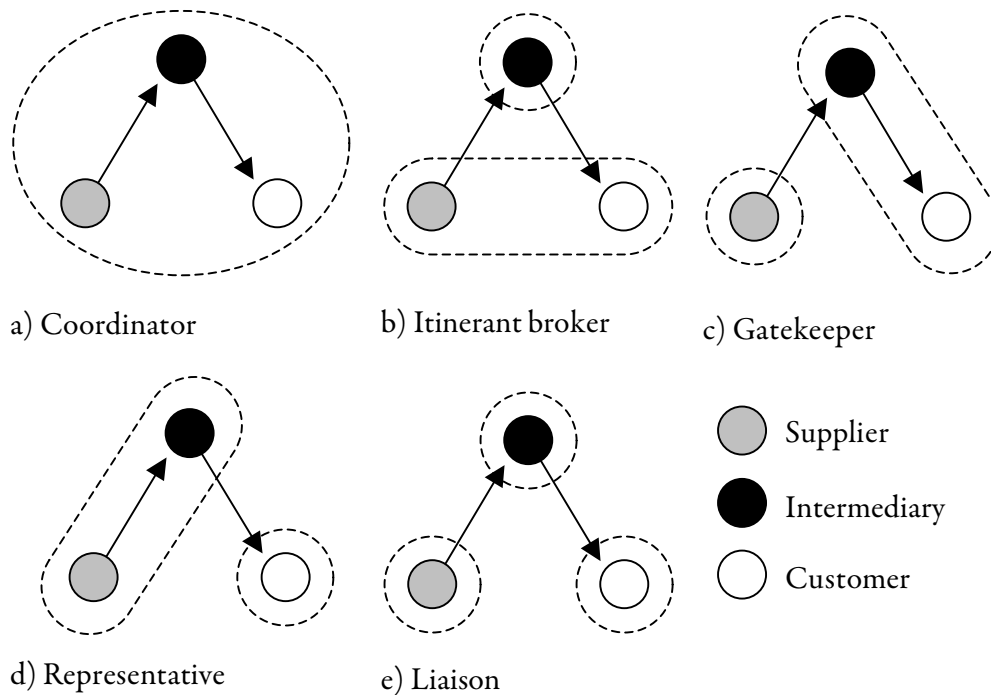
Figure 8. Relational structures for intermediaries [GF89].

The first structure considers the intermediary as a coordinator, showing that all organizations involved are within the same alliance and are aware of each other (Figure 8a).

The second structure shows the intermediary being outside the alliance that binds the supplier and customer (Figure 8b). This is denominated as an itinerant broker; an example of this form are brokerage firms that are generally clearly separated from their customers, while the buyers and sellers are in an 'undifferentiated group' viewing from the broker [GF89].

The third (Figure 8c) and fourth (Figure 8d) structures are quite similar, though each intermediary is in a different alliance. The 'gatekeeper' role intermediates on behalf of the customers with suppliers, where the supplier has no knowledge of the actual customer. The 'representative' focuses on intermediation on behalf of the supplier, where a customer has no knowledge of the actual supplier.

The last structure considered is the liaison (Figure 8e), in which the organizations are in distinct groups. This structure shows independence between the different organizations, where each might not be aware of other indirect relations, thus a supplier might not be aware of any customers of an intermediary.

While each intermediary relation can only fall into a single category of the five, the individual organizations can perform a combination of each of the corresponding roles simultaneously [GF89], thus being in multiple relational structures simultaneously for different relations.

An organization that focuses on relations should be well aware of which structures exist between their organization and other parties. This includes the openness of suppliers and customers for other organizations, as competition within the network might be influenced.

2.3.2. Intermediary functions

Intermediaries can also perform different functions depending on the relations between organizations. These functions describe where the organizations place themselves within a relation structure[Ros99], these functions are:

- Joining: enabling direct coordination between two other involved organizations;

- Relating: enabling coordination between two organizations, through its role as intermediary;

- Insulating: enabling coordination between an organization and a third-party, without the organization having any knowledge of the third-party.

The functions described can be seen as 'bridging incompatibilities' between market sides exchanging goods [Ros99] with the intermediary enabling this bridging. The incompatibilities originate from the trade relations between organizations, where two market sides are not able to trade based on trade frictions. An example of this is trading between a supplier and a consumer, where a retailer can come in between to solve problems such as stock, space and quantities of goods sold in transactions. Rose [Ros99] also states that the important aspect of intermediation is the independence of the intermediary towards either side in the relation. The independence described here is that the intermediary remains a separate organization that has weak ties with the supplier organizations. For intermediaries it is thus important to refrain from a majority of long-standing relations that do not provide a high reward of value for the organization, and focus on weak ties with other organizations in the business network that do provide substantial value. In this way, the intermediary should hold its independent position.

A combination of the typology of functions and the structure shows their relations and how they can be combined, but also show the limitations of each combination (Table 2). It is possible that an organization performs several of these functions at the same time, for different relations and organizations.

Table 2. Combining functions and structures.

Functions / Structures	Joining	Relating	Insulating
Coordinator	X	X	
Itinerant broker	X	X	
Gatekeeper/Representative		X	X
Liaison		X	X

Looking at the combination of functions and structures it becomes clear that the relating function is applicable to all relation structures for intermediaries; this is not remarkable as this in many cases is the core competence of intermediaries. The significance for the analysis framework is that the relation structures have an impact on the functions that can be performed within the business network.

2.3.3. Syndication

Syndication shows the use of intermediaries in a more concrete form, focusing on offering packaged information or goods that have been created through integration of other information or goods [Wer00]. Organizations adopting this configuration focus on a quite specific core competence, and use their position within a business network to gather additional competences. The Internet has enabled the syndication strategy, as reuse of information in different forms is possible, in contrast to physical products.

In the concept of syndication three different roles can be adopted: (1) originator, (2) syndicator and (3) distributor. The *originator* focuses on the creation of original information or innovative products. The *syndicator* packages the information or product, creating a new product and manages the relations between originators and distributors. It is also possible that syndicators package items for other syndicators (Figure 9). *Distributors* deliver the information or product to the consumer or end-user. An organization adopting the syndication configuration can adopt multiple roles at once, which creates more integration within the value chain that is considered here [Por85] (Figure 9).
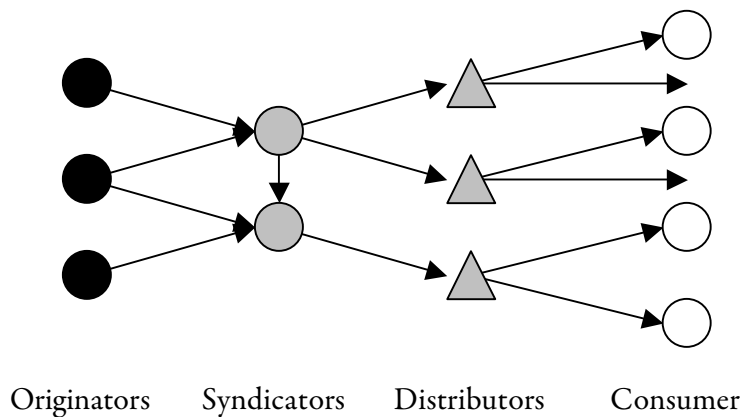

Originators   Syndicators   Distributors   Consumer

Figure 9. Syndication structure (based on Werbach [Wer00]).

This structure is adopted by news agencies, where news agencies and newspapers syndicate information to other news-feeds. The newspaper acts as a syndicator and distributor between the news sources (i.e. news agencies, reporters, photographers, etc) and the general public. The news agency has the role of a syndicator, packaging news-items and photographs so that newspapers or other news-feeds can use the information.

This form of information exchange in the syndication structure shows similarities with the publish-on-demand process structures, in which printed documents are created based on available information.

The business relations between the different roles in this network structure can have diverse effects within the business network. The relation between the originators and the syndicators can result in new packages of information and products. This effect can even spark other originators to engage in relations with the syndicator, thus creating a positive network effect (i.e., network expansion).

The relation between syndicator and distributor shows similarities with the relation between originator and syndicator, since a syndicator can now choose from its network of distributors to find a fitting product delivery for a consumer.

The way this network is structured is quite effective and efficient, since each role only concerns with its direct relations. However, redundancy is created within the business network. This becomes apparent when an originator connects to as many syndicators as possible to spread information. This information might eventually reach the same consumers through multiple channels.

2.4. Value network

The value network configuration enables the focal organization to facilitate the creation of relations between its customers. The focal organization provides their customers with a business network of other organizations (i.e., other customers) to connect to.

The focus within this strategy for the focal organization is the service, service capacity and service opportunity to connect other organizations [SF98]. This can be also seen in the primary activities for value creation in this strategy:

- *Network promotion and contract management* are the activities that consider the selection, initialization and termination of relations with (potential) organizations within the business network of the focal organization;

- *Service provisioning and billing* consists of activities related to linking customers and billing for value received. For billing it is required to measure the customer's use of the service.

- *Network infrastructure operation* is the operation and maintenance of a physical and information infrastructure, focusing on requests of customers.

These primary activities depend on support activities that encompass each primary activity, such as firm infrastructure, human resource management, technology development and procurement.

- *Firm infrastructure* focuses on the management information systems and financial systems that facilitate the operation of the organization itself.

- *Human resource management* (HRM) concerns with recruitment and management of people within an organization.

- *Technology development* focuses on both the development of network infrastructure, and customer services.

- *Procurement* focuses on resources that are needed for the operation of the organization. The procurement task is often specialized to support the development of network infrastructure and the development of new services, as these two tasks are essential for an organization adopting the value network.

These activities have been graphically shown in Figure 10, which shows that the primary activities overlap each other as a result of their dependencies.
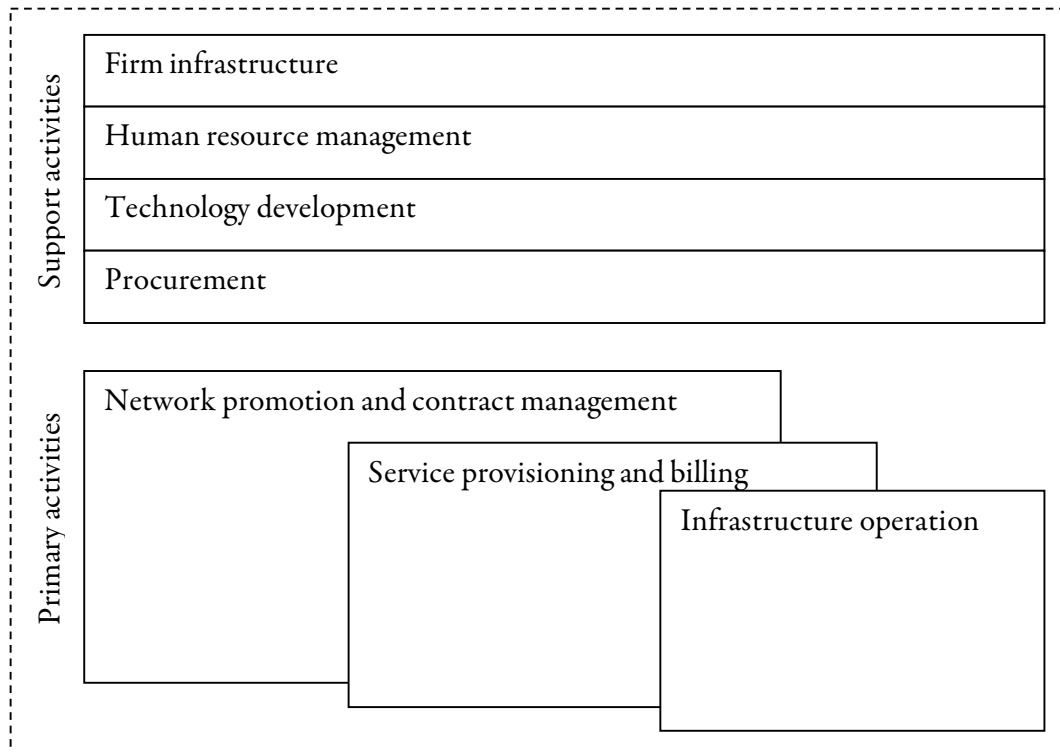
Figure 10. Value network diagram (based on Stabell and Fjeldstad [SF98]).

For an organization adopting the value network strategy (the focal organization) the business network and relations are the competitive advantages of the organization [SF98, FGH06]. As Håkansson and Snehota [HS95] have described, the *combination of organizations* can create new developments between organizations within the network. It has been identified that in the networks of two different value network organizations other business developments occur. Organizations in multiple networks might have a competitive advantage over other organizations in a single business network.

2.5.   Analyzing relations in the value network configuration

Organizations adopting the value network configuration rely on a mediating technology to facilitate the creation of new exchange relations. Within this structure the following relations can be identified: (1) relations between the focal organization and its customers, (2) direct relations between customers of the focal organization (Figure 11a), and (3) indirect relations between customers, through the focal organization (Figure 11b). Different roles should be performed by the focal organization in the business network.
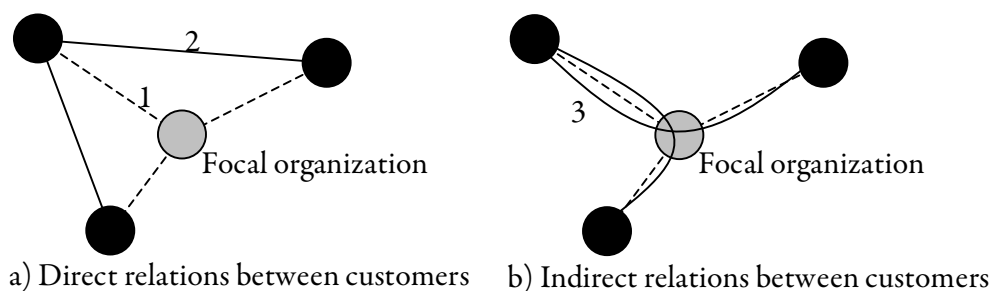

a) Direct relations between customers   b) Indirect relations between customers

Figure 11. Direct and indirect relations within a business network.

The different relations within the business network differ not only in their direction, but also on how they are built up, in terms of the elements and functions of the relation.

The focal organization can have different functions when creating relations between organizations within its business network, by either joining or relating [Ros99]. The focal organization acts within the network as an enabler of relations between organizations, supported by the primary activity of *network promotion and contract management*. The other organizations within the business networked are identified as customers of the focal organization, but each of these customers can act as supplier for other organizations within the network.

2.5.1.   Relation between focal organization and customer

The relation between the focal organization and a customer (Figure 11a, relation 1) focuses on attracting customers, and enabling the customer to create relations within the business network. The substance of this relation consists of activity links and resource ties, where the customer handles the relation-creating-activities by the focal organization as resource. Activities that are linked between the two organizations can be found in the acquisition and maintenance of customers, as the customer wants to use the business network to find new clients. During the time that the relation holds, actor bonds might be formed between the two organizations. As the customer organization perceives more business opportunities from the relation, the relation can grow stronger.

Looking at the functions of the relations, a number of effects can be seen based on the relation between focal organization and customer. For the combination of the two organizations, it can be seen that new business opportunities can arise from the relation. The focal organization will expand its business network with a variety of organizations to provide its customers a wide range of opportunities, which allows the focal organization itself to create new business opportunities through the relations with customers.

The relation affects also the way the customer works, as the marketing and sales department will have to change to enable the creation of relations with other organizations within the business network of the focal organization.

Changes for the focal organization depend on the number of transactions that occur with the customer, specifically on the capacity of handling relations and transactions. Also the focal organization has to enable the customer to be found within the business network.

Looking at the effects the relation has on third parties on either side of the relation shows that for the organizations within the business network the new customer can be competition, as well as a new opportunity. For the third parties on the side of the customer it can mean that fewer transactions are handled, or even relations terminated because of the new opportunities within the business network of the focal organization.

This relation has been modelled accordingly in Table 3.

2.5.2.   Direct relation between organizations within the business network

This relation is based on the linking of activities or resources between two customer organizations within the business network (Figure 11a, relation 2). Based on the strength and length of the relation, actor bonds can form between persons or roles within both organizations. As both the customers can be almost any kind of company in this value

network, it is hard to say how the relation itself is built up. However, looking closer at the functions of the relation it is possible to elaborate more.

Based on the combination of both organizations through the relation new business opportunities can arise; cooperation between the two organizations creates interconnected business processes. The effects this has for either organization separately can be an increase in efficiency of their business process, but might also be an extension of the business goals and processes. Thus the relation affects the business processes of each organization.

Third parties on both sides can benefit from the cooperation between the two organizations, however this cooperation can also mean that relations with certain third-parties are broken. The termination of relations can be based on issues that come up with efficiency and effectiveness of processes that are in cooperation with third-parties; new relations with competitors can enhance the efficiency or effectiveness.

2.5.3.   Indirect relation between organizations within the business network

The third relation, where the relation between two organizations within the business network goes through the focal organization, is the most complex of the three identified relations in this strategy (Figure 11b, relation 3).

Business processes that are linked in this relation between two organizations show that the focal organization should have a process that allows the transfer of goods or information between the two organizations, otherwise this relational structure cannot be achieved by the focal organization. Thus the organizations on both ends of the relation will have connections to the logistical activities of the focal organization, and consider these activities as resources within their own organization. This relation can grow in strength and complexity, which in turn also creates bonds between actors in each of the three organizations involved.

Focusing on the functions of the relation, the combination impacts the focal organization. Linking the activities and resources of the three organizations creates a stronger relation, which in turn affects the activity links and resource ties. The links in logistical activities and resources can allow for expansion in this area.

This allows for the focal organization to expand their role in intermediation, not only as linking the two organizations on either end of the relation, but also physically transferring goods from one to the other. For the customer organization this influences the logistics division of the organization, mainly moving that competence to another organization. This allows the customer organization to focus on its own core competence.

For third parties on either side of the relation it might mean that the customer organization will only deal through the intermediary as it handles the logistics. This would break relations, as not each third party would want to connect to the intermediary.

Table 3. Relation elements and functions of each identified relation.

Relations / Relation elements	Relation between focal organization and customer	Direct relation between organizations within the business network	Indirect relation between organizations within the business network
Activity links:	Acquisition of new relations within the business network.	Activities of both organizations in this relation are linked to each other, to enable new or improved activities on either side of the relation.	Logistical activities are connected between each of the actors in this relation.
Resource ties:	The opportunity and possibility to enable relations between organizations within the business network.	Resources on either side are linked together, which can include knowledge, technology, or other resources.	The exchange of information or goods through the focal organization is a resource for the organizations on both ends of the relation.
Actor bonds:	The relation can grow stronger and form new bonds between specific persons or roles within either organization.	With an increasing strength of the relation, it is likely that actor bonds will form, which can increase the strength of the relation even more.	With an increasing strength of the relation, it is likely that actor bonds will form, which can increase the strength of the relation even more.
Relation functions			
For the combination:	Creation of new business opportunities from a diverse number of organizations within the business network.	Creation of new business opportunities; connecting business processes.	The relation between the intermediary and the two customer organizations grows stronger, and more dependent.
Individual organization:	Customer organization: Changing the way customers are acquired and handled. Focal organization: Changing capacity for handling new relations.	Positive influence on business processes (efficiency, effectiveness) or expansion of capabilities (new processes).	Focal organization moving towards logistical organization, customer organization focuses more on core competences.
Third parties:	Abandoning third parties for new business opportunities in the business network, also adding competition.	Benefits based on the new relations, however relations with third parties may be broken based on the relation.	On either side relations would be broken, based on the relation with the intermediary.

Table 3 shows that the intermediary organization performs all intermediary functions that have been defined by Rose (i.e., joining, relating, and isolating) [Ros99]. The direct relations between customers show both the coordination structure and the itinerant broker

structure. For the indirect relations between organizations in the business network the structures can be a gatekeeper or representative structure [GF89].

These different relations and their characteristics show that the intermediary can be much more that just an enabler of relations. Through the relations various activities between the organizations involved are linked together.

2.6. Value creation in e-business

Within e-business four sources for value creation are identified by Amit and Zott: (1) efficiency, (2) novelty, (3) lock-in, and (4) complementarities [AZ01] (Figure 12).
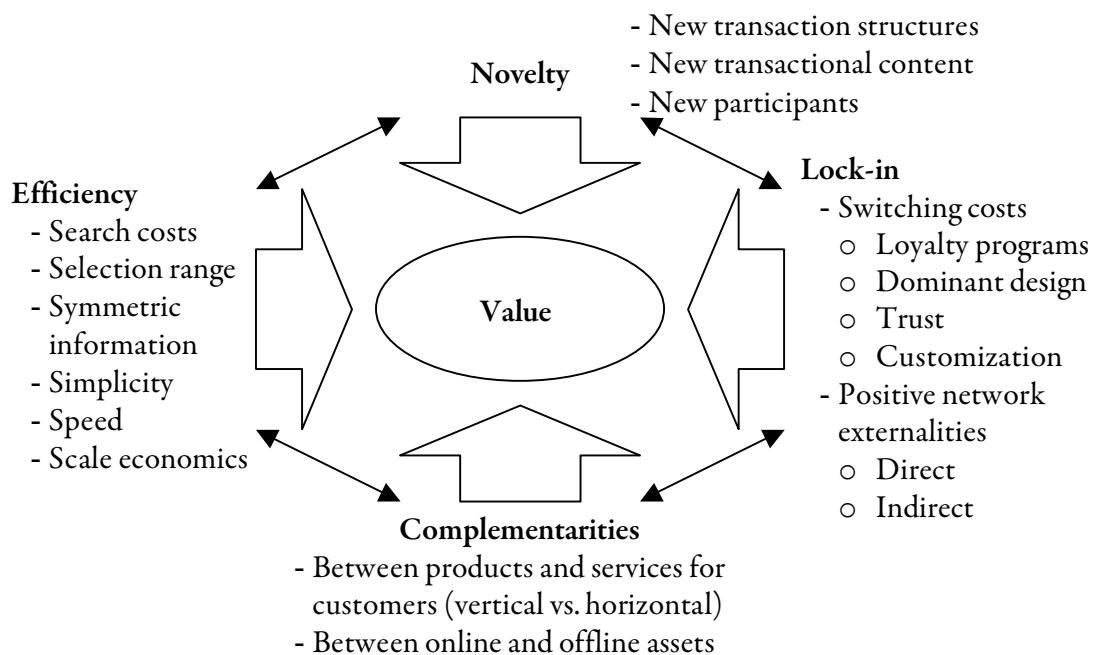

Figure 12. Four sources of value creation in e-business [AZ01].

Efficiency focuses on transaction cost economics, decreasing the costs of transactions in exchanges. Novelty focuses on innovations in both the products and services of the focal organization, and on the structuring of relations. Lock-in prevents customers to move to the competition, thus creating value through reoccurring transactions and lowering costs for maintaining customers. The last source of value creation in e-business is based on complementarities, where a bundle of products or services provides more value than the total value of each product or service separately. These four sources can be applied separately, but in most cases an organization focusing on e-business addresses multiple sources [AZ01].

From a networked business perspective these sources of value creation can be applied on both a relational level, and on a strategic level. On a strategic level an organization focuses on a single source of value creation as core competence, acquiring other competences through the business network (example: specialized knowledge companies).

Relations that focus on lock-in of both the focal organization and the customer will allow only the use of activities and resources for that specific relation, not applicable in other relations. Examples are specific activities for a customer, or customized software.

Relations that regard complementarities are more open for further reuse by the individual organizations. Here the activities and resources on both sides of the relation are combined to create new services and/or products, allowing other organizations in the business networks of either organization to use these services.

The efficiency source can be identified that such a relation enables the customer and its connected business network to see an improvement in business activities. The effect on the combination consists of more dependence of the customer on the focal organization.

For novelty the focal organization and the customer combine each other's activities and resources to create new business opportunities. The combination can create a stronger relationship between the organizations involved. For the individual organizations new business opportunities and relations appear, based on relations with other organizations.

Table 4. Network effects based on the sources of value creation.

Sources of value creation / Network functions	Lock-in	Comple-mentarities	Efficiency	Novelties
For the combination	Almost no effects.	Positive effects with integration of activities and resources.	Transactions between organizations can be improved.	Connecting organizations to other business networks.
Individual organizations	Resources cannot be used in other relation.	Allowing for other business opportunities through the relation.	Internal processes are improved.	New business opportunities and relations in a business network.
Third parties	Almost no or little effects based on the customer.	Creating more value through new products or services.	Improvements on activities and resources provided.	New relations in a new business network.

However, the sources of value creation are not only influenced by the network functions, but the value configuration plays a major part as well. The structuring of the activities within an organization affects the sources of value creation and vice versa, which is made clear in Table 5.

Table 5. Effects for the organization based on the combination of primary activities from the value configuration, and the sources of value creation.

Sources of value creation / Primary activities	Lock-in	Comple-mentarities	Efficiency	Novelties
Network promotion and contract management	Keeping existing relations as long as possible.	Establishing new relations for additional activities that complement current activities.	Establishing relations that influence the existing activities and make it more efficient.	Establishing new relations that create new business opportunities.
Service provisioning	Maintaining existing customers with specific services that retain the customers.	Billing customers for used services and rewarding for acquired services.	A billing system for service usage, based on the usage intensity.	Operating a flexible revenue collection mechanism.
Infrastructure operation	Keeping an information infrastructure that retains the customers.	Operating an open infrastructure that shows complementary services within the network.	Operating an open infrastructure where customers can share how activities can be operated more efficiently.	Operating an open infrastructure elaborating any new opportunities and activities.

The effects that have been described in each of the tables above show that the value creation of an organization can be influenced based on both external relations and the structuring of the internal organization. The focus between each of the different sources of value creation can be quite clearly identified, and also the impact on activities.

Within the framework the combination of value creation sources and activities will be used to show the difference between the current activities and what it should be based on the source of value creation, or the other way around based on the activities defining the source of value creation.
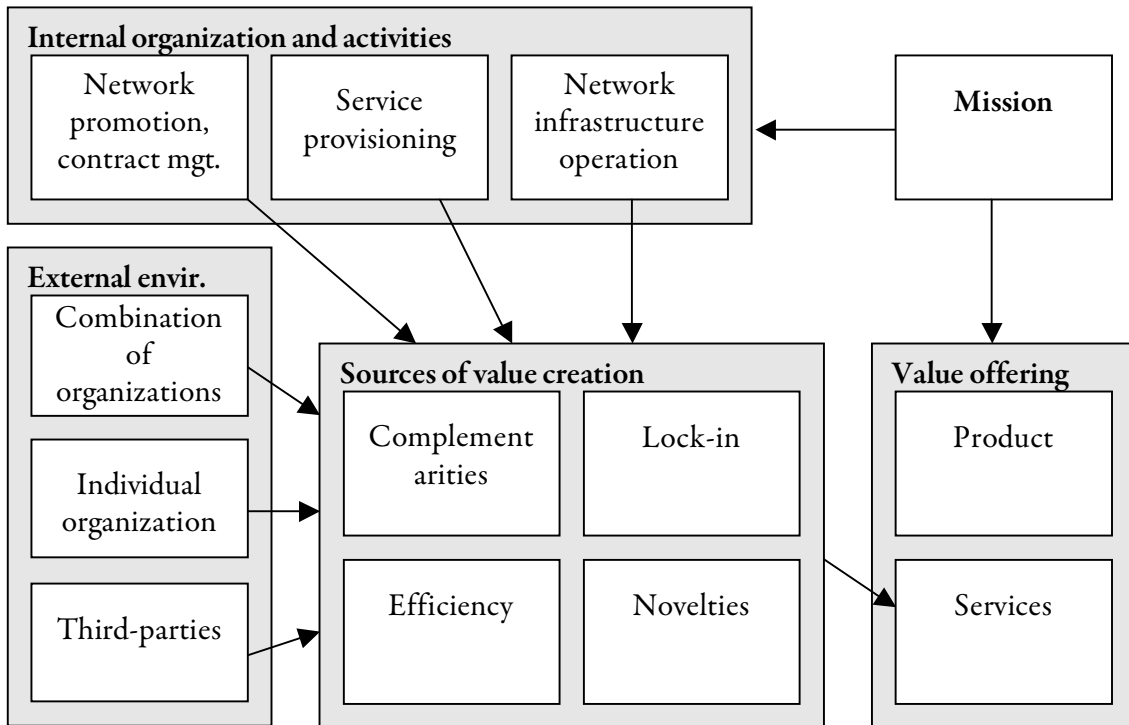
2.7. Analysis framework

Figure 13. Analysis framework of the value creation activities.

The analysis framework has been developed to analyze the value creation and value offering of an organization that intends to extend its value creation in a business network. Figure 13 shows the developed analysis framework in a schematized form. This section will explain the developed framework, so that it can be used in the following chapter on an actual case.

To analyse an organization, the external relations of the organization have been identified and analyzed using the IMP perspective on relations within a business network.

Besides the external environment also the internal organization is considered here for the value creation. The internal organization consists of the activities an organization performs to create value according to a certain organizational structure. Stabell and Fjeldstad [SF98] discuss the structure of primary activities, by organizing these activities based on the motivation to create value by enabling exchange relations within the business network. That has resulted in the value network configuration, which is applied in the analysis framework.

2.7.1. External environment

The analysis of the external environment in this framework is based on the IMP perspective (section 2.2). Relations that increase the network externalities [SV99] through their network functions are positive for an organization and should be used more extensively within the organization. Table 5 provides insights in the link between network functions and sources of value creation.

2.7.2. Mission and Internal organization

The internal organization has a clear relation with the mission of an organization, as the primary activities should be based on the mission. In our analysis framework the primary

activities are based on the value network configuration (section 2.4), considering a networked business organization. The underlying structure of the primary activities and their focus defines the focus, which is on the network promotion, service provisioning, and infrastructure operation. Each of these categories has their own focus on the activities and the network, enabling the creation of relations, handling these exchange relations and providing a network infrastructure for the customers. The focus of these activities shows where they create value for the organization, which allows possible weaknesses and strong points in the value proposition of the organization to be shown. Actual activities performed and the responsible actors in the focal organization are identified through an activity-role matrix.

It is also identified that the mission of an organization should be leading within the configuration of primary activities. Any discrepancies between the activities and the mission show that the activities do not match the mission of the organization. Therefore this thesis concludes that the value creating activities and their focus should be based on the mission of the organization. The value creation can be steered by the network effects and the activities performed within the organization.

2.7.3. Value offering

According to Osterwalder and Pigneur [OP04] the value offering of an organization does not only consists of activities, but also of delivered products.

The value offering should be a consistent package, with matched *product* and *services* [OP04]. Thus, with any considerations towards the activities of an organization one should also inquire about the product being offered. The mission of an organization also has its influence on the value offering, by addressing where an organization is moving to. If the mission differs from the analyzed services and product, the organization should consider changing either the mission or the value offering. With a changing organization structure and overall view of the value offering, also the product that is offered should fit. In many cases this results in other or additional requirements for the product.

The result of this framework is a structure for the organization in which the primary activities and the product have been considered. The analysis shows where in the current structure and arrangement of activities discrepancies and negative developments can be found, and organizational activities and relations should be arranged.

2.8. Conclusions

The goal of this chapter was to answer the following research questions:

Which networked business concepts can be identified in literature?

How to define a framework to define organizational requirements from a business model?

The first research question is answered by the first part of this chapter, considering the IMP perspective, intermediaries, syndication, and the value network configuration. The developed analysis framework answers the second question.

The framework can be applied to any organization that focuses on creating value through the external environment, performed by applying a partner-centred strategy.

The way the relation functions are handled determines the position within the network for the organization. With the function for the combination new opportunities can be created

for the involved organizations, as activities of both organizations might allow for new, innovative products or services. This influences the way both organizations view each other, and how they act in conjunction with each other to other organizations in the business network.

The function for the individual organization discusses how the relation influences the organizations separately; therefore focusing on the internal organization of both organizations involved in the relation.

The value network configuration of Stabell and Fjeldstad [SF98] provides a configuration for the internal organization. The analysis framework has given generic guidelines for an organization that focuses on providing value through the business network (partner organizations). However, this differs for each source of value creation for the organization, and it should be in line with the mission and vision of an organization.

For the case that is described in the following chapter this thesis will look at the value creation of the existing organization shortly and further analyze the organizations that should be the result of a split to a software and service organization. For one of the resulting organizations the value creation should fit better its mission than before, whereas the other organization should have a source of value creation designed specifically for it.

3. CASE STUDY

This chapter considers the case study of an actual publish-on-demand software supplier, which is analysed based on the analysis framework of section 2.7. The results are both in a generic perspective as well as specifically for the organization in the case study.

The descriptions and analysis presented in this chapter are based on data that was collected through semi-structured interviews with the organizational stakeholders within the existing organization and through own research, based on the analysis framework.

Section 3.1 describes the current organization as case introduction, section 3.2 considers the new situation based on the existing situation and the motivation, section 3.3 analyzes this new situation with the analysis framework to create a clear networked business model of the new situation, and section 3.4 describes the new networked business model in terms of organizational requirements.

3.1. Description of existing organization

The focus in this research is Cordeo BV, a consultancy organization that has developed in-house a web-based publish-on-demand (POD) solution. This POD solution is called XLdoc, which is the basis for their customer-specific solutions.

The company was founded in 2001, where it focused on the creation of innovative POD software solutions for their customers. Over the years, the company has expanded its customer network, both nationally and internationally. The focus within the company has been always to create generic software solutions that can be applied without too much configuration to a specific customer. Cordeo has aimed at improving the efficiency within processes that involve the creation, management and production of documents.

With a growing network of partner organizations and customers, Cordeo is in a situation where the capacity of the organization is becoming too small for its number of customers. For this reason the company has opted for the idea of separating the organization into a separate software-development organization and a service provider. Former research has prescribed a structure for the software provider and the service provider to provide their products and services [Kle08]. However, this separation is currently not yet implemented, as the activities of these new organizations are not yet identified.

The focus of the existing organization is made quite clear in their mission: "*improving efficiency through streamlined and transparent processes, effective brand management and cost control. Our POD solutions build an integrated and powerful chain from creation, maintenance and production to fulfilment and distribution*" [From the corporate website http://www.cordeo.com/, as viewed on 27-08-2009]. This shows that Cordeo aims at solving customer issues on the whole spectrum of processes involving document creation. This implies that the publish-on-demand software should also be able to support the entire process of document creation to distribution. This is realized by three separate, but tightly integrated, applications: XLdoc Document Ordering, XLdoc Content Manager, and the XLdoc Image Library.

A new version of the XLdoc software is in development, which should be better adaptable to the wishes of customers. This POD software solution is a generic application, though highly configurable and scalable to meet a broad range of customer-demands, which allows the configuration of customer-specific applications.

3.1.1. External business environment
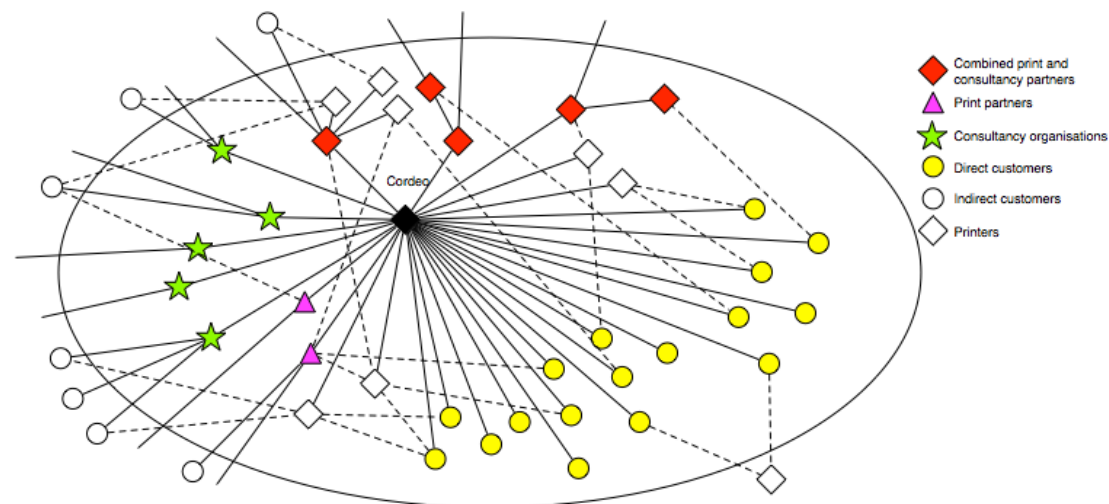
Figure 14. Business network of Cordeo.

Within the existing external environment of Cordeo a high number of both direct and indirect relations can be seen (Figure 14). The following relations can be identified within the business network, which are quire similar to the intermediary relation structure:

- Relation with direct customers;

- Relation with print-service suppliers;

- Relation with print partners:

- Relation with consultancy organizations.

The relation with direct customers is probably quite clear, it shows an exchange between Cordeo and a customer organization that wants to use the XLdoc software.

Print-service suppliers are offering their services of printing documents indirectly to the customers of Cordeo.

Print partner and consultancy organizations are reselling and redistributing the XLdoc POD solution to their direct customers, offering concrete and customer specific solutions.

The consultancy organizations that exist in the current business network do not yet possess the required knowledge to autonomously provide their customers with a fitting solution based on the XLdoc POD software together with support, therefore they pass the customers over to Cordeo.

3.1.2. Internal organization

The current internal organization is structured in terms of several departments with their own independent focus, but require the cooperation of other departments for a number of activities. A matrix of current activities with corresponding departments is given in Table 6.

Table 6. Activity – Role matrix.

Activities / Departments		Operations	Marketing	Software development
Consultancy	Consultancy	X	X	
Software deployment	Technical deployment	X		X
	Functional deployment	**X**		
Software development	Software development			X
	Maintaining customer installations	X		X
Marketing	Creation of marketing material		X	
	Expansion of business network		X	
Operations	Coordination between customer and print-supplier	X		
Partner support	Software deployment	X		X
	Creation management reports	X		

Departments

The goal of the Marketing department is to put the XLdoc solution on the market, by attracting new customers and partner organizations. This includes activities such as consultancy, marketing and generating leads for new opportunities within the business network of partner organizations.

The Operations department supports the direct customers and the partner organizations of Cordeo, focusing on consultancy, customer deployments of XLdoc, and support.

Software development creates innovations and maintains the XLdoc software that is deployed on in-house servers, and maintains the technical infrastructure. These innovations become eventually part of an actual deployment for customers.

Activities

Consultancy: Several customers require advice on their document creation processes, for which they come into contact with Cordeo. Potential customers are attracted through the sales and marketing department, mostly flowing from the personal network of the responsible actor or through customer references. During this process, the actual analysis of the problem is performed and a solution is proposed to the customer. In many cases this solution is based on the XLdoc software, and customers accept the solution.

In more detail within this process a new relation is established between Cordeo and a customer, for which activities are performed. These activities consist of advising a customer, matching a product to the customer problem, and presenting the customer an applicable solution. After this consultancy activity the focal organization may come to the activity of software deployment, to actually solve the customer problem with their solution.

Software deployment: This activity regularly follows the consultancy process for customers, by further providing the customer with a specific software solution for its document-publishing problem. Cordeo also participates in software deployment by partner organizations (such as print partners and consultancy partners). These organizations handle their own customer-base, but need the help of Cordeo to deploy POD software solutions for their own customers. This is necessary because the software is hosted on the physical network provided by Cordeo, and partner organizations are not able to deploy customer installations themselves to these servers.

Within this deployment activity, different views can be distinguished: functional deployment and technical deployment. The functional deployment focuses on the configuration of the software, where the scope and functionality of the software is organized. Technical deployment is the organization of the physical infrastructure on which the software runs, and the management of the multiple deployments.

The timeline of this software should also be considered, as the organization identifies certain phases in the rollout of a software solution. First the software and hardware are configured (functional deployment and technical deployment), next the customer tests the configuration. After this step the customer can approve the software, according to the scope of functionality and quality that was identified before the deployment phase. Once a customer has approved the deployment, the operations phase starts during which support is given to the customer for usage and possible failure handling.

Software development: Another activity is the development of new software that can be deployed by Operations for customer organizations. Currently the focus in this process is on the creation of a new version of the POD software solution. Coordination for features and requirements that should be supported by the software is done within the department, but also on occasion with Operations and Marketing as these departments can translate customer wishes into more specific feature requests. Based on coordination meetings and discussions new features are accepted, postponed or even cancelled for the POD software. When features are accepted the Development department spends resources to implement these software features.

Marketing: This activity is concerned with putting the publish-on-demand software on the market. Resources are spent to get in contact with potential customers and partner organizations, which includes the creation of marketing materials.

The actors performing this task use their social and business relations to come into contact with potential customers. Partner organizations are usually found in existing customers that want to incorporate the XLdoc solution in their own offerings.

Coordination between customer and print-supplier: As printing orders are sent and received by email, some orders are checked for inconsistencies before a print-service supplier receives the order (for example, rush orders), but since print-service suppliers are increasingly moving to an automated workflow, checks happen less frequent. For items to be published PDFs are generated based on the template and the input, which are sent to an FTP-server that allows the print-service supplier to fetch the high-resolution print file.

Partner support: As partners are not capable to perform deployment and maintenance of customer configurations by themselves, both Operations and Development play a role in supporting these partner organizations. Their support focuses on actually deploying a customer specific configuration, and creating financial and usage reports for the partner organization.

3.2. Description of new situation

Based on the motivation of both directors the intention is there to separate the existing organization into a software development company and a consultancy organization. This development has been researched to some extent, but has left a number of unknowns for this situation to become reality. The research by Klein Douwel [Kle08] has identified that a separate *Cordeo-new* (consultancy organization) and *XLdoc-new* (software company) can handle their current business network more effective and efficient (Figure 15).
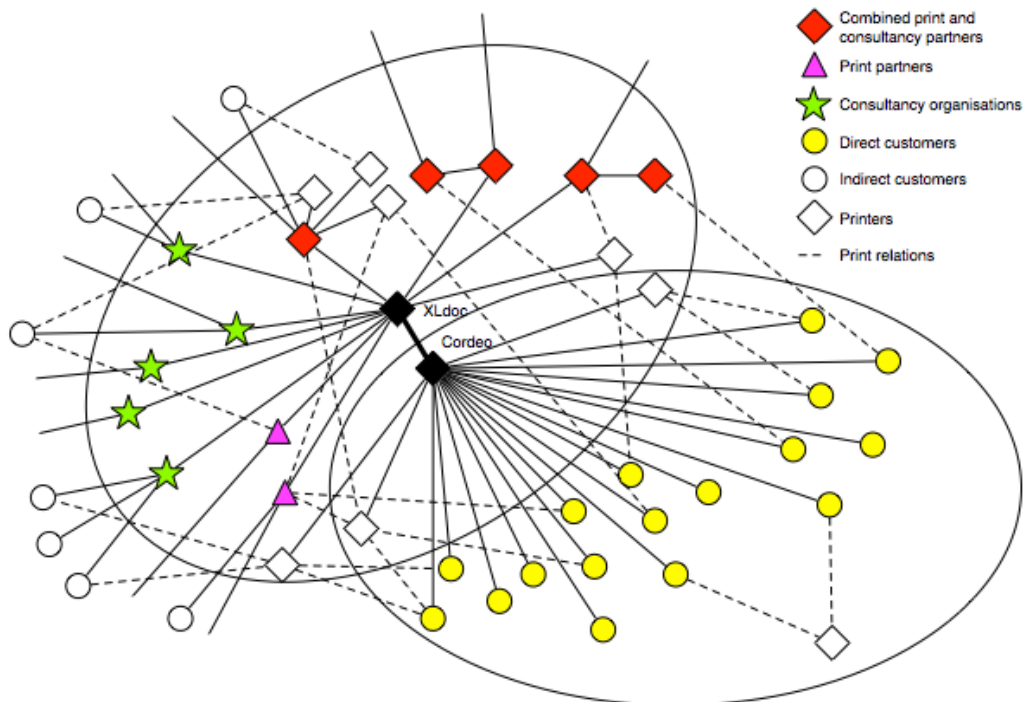

*Figure 15. Business network in new situation.*

In this new situation software configuration is the intended task for the partner organization, instead of Cordeo-old that performs this task currently. The activities performed between the both organizations are elaborated in section 3.3.2.

3.3. Analyzing the new situation

Both organizations are analyzed in the new situation (Cordeo-new and XLdoc-new) using our framework of section 2.8. First the external relations present within the new situation are explored based on the elements of the relations and the network effects that have been identified.

Second, the current activities are analyzed to be able to show the activities that should be performed in the new situation. These activities are matched within the value network diagram to see what is missing within both organizations once separated, and elaborating on the separation of existing activities.

Further exploring the value creation of the organization the actual value creation is further analyzed from both the angles of the external environment (relations) and the internal organization (activities). Which leads to a number of organizational guidelines for the
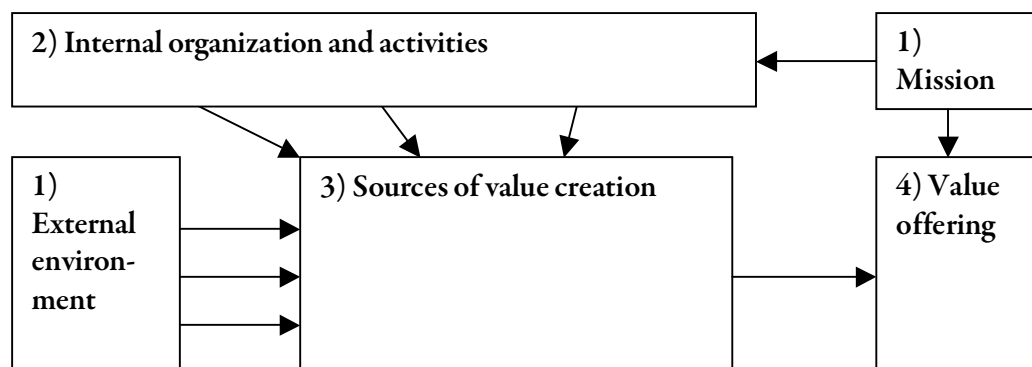
separated organizations.

Figure 16. Schema of the developed analysis framework.

3.3.1. External environment

This section covers the organizational relations that exist in the new situation, for both Cordeo-new and Xldoc-new (figure 15).

Relation with direct customers

The relation between the direct customers and Cordeo-new can be characterised by a full support of document management and fulfilment activities. Document and publication-related issues will likely be the initiation for this relation.

The customer will use the provided POD software solution as a resource to handle its issues. This might result in customized customer-focused solutions, based on the original POD software solution. However, the software usage is not the only resource that is provided to customers, Cordeo provides also support with the solution. This support can be on both the whole customer process for document management, creation and publication, and on the POD solution itself, such as knowledge on how to use the software.

As there is only a limited amount of staff, where each member provides support for a multitude of direct customers. This support is also focused on specific persons that aid the customer in case of need.

When looking at the functions of the relationship, it is clear that the customer will be affected in a number of processes and workflows. For the focal organization it will add another party to support, for which time and capacity need to be reserved.

In most cases the relation of the customers with a printer will also change, because a printer will also need to support the XLdoc platform. It might also be that a customer will use one of the printers known to support XLdoc, which will sever the relationship with its original printer.

Table 7. Relation with direct customers.

Relation elements	Cordeo-new	XLdoc-new
Activity links:	The POD solution of Cordeo-new will be coupled to the document management, creation and ordering processes of the customer.	The deployment process is linked between XLdoc-new and Cordeo-new.
Resource ties:	The customers are using the POD software solution in their own business processes.	-
Actor bonds:	Depending on the amount of support and additional work needed, the bonds between customer and Cordeo-new grow.	Through deployment of the software the actor bonds between Cordeo-new and XLdoc-new grow.
Relation functions		
The combination:	Issues that the customer had concerning document management, creation or publication have been solved by the software solution.	-
Individual organization:	The customer organization is solving issues they have with documents in their organization; Cordeo-new has a new customer for whom resources and time have to reserved.	XLdoc-new will have to deploy resources and time for another customer.
Third parties:	Connected print-service suppliers to Cordeo-new can gain print-orders for the new customer, however existing printing relations between the customer and a print-service supplier can be severed.	The number of indirect contacts for XLdoc-new increases.

Relation with print-service suppliers

The relation between Cordeo-new and a print-service supplier, and XLdoc-new and a print-service supplier, focuses on using the resources of the print-service supplier (the printing of documents) for users of the XLdoc software solution. Users can order documents through the XLdoc software, which gets sent to the print-service supplier for further processing.

The print-service supplier can reach new customers that are in the business network of Cordeo-new, for which the organization does not have to put in a lot of effort. The expansion within the business network of Cordeo-new creates a positive effect on the rest of the network, and can attract new business opportunities. An example of such a development would be the creation of a relation with a print-service supplier in Japan. Existing customers that want to operate in the Japanese market but did not have the resources themselves for documents are now able to create documents on the local market, or improve their efficiency by not having to physically ship documents to Japan. Also other partner organizations may use the print-service supplier for the customers in their business network.

The same goes for the relation between XLdoc-new and a print-service supplier, where XLdoc-new has the intention to enable their partner organization to use the printing facilities of the print-service supplier.

Table 8. Relation with print-service suppliers.

Relation elements	Cordeo-new	XLdoc-new
Activity links:	Activities that are linked between the two organizations, on one side the ordering activity (Cordeo-new), and on the other the actual printing and delivery of documents (print-service supplier).	Ordering through the XLdoc software is sent to the print-service supplier for production.
Resource ties:	Cordeo-new addresses the printing activity as a resource in their process, and the print-service supplier uses the support provided by Cordeo-new as a resource in their business processes.	XLdoc-new uses the services of the print-service supplier for their partnet organizations.
Actor bonds:	For a number of print-service suppliers the relations have expanded to personal contacts between Cordeo-new and the printer. However, this is not the case for every print-service supplier within the business network.	Actor bonds are present between XLdoc-new and a print-service supplier for extension of the relation.
Relation functions		
The combination:	Connecting multiple customers to a print-service supplier, to expand the business network.	Connecting partner organizations to print-service suppliers, expanding the business network.
Individual organization:	For the print-service supplier, creating new printing relations without having to perform acquisition itself. Cordeo-new can use this print-service supplier for other customers, thus expanding the business network.	XLdoc-new can use this print-service supplier for other customers, thus expanding the business network.
Third parties:	Other customers of Cordeo-new can use the print-service supplier for their own printing activities.	Other partner organizations of XLdoc-new can use the print-service supplier for their own production.

Relation with print partners

The print partners depend on support by the higher-level partner organization Cordeo-new. Without that support they are not able to provide the full service to customers. Therefore also activity links are present, where Cordeo-new provides a number of activities on behalf of the print partner. Knowledge is also shared across relations with print partners. This knowledge sharing also creates actor bonds between Cordeo-new and the print partners; actors influence each other during the knowledge exchange of support. This could create stronger relations between Cordeo-new and a print partner.

Print partners are using the functions for their relationships even further, by also providing POD services directly to their customers. The relationship between Cordeo-new and the print partner enables the print partner to explore a broader market, providing a web-based POD solution.

However, for each customer that is acquired by the print partner the deployment is still performed by Cordeo-new, as the network infrastructure is maintained in-house.

Table 9. Relation with print partners.

Relation elements	Cordeo-new	XLdoc-new
Activity links:	Activities that re linked between the two organizations on one side the ordering activity (Cordeo-new) and on the other the actual printing and delivery of documents (print-service supplier).	Deployment activities are performed by XLdoc-new for the print partner, and print activities are performed by the print partner for XLdoc-new's partners.
Resource ties:	Cordeo-new addresses the printing activity as a resource in their process. Print partners are using the POD software of Cordeo-new to offer their own customers a POD solution to explore a broader market.	XLdoc-new addresses the printing activity as a resource for their partner organizations. Print partners are using the POD software of Cordeo-new to offer their own customers a POD solution to explore a broader market.
Actor bonds:	Throughout this relation strong commitments and personal relations have formed between the two organizations.	Throughout this relation strong commitments and personal relations have formed between the two organizations.
Relation functions		
The combination:	Allow distribution of the XLdoc software together with a full printing and delivery service.	Allow distribution of the XLdoc software together with a full printing and delivery service.
Individual organization:	Cordeo-new supports another partner organization. The print partner has gained another competence through which they can create value.	XLdoc-new has gained another way to distribute the XLdoc software. The print partner has gained another competence through which they can create value.
Third parties:	Organizations in the business network of the print partner gain a more efficient opportunity for document creation and management.	Other partner organizations can use the print-services of the print partner for their customers.

Relation with consultancy organizations

The consultancy organizations rely on resources and a number of activities of both the focal organization (XLdoc-new) and the higher-level partner organization to fully support their customers. Within a theoretical setting it can be seen as resource ties and activity links in this relation.

Looking at the functions of the relationship, it can be seen that the consultancy organization focuses on third parties. Selling the XLdoc solution to their customers, and passing them on to Cordeo-new for the implementation and support processes. The conjunction between Cordeo-new and a consultancy organization results in a dyadic function that focuses on expanding the relationship between both companies. This also has its effects on the individual companies, allowing consultancy organizations to use the knowledge created in the relation with Cordeo-new to be used in other relations. Cordeo-new has gained another partner in its network that promotes and can distribute the XLdoc solution.

3.3.2. Internal organization of XLdoc

Within the new situation a partner organization, for now Cordeo-new, should be able to autonomously deploy a customer-specific deployment of the XLdoc POD software. Besides this, the software provider, XLdoc-new, should remain control over the product and be able to update the product with new releases and still be able to support partner organizations.

In general splitting off the 'Software development' -department performs the separation of the activities that are considered in Table 6. However, things are not that easy by considering the difference in focus of both organizations.

For Cordeo-new the organization the mission is clear, the organization focuses on the creation of efficiency within document handling processes. However, in this section the focus is on the internal organization of XLdoc-new, activities for Cordeo-new are addressed later.

From the developed analysis framework that becomes clear that the activities influence the sources of value creation for an e-business organization, on which the value offering of an organization is based. The primary activities identified by Stabell and Fjeldstad [SF04] (network promotion and management, service provisioning, and infrastructure operation) have not yet been defined for XLdoc-new. For an organization that focuses on the business network and creating value through a network, the value network configuration is one that fits quite well.

And within this value configuration for XLdoc-new the sources of value creation that can be applied are (1) novelty, (2) efficiency, and (3) complementarities to create value as an independent organization [AZ01].

Value creation with *novelty* focuses on software innovations but also on other companies that are entering the business network of XLdoc-new, which can participate as (for instance) new print-service suppliers. Enabling the creation of new exchange relations within the business network allows for innovations between existing partner organizations and print-service suppliers. Examples of this are more integrated business processes between the organizations involved, and new services by combining the core competences of both organizations.

Creating value through *efficiency* should be based on the publishing activities that are automated, such as the layout of documents through templates. The value of the solution is partially based on network externalities, which are effects in the business network when the value of a product or service is based on the number of users [AZ01]. For XLdoc-new the value of using the POD solution increases with a higher number of organizations using the XLdoc POD solution and partner organizations that provide it.

The *complementarities* are based on the XLdoc software, which allows the creation, management, and ordering of print- and merchandise-assets. Through the business network of the organization it is possible to connect to different print-service suppliers around the world, allowing for another complementary step in the process of creating printed documents. For XLdoc-new the value creation is enabling the complementary activities through the offering of their software solution to partner organizations.

However, the above three sources for value creation are not the only aspects that need to be considered for the XLdoc-new organization. The value network of Stabell and Fjeldstad also shows aspects that are applicable to the organization, such as maintaining a network infrastructure that allows connecting the participants in the business network [SF98].

The value creation source of *lock-in* should not be used, as this restricts the expansion of the network through other organizations. For the product that is delivered in a relation with lock-in it can only be applied for that specific relation; the same goes for the services that are delivered. The focal organization and the other organization would then lock themselves both in this relation. Other organizations that have a relation to either one of the organizations involved in the lock-in, gain no benefit from the locked-in relation.

The usage of software is also a factor for value creation, as the actual user can incur benefits from the software. The benefits here can be analyzed through network externalities, as the value of a service or product within a network can increase with more users [SV04]. However, the software provider should address these benefits and additional values, which have been identified as [WP02]:

- The capabilities of the technology: The actual functionality of the software that should match the requests of the customer;

- The economics of deploying the technology: How users are billed for their usage of the technology, and other financial consequences;

- The skills and abilities available, either in-house or from external sources, to develop the applications;

- The skills and abilities within the organization to use the applications.

As *skills and abilities* are not easily acquired, knowledge about the delivered services and products are to be transferred to the users and partner organizations. These aspects need to be considered in the business processes of XLdoc-new, which can be applied in supportive processes for partner organizations.

The business processes should also be looking at the economics of deployment, to actually create revenue for XLdoc-new. Both from an organizational viewpoint and the value offering viewpoint, revenue administration processes will have to be instated.

This thesis summarizes the aforementioned results in Table 10, showing the identified organizational activities for the XLdoc-new organization.

Table 10. Activities for the XLdoc-new organization.

Activities	
Software development	Software development
Software deployment	Technical deployment
	Maintenance of customer deployments
Partner support	Functional deployment
	Creation management reports
Marketing	Expansion of the business network

Relating this to the earlier mentioned structure of a value network organization, these organizational goals can be applied to such a structure. Figure 17 shows the value network diagram for the XLdoc-new organization.

Network promotion and contract management includes promotion of the solution throughout the network, by attracting new partner organizations. As not each partner has the knowledge to be completely autonomous, relations with a high level partner will have to be enabled by XLdoc-new. Partner organizations that are not performing according to the terms of the contract will have to be purged from the business network. As software usage is generally part of the contracts, the results of monitoring are used for contract management.

Service provisioning for the business network consists of the activities that are supported by the XLdoc-new software, such as publication of documents and the order handling. This also includes the technical support that is given to high level partner organizations and deployment of specific customer solutions. But the major value creating activity here is the development of innovative POD software, which is provided via its autonomous partner organizations to customers. For partner organizations the knowledge of the functions of the XLdoc solution, configuration and deployment should be available.

Infrastructure operation consists of the technical infrastructure, on which customer specific solutions can be deployed. Another part is the ability to support partner organizations during the operation of the software. For XLdoc-new to bill their partners for system usage, a monitoring system records the usage of each of the operational deployments.
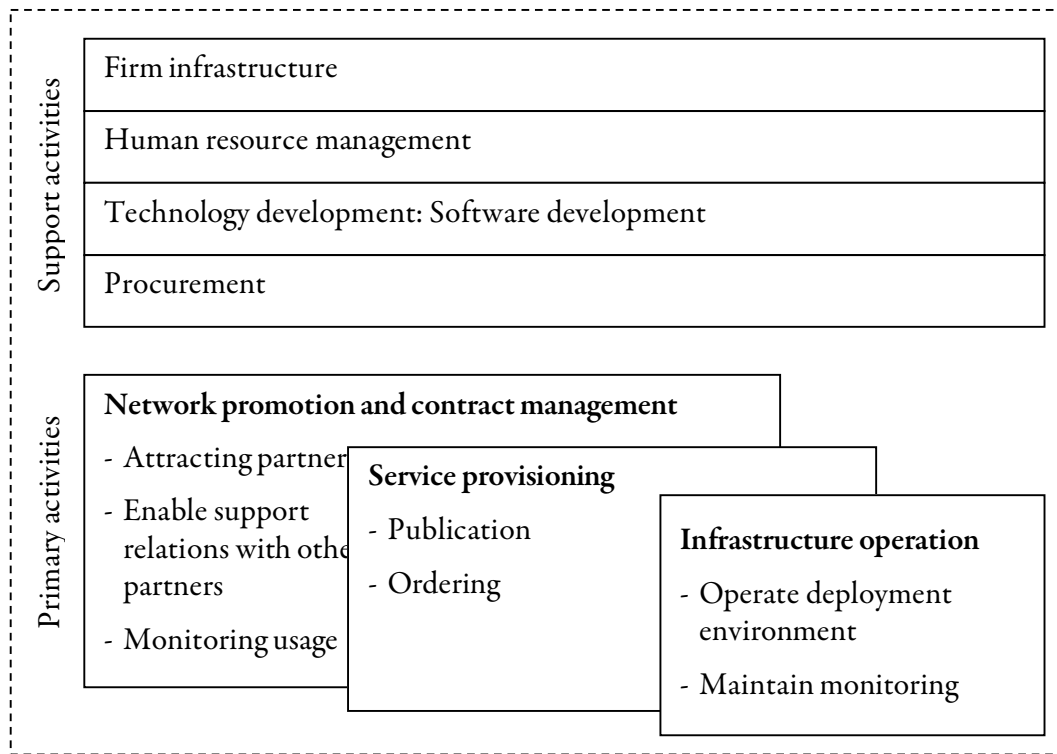
Figure 17. Value network diagram for XLdoc-new.

3.3.3. Value creation in the new situation

Each of the following relations considered show a specific value creation within the relation. The direct relations between focal organization and customers considered here are all of the four different relations identified earlier (direct customers, print-service suppliers, print partners, and consultancy organizations). In Appendix A the value creation that is explained in the following section, is summarized in a matrix-form.

Direct relations between the focal organization and customers

Because the XLdoc software is flexible and configurable, lock-in is not an issue in direct relations. This is also based on the solutions that Cordeo-new provides, which can be used for other customers than the original.

However, through the XLdoc software a connection is made between the digital and physical document management. This shows the focus on complementarities and efficiency, which is also the case looking at the relation between Cordeo-new and a print-service supplier. In that case the print-service supplier receives input for a new order, which can then be printed. This creates a more efficient workflow within the print-service supplier, but also enables new workflows such as automated printing.

Direct relations between customers

Looking at the relations that exist between organizations within the business network, such as relations between print-service suppliers and partner organizations, some form of lock-in is present. The information exchange within this relation is running indirectly through the XLdoc software, though is directly between the organizations involved. Should the software not be used anymore, the relation would also break.

This relation also focuses on efficiency and novelty, as the usage of the XLdoc enables the partner organization to create relations with print-service suppliers in other countries (other markets).

Indirect relations between customers

This relation considers the exchange relations between customers and print-service suppliers, which is running completely through the Cordeo-new organization and XLdoc software. Here customers are locked in for their exchange relations with a print-service supplier, though customers gain a form of efficiency in their document creation and management business processes. Through this relation a link is made between the services of the print-service supplier to be used by the customer, which adds more functionality to the software for creation of documents (i.e. complementary).

With the sources of value creation now known for the different relations, it can be translated into another matrix that holds the influence of network effects over value creation sources. This matrix can then be compared to the same matrix developed based on theoretical concepts (Table 3), where some issues and differences can be discussed.

Table 11. Relations – value creation matrix.

Value creation / Relations	Lock-in	Complemen-tarities	Efficiency	Novelty
Direct relations between focal organization and customers		X	X	X
Direct relations between customers	X		X	X
Indirect relations between customers	X	X	X	

The above matrix (Table 11) shows that efficiency is one of the main sources of value creation considered in the business network of XLdoc-new. For each of the relations that are occurring between organizations within the business network of XLdoc-new, the issue of lock-in is present. Through these relations XLdoc-new adds complementary functionality to the exchanges, allowing the organizations to do more with their own competences. By enabling the creation of these relations the organizations involved commit themselves to the use of the business network, not being able to operate that part of their market without the focal organization. The organizations lock themselves thus in the network, which can be without consequences as long as everything is functioning, however with conflicts in the relation between an organization and the focal organization this lock-in is negative. An end-result may be the termination of the relation with the focal organization, meaning that the organization loses a part of its business network where services were provided. This is also negative for the focal organization, as this should possibly acquire a new organization to fulfil the same position.

3.4.   Organizational guidelines

To ensure the new situation can be made reality, the current organization has to address their activities and value offering, and to identify the responsibilities for activities during deployment and operation of the XLdoc software.

The activities and organizations that have been identified in section 3.3 indicate that the XLdoc-new organization is now responsible for the development and deployment environment of their own organization and its dedicated partner organization Cordeo-new. As other partner organizations in due time might be able to autonomously deploy and operate the complete web-based solution, including the technical infrastructure, XLdoc-new will only provide new software releases and technical support.

Cordeo-new should no longer focus on the development of the application but more on the consultancy and deployment tasks that fit its mission-statement. The responsibilities and the relations are shown in Figure 18.

The partner organization should also be able to deliver the customer fitting support during the deployment, testing and operations phase of the software delivery (section 3.3.3).

However, a partner organization will not be able to perform this support by themselves, it needs support from the focal organization to perform these actions (functional deployment, operation, and support).
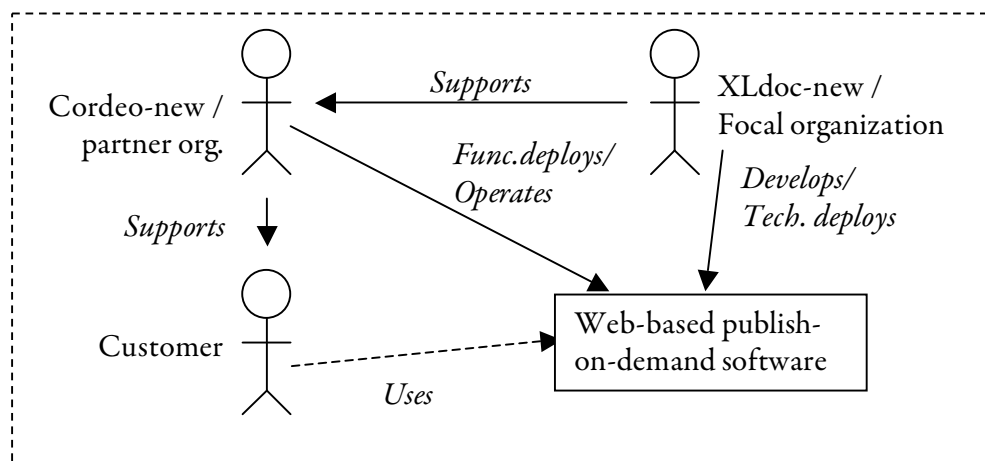

Figure 18. Activity scope.

Figure 18 proposes a division of activities between the focal organization and a partner organization that should be performed in order to deploy a costumer-specific configuration of the XLdoc software on the XLdoc-new infrastructure. This change in responsibilities and possibilities also influences the software product that is provided by XLdoc-new.

The distribution of the activities within the network of focal and partner organization forms the answer to the third research question, determining the organizational requirements for a networked business organization that lets its partner organizations autonomously provide its web-based software. Each of the activities that should be performed by the focal organization is required in order to let the partner organization provide the web-based software to its customers. But the partner organization should also adapt to an autonomous offering of the software to its customers, as support, deployment and operation of the software should be performed by the partner organization.

For the focal organization the mission is to maintain and technically deploy the web-based software on behalf of the partner organization and develop new innovative software features based on partner requests and efficiency.

4. SOFTWARE REQUIREMENTS

Within the developed analysis framework the focus for now has been on the structuring of the organization and the way it creates value, but a part of that value creation is the offered product. In this case the product is web-based software that should be autonomously provided to partner organizations. As the requirements for the involved organizations change, also the requirements for the product offered change. This chapter identifies the requirements for the software to be provided autonomously by partner organizations of the focal organization.

These requirements will focus on both the functionality –what the software should do– and the quality –how well it should perform– of the software. The functionality of the software is identified based on the supportive activities to be provided by partner organizations and on theoretical concepts that explore these activities further from a software perspective.

The functional requirements have been identified based on semi-structured interviews with stakeholders for the software within XLdoc and the partner organization Cordeo. The quality requirements have been determined based on the standard ISO Quality of Service X.641 framework. Quality should also be warranted for the functionality that is described, as the activities are part of the organizations value offering.

At the end of this chapter generic software requirements are identified that are as part of the general research conclusions.

The structure of this chapter follows the above reasoning, by describing in section 4.1 the general functionality of publish-on-demand software solution as introduction, section 4.2 discusses the ideas on which requirements can be based, from theory to interviews with stakeholders, section 4.3 describes the functionality requirements based on the supportive activities, and section 4.4 identifies quality requirements through a quality standard, and section 4.5 summarizes the findings in this chapter.

4.1. Publish-on-demand software description

Before the software can actually be related to the results of the case analysis of chapter three in this thesis, a description of current capabilities of publish-on-demand (POD)

software is required. We focus here on generic functionality that can be found in all web-based publish-on-demand software, not focusing on specific POD software such as XLdoc.

Based on public information on the Internet from several vendors (Diskad [http://www.diskad.nl], XLdoc [http://www.xldoc.net], Capital ID [http://www.capitalid.com], Blurb [http://www.blurb.com], and Lulu [http://www.lulu.com]) we have come to the following elements that are present in each of these software solutions.

Each of these POD software solutions is accessed through a web browser, allowing access from any computer without the need to install additional software. The software is deployed on the servers of the software providers.

4.1.1. Digital asset management

Each of the software solutions includes a form of digital asset management, allowing users to upload and manage their images, fonts, design files and other digital forms of assets that can be included within a printed document or used for the creation of documents.

In the more advanced software solutions such as Capital ID's and XLdoc's it is possible to place an asset in one or more categories and assign keywords to it. Users can find their assets back through searching and filtering items with a certain keyword or properties of an asset, such as labels, type of asset, and descriptions.

4.1.2. Document creation

Another element in each of the software solutions is the creation of actual documents filled with content, both text and images. Users can create their own document from predefined templates with certain flexibility over the used fonts and the layout, or even create documents that do not restrict the layout or fonts.

4.1.3. Ordering

Finally every software solution incorporates an ordering process where users can order their created documents from within the software. This sets in motion a process where a predefined supplier for that customer receives a PDF version of the document for production and sends the produced items to the user.

These descriptions of functionality do not discuss every aspect of POD software, but show the main functionality that is offered to the users.

4.2. Discussion of functions and issues

With the basis of the software covered with a description of POD software, this section will further elaborate on the organizational activities identified for the focal organization and the consequences on the software.

This section specifically regards the software functionality based on the activities identified in section 3.3.2, by focusing on the supportive functionality that is needed for the software to be autonomously deployed by partner organizations and to allow mentioned activities.

Through semi-structured interviews with the stakeholders and the organizational requirements, a number of basic functions and deployment issues are discovered. The results of these interviews are applied, together with the activities for the focal organization, and XLdoc-new identified in chapter 3, on generic POD software as described above.

Autonomous deployment by the partner organization

As software deployment is transitioning towards the partner organization, the partner organization should be able to perform the tasks of autonomously deploying the software for its customers. This also includes the full support for the customer and fixed procedures for the deployment to be performed in order to provide a consistent service and satisfied customer.

Software deployed on partner infrastructure

It has been addressed in interviews with stakeholders within the focal organization that partner organizations should not only be able to autonomously deploy the POD software, but also be able to operate it on their own technical infrastructure. This depends on the partner-level defined by Klein Douwel [Kle08] for XLdoc and the demand of the customer.

The actual configuration of the software to fit the requirements of the customer is performed by the partner organization, but updates of the actual software that are distributed from the focal organization should be able to be integrated in those installations.

Billing information

From the interviews and the fact that usage of the POD software solution should generate revenue for both the focal and the partner organization, the software should be able to generate some sort of usage statistics used for billing customers. These usage statistics can then be used for the organizational process to create invoices for software usage.

Customer support

Based on the interviews with the stakeholders the partner organizations should be able to autonomously provide customer support during the time a software solution is operational. This requirement is supported by the identified activities for the focal organization (Figure 18).

Automated communication with print-service suppliers

With the print-service suppliers moving towards an automated workflow for the retrieval and processing of printing orders, the POD software should deliver the orders in a correct format and include the required information for the print-service supplier. The communication with print-service suppliers should be based on a standard communications protocol, for instance the Job Definition Format (JDF) that is maintained by the industry consortium CIP4 [CIP4].

4.2.1.   Skills and abilities to deploy the software

When partner organizations deploy the web-based POD software for their own customers, they should have the knowledge and resources available to perform these deployments [WP02]. In some cases this means that a partner organization should perform the functional deployment of the POD software, while the focal organization performs the technical deployment (Figure 18).

The functional deployment is the configuration of the POD software for customers, defining the types of assets within the system, and initializing the security restrictions for different roles.

Technical deployment is the actual deployment of the software on physical servers, which includes the registration of domains and copying the software files to a server. For high-

level partners the technical deployment should be able to be performed autonomously on self-owned infrastructure.

As all the knowledge about deployments is created by the focal organization, the focal organization should provide the partner organizations with a form of support to enable the partner organizations autonomous deployment of the POD software. This support can be addressed both from a software solution (i.e. supportive software tools) as well as from providing courses and training to partner organizations. High-level partner organizations might also be part of these offers to provide support to partner organizations.

The above can be summarized to the following requirements:

- Provide software configuration tools for partner organizations;
- Provide supportive software tools to partner organizations, to aid in autonomous deployment of the POD software.

4.2.2. Skills and abilities to use the software

Aside of the knowledge to deploy software, also knowledge and resources should be made available to actually use the software [WP02]. The target audience of this knowledge consists of the actual users of the software, thus the direct customers of the partner organizations. The support of a customer should become a supportive business processes within the value configuration of the partner organization [NLK01, Stu94].

In order for a partner organization to provide adequate support it should have the capabilities to do so, which are the knowledge and the resources. Initially knowledge can be acquired through training sessions, but as time goes by knowledge changes, as new developments can arise or other opportunities. Through a knowledge exchange mechanism it is possible for the focal organization to support the partner organization with the knowledge, such as an online knowledge base or other information system. And if a partner organization cannot find the answer to the support question through the knowledge-exchange mechanism, it should be able to contact a high-level partner organization.

- Provide a knowledge exchange system to partner organizations for online software usage training.

4.3. Functionality requirements

This section covers the elaborations of the above descriptions that are based on theory, identified organizational requirements, organizational activities (Figure 18) and interviews with stakeholders.

4.3.1. Billing

In section 4.2.1 the importance of billing information has been briefly discussed, but not just billing information is important, also the way the organization handles the information is essential. This does stem from the financial building block within a business model [OP04], where the actual revenue and costs are considered.

Hoch et al. identify when offering software to a market, also a clear license model for usage of the software should be used [HKG01]. Clients should be able to analyse their needs based on the fit of the software as well as the fit with the pricing structure. The following licensing models can be identified:

- Subscription-based: A periodical fee based on the actual usage of the software and number of users is asked. Support is given throughout the subscription period.

- Utility-based: Related to the usage of the application, 'peak or near-peak levels of usage' are considered here, acquired by periodical statistics;

- Transaction-based: Correlated to the number of transactions handled by the software for a certain users, or group of users. Payment can be issued directly or periodically;

- Fixed fee: Similar to the subscription-based license, though fixed fee is less constraining. Subscription is based on usage figures and adapts the fee consequently, while this license does not consider adapting the fee during the contract period. Generally a periodical fee is determined beforehand, based on number of users, models and/or support levels.

It is quite common to combine a two of the above licensing models to create a fitting pricing model for a value offering [HKG01]. An example of this is a fixed fee for the software provided, and a transaction-based model for the actual usage.

With the organizational goals of the focal organization a fixed fee model can be applied for complete autonomous partner organizations, and any of the other models for other partner organizations. To apply the licensing models, other than fixed fee, statistics or other forms of usage monitoring should be available to determine actual usage on which the pricing is based. The software should address the monitoring, as software usage is the element of measurement.

As the software can provide management information about the software usage to a partner organization, the partner organization should be able to autonomously invoice their customers.

This thesis summarizes these conclusions into the following requirements:

- Provide management information on software usage;

- Apply a monitoring system to collect software usage information;

- Possibility to apply different pricing models within the POD application.

4.3.2. Knowledge exchange

As the knowledge to operate and deploy the software is transferred through training sessions, afterwards the same knowledge and more in-depth information should be made available to a partner organization. However, before we actually can go deeper into knowledge transfer this thesis needs to establish what knowledge actually is.

In literature two types of knowledge can be identified:

- Tacit knowledge: knowledge that people carry in their minds, though within the field of knowledge management it is generally defined as knowledge that is only known by an individual [Wikipedia: Tacit knowledge (August 26, 2009)]. Tacit knowledge is very difficult to acquire; only through person-to-person training or personal experience tacit knowledge can be exchanged [NT95].

- Explicit knowledge: knowledge that is readily available to be transferred to others, generally the result of codifying tacit knowledge. Examples are manuals, document and procedures.

For handling these kinds of knowledge there exist two practices: codification and personalization [HNT99].

Codification consists of codifying knowledge and storing it in a database, so that it can be generally used and accessed. This approach is mainly used by organization that emphasize on a products- or service-strategy within a quite stable environment. The driving force behind this practice is the amount of knowledge shared by their owners (i.e. the people), in some way they should be encouraged to share.

The method for codification of knowledge should be standardized to be able to create generally usable knowledge. Otherwise the knowledge might not be generally understood or interpreted correctly, thus rendering it useless. The codification structure – taxonomy – should be made available to the partner organizations to be able to share knowledge, and interpret the available knowledge. With a general taxonomy that can be understood by anyone that wants to acquire the knowledge, or provide it to the system, knowledge can be transferred quite efficiently. A taxonomy can be as easy as providing the subject, motivation, advantages, and disadvantages of a particular piece of knowledge.

Personalization consists of a different approach: instead of storing and sharing knowledge, it is stored within the system which person within the community (the group of knowledge providers) actually has the required knowledge. Generally companies providing highly customized service offerings or that have product innovation strategies use this approach, by focusing more on direct person-to-person transfer of knowledge. Knowledge owned by people should be categorized according to a certain taxonomy and focus, which is not a simple step. The resources used for personalization are people: exchanging knowledge between experts and knowledge recipients is very time-consuming, thus very expensive. Though this approach can handle tacit knowledge, which cannot be codified. This is a major benefit in comparison to the codification approach, though each of the approaches is not exclusively used. According to Hansen et al. [HNT99] there is always a mix of both approaches, though with a major focus on either one of the approaches depending on the type of knowledge (80 / 20% mix).

As the knowledge to deploy and use the software is fairly general and similar in each case, the focus will be on the codification of knowledge. In order to deliver this knowledge the codification process should be clear and adapted by every organization that wants to share knowledge.

A clear codification scheme (a taxonomy) should be provided to all the knowledge contributors and users, to allow the contributors to add knowledge to the system that can be reused later. An access authorization is consistent to all parties involved with the knowledge exchange, where the provided knowledge is separated according to predefined constructs, procedures and rights. Each chunk of knowledge is then separately stored within an electronic system, which can be accessed by all participants.

This can be summarized by the following requirements:

- A predefined taxonomy for knowledge transfer should be available;
- Users should only be able to view applicable knowledge.

4.3.3. Multiple communications interfaces

Through interviews with stakeholders it has become clear that an automated connection between the software and the actual print-service suppliers should be present. This enables the software to send ordered documents directly to a printing system for actual production.

For services that are connected across a network, one way of communication is the use of web services. This allows services of information systems to communicate with each other without human interaction and the use of a graphical interface. Communication for web services is generally performed over a SOAP-interface by sending XML-based messages, based on a fixed XML definition standard [ACK04]. For the print industry examples of these XML communication standards are JDF and PPML [http://www.podi.org].

With a support of both the web services interface, and a graphical user interface (GUI), the POD software should have an interface between the core functions and both interfaces. To establish communications with both interfaces (web services and GUI) the software should hold an application programming interface (API) that both external interfaces can address to provide functionality.

APIs exist in two distinct variations: language-dependent and language-independent [ACK04]. Either have their advantages and disadvantages over the other, though for a web-based application the language-independent API has the major advantage. Such APIs are developed so that the function can be accessed through interfaces of other programming languages than the language in which the application is developed. Through the use of a language-independent API the technology that controls the web-services, does not depend on the technologies used for the GUI.

This can be summarized by the following requirements:

- Provide an interface for automated communication between software and print service suppliers;

- Provide the ability to create other interfaces to communicate with the system.

4.4. Quality requirements

Functions depict what a system should actually do, but it does not specify how well or to what extent it should perform these functions. This section covers the quality requirements for web-based publish-on-demand software, based on a standardized quality framework, the Quality of Service Framework X.641 [ISO X.641]. According to that framework quality can be defined by the following characteristics:

Temporal coherence

Whether an action has been performed on each item in a list within a given time. Showing that the system actually performs an action when a task is given for a number of entities in the system;

Spatial consistency

Whether or not copies of variables or entities are identical at a given time or within a given time window. This is very important in a distributed system, and with a system that has backup capabilities, as copies must be identical to the original;

Capacity

The services that can be provided in a specified period of time. Which can be quantified as:

- Throughput: the rate of user data output from a channel averaged over a time period. For web-based applications this is restricted in the bandwidth of the hosting server, or on other parts in the communication-chain. A system that can function

properly, but does not have enough bandwidth to provide data to a client that results in a severe lag, is unworkable;

- Processing capacity: the amount of processing performed in a period of time. This aspect considers the internals of a system. An example is an action that requires a lot of processing power of the hardware. The execution of multiple similar actions will then take a long time. For the client-side this results in delays between the initiation of an action and the actual result;

- Operation loading: proportion of capacity being used in a particular time window. How the system and the underlying infrastructure handle the load of the functionality.

Integrity

Whether the system performs the exact routines for its functionality, described by the accuracy or correctness of the handling of an event, set of events, a condition, or data.

Safety

The level of atomicity of an event, an action, or a resource. The event, action or resource should not affect other entities in the system other than instructed by the programme routines.

Security

Whether usage of system data or system resources is protected against unauthorized use.

- Protection: the security afforded to a resource or to information. Resources spent to secure a resource of the system or information within the system;

- Access control: protection against unauthorized access to a resource;

- Data protection: protection against unauthorized access to data;

- Confidentiality: protection against unauthorized viewing of data;

- Authenticity: protection for mutual authentication and data origin authentication. Whether the information within the system is the original information, and not altered through the bypassing of security;

Reliability

Whether the system operates in diverse situations, when failures occur and how long the system is not reachable when maintenance is performed or recovering from a crash.

- Availability: the proportion of agreed service time that satisfactory service is available;

- Fault containment: ability to operate in the presence of one or more faults/errors;

- Fault tolerance: ability to minimize the impact of components error/failure;

- Maintainability: The duration of any continuous period for which satisfactory, or tolerable, service is not available, related to some observation period.

The web-based POD software should adhere to a predefined set of these quality requirements before being transferred to partner organizations for deployment.

This list shows both the operating (deployment and usage) and development requirements for software, each of the requirements in the list affect both the operation of the software and the development.

As the software will be part of the business process of the customer, the software should be reliable. An element of reliability is the availability of satisfactory service, which is measured in percentages or hours per period. With 99% availability per year it means that the software cannot be used for 87 hours (approx. 3,5 days) in a year. In the world of hosting solutions the availability has risen to 99.9%, which means a maximum downtime of 8.7 hours per year. For software deployment at partner organizations, the hosting services should meet up to a standard that is predefined through a Service Level Agreement with both the customer and the focal organization.

Other parts of reliability have been specified in the ISO X.641 framework [ISO X.641]; as the software should perform correctly and be workable, the capacity and integrity of the application should also be guarded.

To provide a consistent service this thesis has identified the quality requirements as shown in Table 12.

Table 12. Quality requirements for web-based publish-on-demand software.

Quality requirements	
Availability	Provide a service that is at least 99.5% of a full year available for its intended functions.
Workability	The system should have a low response time, with actions performed without lag.
Data reliability and consistency	The system should have the ability of continuous logging of each activity, to provide the ability to rollback after failures, or reinstate the system via a backup.
	The system should be able to perform periodic backups of the entire system, and be able to use these backups to reinstate the system.
	The system should be able to roll back actions in case of failures and errors.
Contracts	Provide standardized service level agreements for the service between partner organization and customer, specifically for the software.

4.5. Conclusion

Make these conclusions more over viewing, instead of repeating what is already stated, and end with a list of well-formed requirements.

This chapter has identified and discussed a number of functional and quality requirements for a POD software solution. The software offered to the partner organizations should meet each of the mentioned requirements (Tables 12 and 13).

The functionality requirements that have been presented show functions that should be supported by the software solution (Table 13).

Table 13. Functionality requirements for publish-on-demand software.

Functionality requirements	
Skills and abilities to deploy the software	Provide software configuration tools for partner organizations.
	Provide supportive software tools to partner organizations, to aid in autonomous deployment of the POD software.
Skills and abilities to use the software	Provide a knowledge-exchange system to partner-organizations for software usage training.
Billing	Provide management information on software usage.
	Apply a monitoring system to collect software usage information.
	Possibility to apply different pricing models within the POD application.
Knowledge exchange	Provide a predefined taxonomy for knowledge transfer.
	Users should only be able to view applicable knowledge.
Multiple connections interface	Provide an interface for automated communication between software and print service suppliers.
	Provide the ability to create other interfaces to communicate with the system.

Each of these requirements addresses the need within the software to support the activities that have been identified in chapter 3. The POD software should not only have functions matching the above requirements, but should also be up to specifications based on quality.

The quality of the offered service should always be kept at a high level, allowing the users to use the software at any time and place (with Internet access). This includes an availability of the service of at least 99%, but recommended is to go for 99,9% availability allowing only 8 hours and 45 minutes of not being available per year. Offering the software through partner organizations creates an extra opportunity for mishaps, and the reliability of the software should not be at stake.

Each of these quality requirements (Table 12) should also be met by the design of the applications and the infrastructure that it is operating on.

5. DESIGN ELABORATION

This chapter discusses the design of the functionality identified in both the results of chapter 3 (organizational activities) and chapter 4 (software requirements). The actual design covers the functionality, software architecture, and infrastructure architecture, based on theoretical concepts and best practices.

This chapter answers the last three research questions:

- Can a general structure or architecture be given for web-based software solutions, to be used autonomously by partner organizations?

- Which tools should be provided to partner organizations in the business network, for autonomous deployment and support of a web-based software solution?

- How should such tools be provided to partner organizations in the business network?

The architectural design addresses both the software architecture, and the infrastructure architecture that is applicable based on the requirements that have been identified. This is based on the proposition that the requirements impact both these architectural viewpoints.

The structure of this chapter follows the flow from both these design viewpoints as follows: section 5.1 describes the theoretical concepts that are applied for both the functional design and the architectural design, section 5.2 describes the functional design of the software and partner tools, section 5.3 describes the influences on the architectural design of the software, section 5.4 describes the influences on the architectural design of the infrastructure, and section 5.5 summarizes all these findings by relating the results back to the requirements.

5.1. Software architecture views

The design of software and software architecture has been described by quite a number of authors [ACK04, CN95, Kru95, PHG04, Wie08, a.o.], with each a specific and different view on the design process. Though, one consistent factor for almost each view is the use of a predefined notation-language. Describing the functional and architectural designs can be done in two different approaches, text-based using Architecture Description Language (ADL), and graphically using Unified Modelling Language (UML) or other notation-

languages [CN96]. Throughout this chapter the UML notation will be the form of choice, as this language is quite extensive, generally applicable, and not overly complex. This allows for someone that is not familiar with the language to comprehend it without much difficulty.

Within the whole activity of software design, Kruchten [Kru95] describes a framework that discusses five different interdependent architectural views that are also distinguished by Clements and Northrop [CN96] (Figure 19),
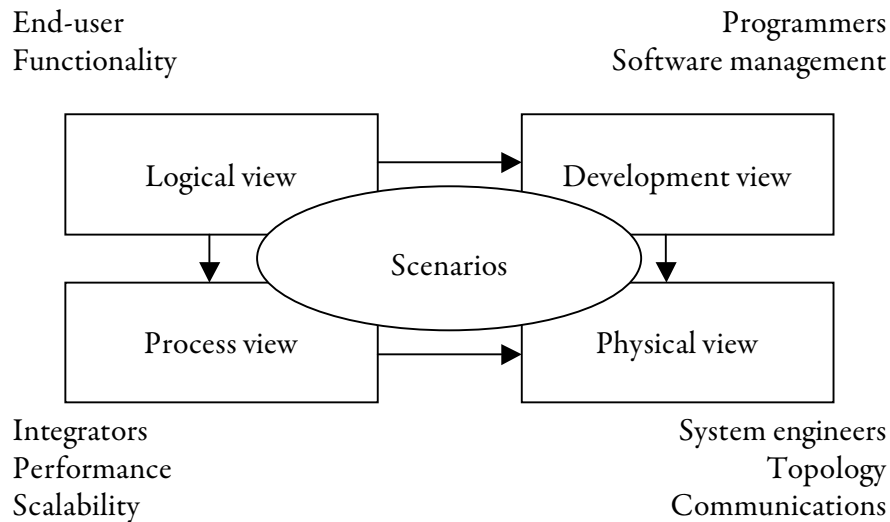
End-user   Programmers
Functionality   Software management

Integrators   System engineers
Performance   Topology
Scalability   Communications

Figure 19. The "4+1" architectural view model [Kru95].

These architectural views represent the abstraction layers within software design, starting out with the functionality logic (*logical view*). The *process view* captures the concurrency and synchronization aspects, applying performance and stability requirements.

The *development view* describes the software development environment, focusing on the internal requirements with regard to the actual development of the software (such as ease of development, software reuse, and toolset constraints).

The *physical view* maps the software onto hardware components, focusing on non-functional requirements.

The *scenarios view* describes use cases based on the requirements, to act as driver for the validation of the architecture and discovery of architectural elements. In Figure 19 the arrows represent the order of abstraction of the architectural views.

For software architecture design it is not always necessary to discuss each view, views can be omitted from the design. The development view that is presented in this model will not be considered in this thesis, as this view is not relevant in this research. It falls outside the scope of this research to define the environment and tools that should be used in the development of the design.

5.2.   XLdoc applications

The specific software that is applied in this design chapter is the XLdoc POD software. As the software is capable of being configured in many different forms the generic configuration is addressed here.

The generic XLdoc software solution consists of the following different applications available to the end-users [from http://www.xldoc.net/]: XLdoc Portal, XLdoc Digital Asset Manager, XLdoc Creation Studio, XLdoc on-Demand Studio, and XLdoc Ordering. Each of the application descriptions is based on the official application description that can be found on the XLdoc-website.

XLdoc Portal

The XLdoc Portal forms the basis of the XLdoc Suite, containing the basic functionalities and overviews within a customizable entrance page. This entrance to the rest of the XLdoc Suite does offer advanced search options, navigation and a personalized layout of widgets.

XLdoc Digital Asset Manager

This application can be used to store, find and access media files, which include Portable Document Format (PDF) files, images, fonts, design files, or any other digital asset. Each of these assets can be organized through categorization or keywords, managed, and downloaded. The management functions are dependent on the file type of the digital asset, but nevertheless extensive authorization capabilities are in place to ensure that no unauthorized actions can be performed.

Assets can be found within the XLdoc Digital Asset Manager through both simple and advanced search and filter features.

XLdoc Creation Studio

The XLdoc Creation Studio allows user to easily create well-designed documents, and revise and maintain them. The application allows authorized users to manage documents based on flexible templates, with advanced possibilities such as automatic text fitting, optional picture positions, scalable pictures, scrolling text boxes, etc. This application is especially suited for creating standard collateral such as leaflets, mailers, brochures, product data sheets and customer cases. The templates that form the basis in this application are externally created through the Adobe InDesign desktop-publishing software.

XLdoc on-Demand Studio

This application allows the user to create rule-based documents, where other users can actually create customized documents based on these rules on the fly through a wizard. This application is ideally suited for creating personalized and/or customized documents such as business cards, stationery, advertisements, posters, point-of-sale material and direct mailers.

XLdoc Ordering

Through XLdoc Ordering the user of the software has the possibility to configure the ordering of assets or other documents online. Access to a worldwide supplier network is given and the user is able to control budgets and the documents self with an approval workflow. To use XLdoc Ordering, the XLdoc Portal is required.

5.3.   Elaboration of functional requirements into design

This section covers the functional design of the software, based on the functional requirements, and the logical view from the architectural view model [Kru95, CN96]. The foundation and motivation for these functions are the identified requirements (chapter 4).

In Table 14 the combination of organizational activities for the focal organization (Table 11) and functional requirements (chapter 4) provides insight in possible functionality for

partner tools. The last column of the table shows an activity that should be performed by the partner organization.

Table 14. Applying organizational activities of XLdoc to functional requirements.

Organizational activities → Functional requirements ↓		Software development	Technical deployment	Deployment maintenance	Functional deployment	Creation mgt. reports	Customer support
Skills and abilities to deploy the software	Provide software configuration tools for partner organizations.		1	1	1		
	Provide supportive software tools to partner organizations				1, 2		2
Skills and abilities to use the software	Provide a knowledge-exchange system to partner-organizations for use training.			1	5		2
Billing	Provide management information on software usage.					3	
	Apply a monitoring system to collect software usage information.					3	
	Possibility to apply different pricing models within the POD application.						
Knowledge exchange	Provide a predefined taxonomy for knowledge transfer.			4	4		2
	Users should only be able to view applicable knowledge.			4	4	3	
Multiple connections interface	Provide an interface for automated communication between software and print service suppliers.				6		
	Provide the ability to create other interfaces to communicate with the system.		6	6	5		

The combinations within the table have created a number of general partner tools to be designed for the partner organizations:

1. Deployment support tool
2. Customer support tool
3. Software usage management reports tool
4. Partner knowledge sharing tool
5. Application configuration tool
6. API documentation tool

Deployment support tool

This partner tool originates from the deployment activities and the requirements of skills and abilities to deploy software. Partner organizations should be able to deploy the software itself, and be able to maintain it once operational. This tool operates on different levels within the deployment of software: technical deployment, functional deployment, and maintenance. The technical deployment is only in the picture with a high-level partner organization that is deploying it on its own infrastructure.

The *technical deployment* of the software is the actual configuration of the software on the hardware for access from the outside, such as configuring the physical server to accommodate the software.

Functional deployment is the configuration of the application for a specific customer, with specific functions and entity types in the application. This also includes the configuration of security settings with regard to viewable items by specific user groups.

Though this tool should not be on its own, for each partner organization to deploy the software, each partner organization should receive training about the deployment.

Customer support tool

With customer working on an actual software system user-questions or requests are bound to rise, this tool addresses this. The partner organization should have a mechanism in place for customer-requests with the ability to pass them on to the focal organization in case of errors or feature requests. However, the partner should be able to help the customer in almost any case with the knowledge that is provided through a knowledge base. This knowledge should be shareable and have a predefined taxonomy to search and add topics within the system.

Customer usage management reports tool

For administration and billing purposes the usage statistics should be easily acquired from the deployed software configurations. Through this tool the efficiency of getting such information out of the system is increased, and if these reports are generated in a standardized format (MS Excel, CSV, XML-based, or HTML) it is even possible to automate the creation of invoices.

Partner knowledge sharing tool

The application of this tool addresses the issue of knowledge that is not always available for partner organizations. For a clear and unambiguous support for all customers, the partner organizations have access to the same information needed to support their customers.

Through this tool experiences from other partners can also be shared within the business network, which in most cases come from a high-level partner organization such as Cordeo. In a later stage it might be that also partners with a lower-level are willing to share their knowledge, however an incentive should then be applied to motivate the partner organizations to share.

The same discussion of section 4.3.2 applies also in this case; why should partner organizations that might be competitors in their markets share knowledge? For organizations in this situation the value of additional information to better support their customers can be a deciding factor in the value offering of the organization.

Application configuration tool

With this tool it is possible to configure a specific customer application, based on metadata and the requests of a customer. This tool should also allow the enabling and disabling of system languages, where can be chosen from pre-configured languages.

One could also address this tool as being part of the deployment tools, however this partner tool is more concrete and can also be used during the operational phase of the software.

API documentation

For a software system with an Application Programming Interface (API) the partner organization can create its own front-end software and use the web-based POD software as a backend for data storage and other functionality. Before a partner can attempt such a feat, the knowledge on how to address the API should be available to the partner organization.

5.3.1. Software architecture: Logical view

The combination of functional requirements and the activities have led to the proposal of different partner tools, but the design of these tools is much more than just a description. As each of these partner tools is a piece of software and is likely to be interconnected, the need for a clear software architecture of these partner tools is present.

The logical view focuses on the supportive functions of the actual software system and the supportive partner tools that have been discussed in the previous page. This results in the design that is shown in Figure 20, showing the supportive functionality provided to the partners and the subsequent processes.

The *software usage information tool* addressed the need of providing usage information about a specific deployment of the software, for which it needs a system monitoring service that actually monitors the system usage. The software usage information tool parses this usage data and provides it in a usable way to the user of the tool (i.e., the partner organization). This monitoring service is dependent on a software process within the actual application to perform the monitoring.

System reporting is quite similar, though focuses much wider on the software. This tool not only focuses on usage information, but also on other statistics that are not directly needed for customer billing.

Partner- and customer support is somewhat more extensive, as the partner should be aided in both the functional and technical implementation (depending on the partner level). Support systems are dependent on knowledge that has to be maintained and packaged for delivery to either the partner or the customer. The training services depend on that knowledge to allow some sort of online help function. However, for other users and the

knowledge-managers to assess whether the knowledge is useful in situations the users of the knowledge have to be able to rate the knowledge.

The bases of these functions are the following partner tools (as described above in 5.3): *customer support tool*, *partner knowledge sharing tool*, and *API documentation*.

Another service is the *ticketing service* for the users to provide a single entry point for issues that arise during the usage of the software. Requiring that the user should provide certain information about when the issue occurs and in which circumstances allows the partner or development department to fix issues more efficiently.

These services need to be implemented by the business processes that are described in the software architecture.
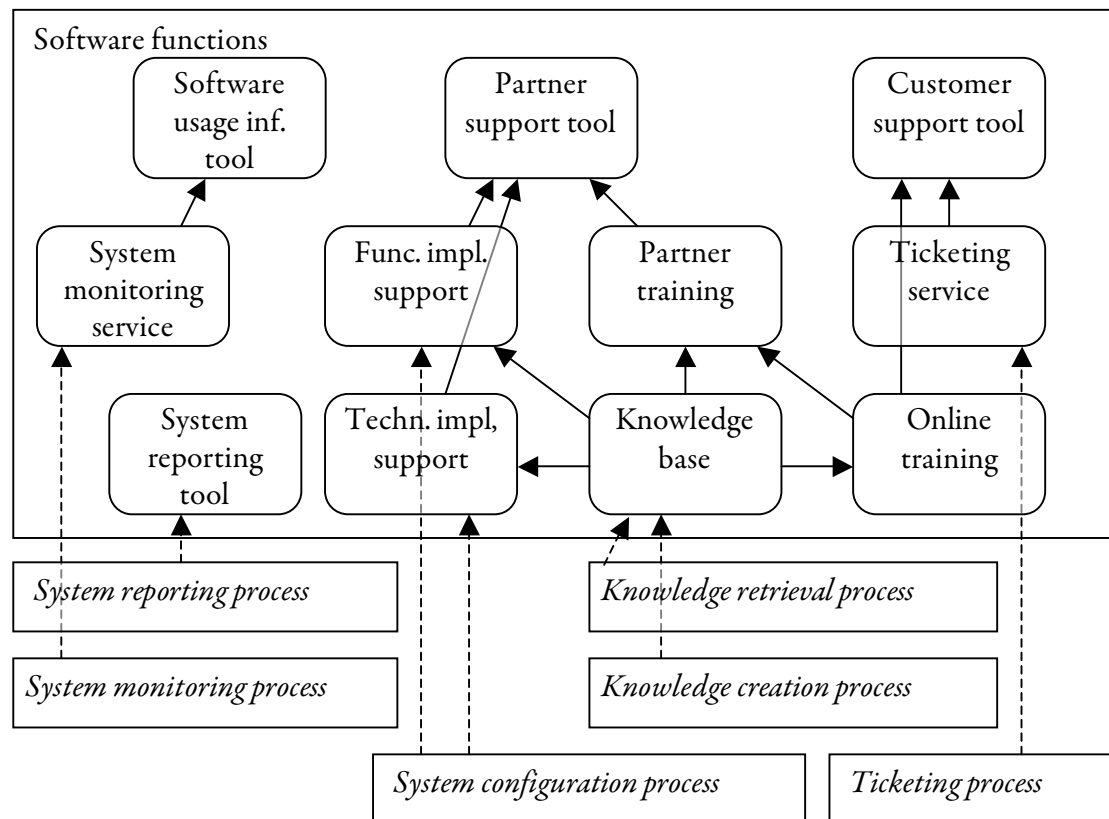

Figure 20. Logical view on the supportive functions of the software architecture.

5.3.2. XLdoc specific partner tools

As the identified partner tools earlier in this section are for a generic POD software provider, this section covers the specific partner tools that can be derived from the earlier tools. Some tools are identically named, and will not be described here again. In Appendix B a more detailed design of each of these XLdoc partner tools is elaborated.

Each specific tool can be placed in a category that focuses on other aspects of the identified activities that should be performed by the partner organization.

Interface branding

With different partner levels defined in the licenses, "private label"-partners should be able to apply their own style to certain graphical elements of the software application. This also encompasses the ability to change the look and feel of the XLdoc software through the use of additional or custom styles.

Metadata configuration

Adding more specific document-types and such, without affecting the solid structure. Metadata is configured through configuration-files, though if something goes wrong with these files, the database could become corrupt and render the application useless. Thus, validation is necessary before new metadata can be applied to the application. It also requires validation on the database, as changes in the metadata imply changes on the underlying database, which the application relies on.

This tool can be used during the implementation phase of the application for a customer, and when a customer has requested changes in the running application.

Print partner tool

Provide up-to-date information to partners of which print-service suppliers are in the network of XLdoc. Providing ways to create a business relation between the partner and the print-service supplier.

Wizard creation

Most functions in a publish-on-demand application are combinations of separate functions; with this tool functionality to create custom combinations of these functions is added. These combinations of functions are regarded as workflows, and can be offered as a separate wizard outside of the regular XLdoc system GUI. This tool focuses on the creation of such wizards, based on defined workflows.

Sales tool

This tool supports the sales process of the partner organizations with various sales materials, such as promotional material and other assets that can be used in the sales process.

Online training

This tool focuses on the online training of users, being a second moment at which end-users can learn or remember what they can do with the system. This tool is based on the requirement of providing customer support by the partner organization.

Online training can be offered through multiple web-based media: based on text and images, based on (streaming) video, and based on interactive media.

When enabling the use of video-material in this tool, this has quite an impact on the physical aspects of the software system. Videos are generally quite large files, requiring a high bandwidth if numerous users are requesting videos simultaneously. However, bandwidth is not the only factor, the physical hardware should also be able to keep up with the demand. This requires a scalable hardware solution, to allow for expansion of the service.

Financial support tool

Allowing creation of invoices for customers based on provided system reports that are acquired through the system reports tool.

5.4.   Influences on software architecture

The software architecture consists of processes and different software modules that implement actual activities defined within the processes. Figure 21 shows as if the activities

are used sequentially and that each activity needs to be performed, but activities can be skipped within a single process. This is not modelled due to the large number of arrows within the processes this would have as a result, thus creating less clarity within the architecture.

System configuration process

This process is in place to perform a functional deployment of the POD software, and if need be, perform a data migration by importing existing data. First the available asset types within the deployment are configured, which are based on the available asset types within the generic system. This also includes the creation of new types within the web-based POD software (i.e., custom types). Via a software module these types can be selected or new types can be added to the configuration.

Security configuration is the setting of read- and write rights for specific users or user groups, which is supported by a rights management module. Within the application configuration step actual functions and workflows are enabled.

Ticketing process

This process is defined for customers to enable them to make requests and ask questions during the deployment, testing, and use of the POD software. The process follows the steps of a regular support ticket system, with an input of the ticket followed by the assigning of an actor within the partner organization that is handling the support ticket. Based on the knowledge this actor has, the question is answered, or is sent to more knowledgeable actors within the focal organization. This whole process is supported by a ticket registration module.

Knowledge retrieval process

The "knowledge retrieval process" is one of the implementations of the knowledge base, allowing the users of the system to search and acquire appropriate information. The first step is a search-query by the user, or just a general overview of the knowledge contained in the system. As the knowledge bank supports both the end-users (customers) and the partners, knowledge for either role must be kept separate. The results of the search-query are shown as a list of applicable knowledge resources, after which the user can view the knowledge in its appropriate form (delivery). Within this step the user is also given the opportunity to show if the delivered knowledge was helpful or not (grading).

Knowledge creation process

For the "knowledge creation process" it is more elaborate, where a user can contribute knowledge to the knowledge bank. This is then categorized and codified according to a pre-set method, which will not be discussed here because of its specificity. It is the intention that this step is performed by a software system, but a real person might also perform this step. The result of the codification is then offered for review to the originating user, which can call for a revision of the information, but eventually is stored as knowledge within the knowledge bank.

System reporting process

The "reporting process" has a different focus, not on the knowledge, but on the side of actual publish-on-demand software. This process retrieves the usage statistics from the software, after which reports are generated. These reports are converted to fit specific purposes, such as management reports or to aid financial tools to create invoices. These

specific statistics are then delivered in a desired format to the user, either a partner organization or an end-user.

System monitoring process

This process is actually one that is included within the system reporting process, and is within this scope of processes and modules not a separate process. However, a monitoring module is present that performs the monitoring and provides raw data for the reporting process (as described above).
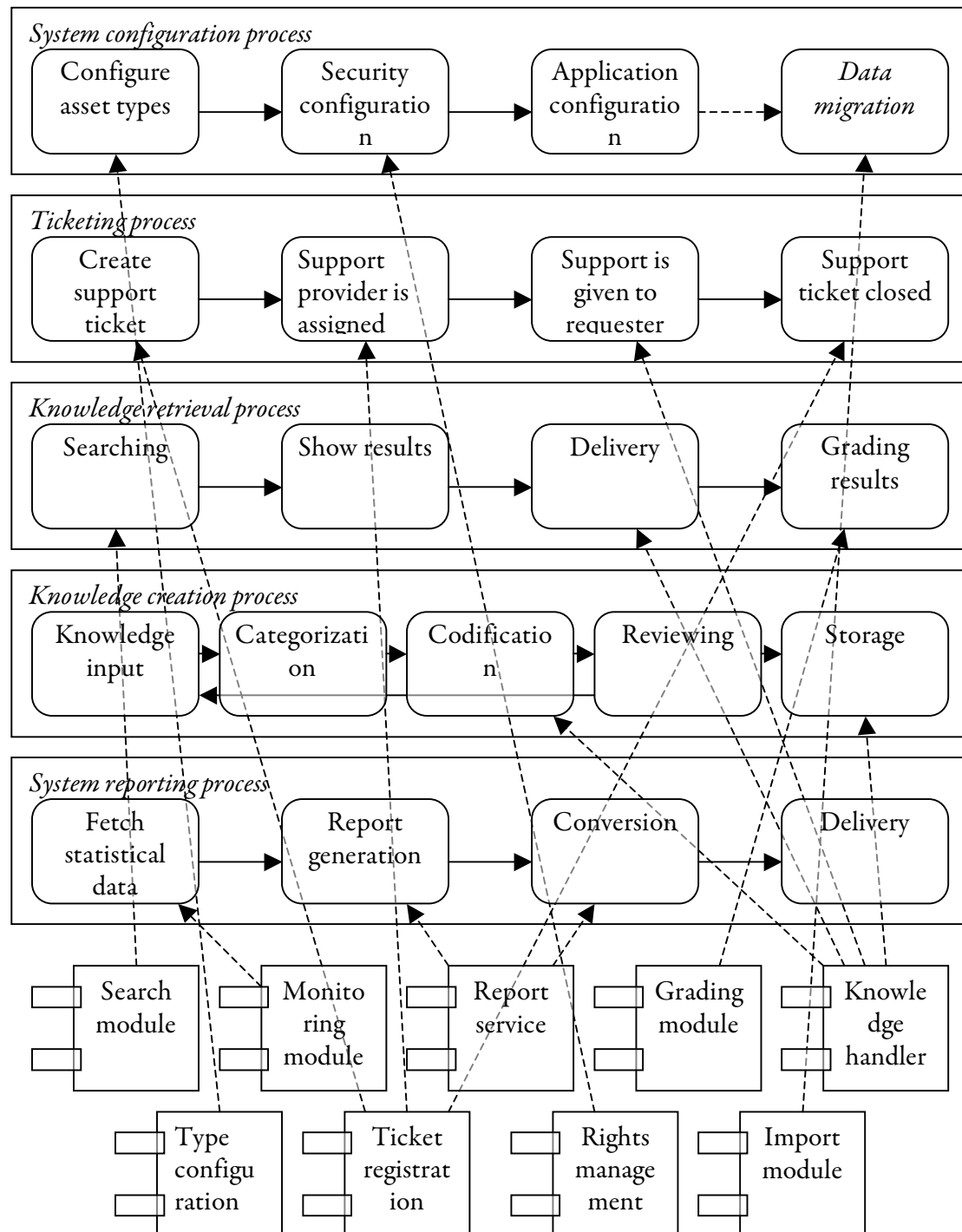
Figure 21. Process view of the software architecture.

5.4.1. Knowledge taxonomy

Parts of the knowledge handling processes are the ability to share knowledge, but as pointed out in section 4.3.2 knowledge should be codified according to a predefined taxonomy. This thesis discusses here an appropriate taxonomy for the knowledge that should be provided to partner organizations through the knowledge-sharing tool.

In the taxonomy provided for different schools of knowledge management [Ear01] several attributes for a fitting knowledge taxonomy can be identified. In this taxonomy the focus, aim, and critical success factors are attributes that provide an overview of the object.

Table 15. Knowledge taxonomy for XLdoc

Attribute	Description
Focus	The direction of attention within the knowledge object.
Artefacts	The objects that the knowledge object is considering.
Critical success factors	Factors that are essential for this knowledge object to be applied.
Content	The actual knowledge description.

This taxonomy is designed based on different schools of knowledge management identified by Earl [Ear01], and on the topography presented by Cowan, et al. [CDF00]. The focus of the knowledge object is described in the first attribute, for instance the means to use an object. The artefacts consider the objects included in this knowledge object, such as a computer, hammer, or mouse.

The critical success factors describe the do's and do not's that are essential for the knowledge to be used properly. And the content attribute gives an actual knowledge description that can be understood based on the definitions provided in the other attributes.

5.5. Influences on infrastructure architecture

The infrastructure architecture is the domain of the quality requirements (Table 15), being able to meet the identified requirements on the physical level.

To ensure *availability* of the software for customers and partner organizations, the use of redundant servers is one of the possibilities to meet the requirements. However, server failure is not the only event that can cause a lapse in availability, the loss of a connection to the Internet or a power-cut also means that the software is not available. Counter-measures for these last two scenarios are respectively a second Internet connection, and a backup power supply (such as an Uninterruptible Power Supply (UPS)).

Workability of the software is considered in the bandwidth of the connection between software provider and the customer, but also in the processing power of the physical servers. The infrastructure should be scalable to be able to cope with additional customers and the peak load of the software on the servers.

For *data reliability and consistency* the technical infrastructure should have a backup server in place that can take over once the primary server has failed. To ensure that the backup server is at the same state of the primary, a continuous backup routine should exist.

These considerations have been graphically depicted in Figure 22.

Table 16. Identified quality requirements for the web-based publish-on-demand software and the partner tools.

Quality requirements	
Availability	Provide a service that is at least 99.5% of a full year available for its intended functions.
Workability	The system should have a low response time, with actions performed without lag.
Data reliability and consistency	The system should have the ability of continuous logging of each activity, to provide the ability to rollback after failures, or reinstate the system via a backup.
	The system should be able to perform periodic backups of the entire system, and be able to use these backups to reinstate the system.
	The system should be able to roll back actions in case of failures and errors.
Contracts	Provide standardized service level agreements for the service between partner organization and customer, specifically for the software.

To improve scalability and performance, the PDF engine that is currently running on the same physical hardware can be moved to a separate node. This allows the application server to handle more requests from the web-based graphical interface. However, this is only relevant for major customers that are using the system extensively. A single partner with customers that only use the POD software in a limited fashion can keep the different servers on a single piece of physical hardware. However, backups are required for a consistent service.
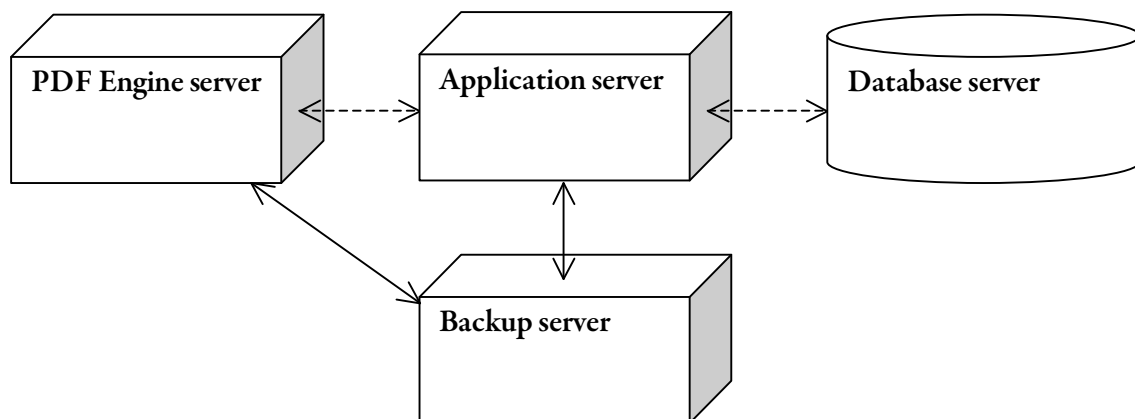

Figure 22. Physical view on the software architecture.

6.   CONCLUSIONS

This chapter presents the main contributions of this thesis, shows the limitation of the research, and identifies points for further discussion.

The structure for this chapter is as follows: section 6.1 describes the contributions this thesis has made, section 6.2 discusses the limitations within the research performed, and section 6.3 discusses future work.

6.1.   Contributions

The main contribution of this thesis is the proposed framework for the analysis of organizations with a networked business strategy (section 2.6, Figure 23). This framework is based on several state-of-the-art theories, which include theoretical concepts of the IMP perspective [FGH06], as well as Amit and Zott's theory of sources of value creation in e-business.

Through the combination of several viewpoints (internal organization, external environment, and the sources of value creation) this framework is a novel approach for the analysis of networked organizations.
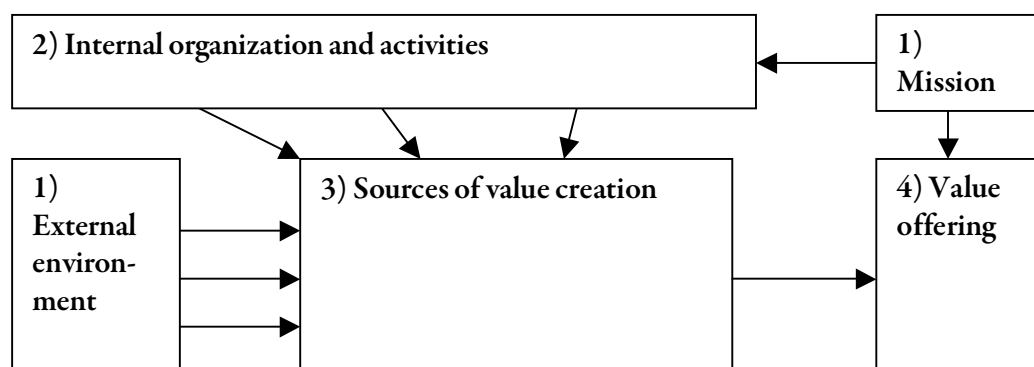
Figure 23. Analysis framework for organizations with a networked business strategy.

As part of a case study this framework was applied to the organization of Cordeo, an actual publish-on-demand software and services provider. The result of applying the framework is the separation of activities of Cordeo in two organizations, a software development organization (XLdoc) and a consultancy organization (Cordeo).

For each of these organizations the activities have been analyzed, with a more in-depth analysis of the resulting XLdoc organization with respect to business and IT. This thesis proposes the activities that should be performed within this focal organization to enable the autonomous deployment of the software by partner organizations (Table 17), and also proposes additional software functionality (Chapter 5).

Table 17. Organizational activities for the focal organization.

Activities	
Software development	Software development
Software deployment	Technical deployment
	Maintenance of customer deployments
Partner support	Functional deployment
	Creation management reports
Marketing	Expansion of the business network

6.2. Limitations

The scope of this research was based on the case of a single organization within a business network, offering web-based software within the publish-on-demand application domain. This framework and its results are thus specific for organization offering POD web-based software. Organizations that fall outside this scope have not been considered during the development of the framework, which limits the suitability of the framework. It has yet to be asserted whether the proposed framework is also suitable for other types of organizations with a networked business strategy.

More explicitly, this thesis has left the financial aspects of the business model [OP04] outside the scope, as it falls outside the area of expertise of the author. Pricing models and licensing of the offered products and services should be researched for the actual creation of revenue based on the value creation activities.

Besides sharing the pricing models for the offering of software with partner organizations, also knowledge is shared between the focal organization and its partner organizations. Knowledge exchange has been discussed in terms of required knowledge, but the details and mechanisms to actually exchange this knowledge have not been worked out. An abundance of mechanisms for knowledge exchange exist, however to actually find a suitable mechanism requires further exploration outside the author's area of expertise.

The identified partner tools, both the generic and specific tools for XLdoc, in this thesis are described and designed at the level of their functional requirements. However, a functional

specification for each of these tools is not given, as this requires an in-depth knowledge and analysis of the actual processes and steps that should be performed in these partner tools.

Such in-depth knowledge and analysis is also required to consider the technical infrastructure in detail. This thesis has proposed a technical infrastructure that fits the quality requirements, however it is likely that there are more suitable possibilities for the infrastructure.

Although there are some limitations to this work, we believe that it will prove useful for both research and practice.

6.3. Future work

The thesis does not explore all issues that have been uncovered during the research. The following paragraphs highlight the topics for further exploration.

The *financial aspects* have been addressed as being a limitation of this thesis, which should be further explored. It has been discussed in section that the financial aspects are an integral part of the *business model*, which should always be considered. With the offering of web-based software products through partner organizations current revenue models should be further expanded to handle the indirect relations and revenue streams.

The second topic considers the recent direction towards *cloud computing* and *software-as-a-service* (SAAS). Cloud computing is the next step in the development of providing web-based solutions, where customers do not own the physical infrastructure that serves the software, but connect to it over the Internet [Hay08]. Usually the *cloud* is a collection of interconnected hardware nodes that can act as a single server, but also allows virtualization to create 'additional servers'. So far this resembles the way the software should be provided by XLdoc, in cloud computing the software remains at the infrastructure controlled by the software provider. This view does not match the suggestion of deploying software on infrastructure of partner organizations, which creates difficulties to update software.

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APPENDIX A – RELATIONS OF CORDEO

Relation elements	Relation between Cordeo and direct customers	Relation between Cordeo and print-service suppliers	Relation between Cordeo and print partners	Relation between Cordeo and consultancy organizations
Activity links:	The POD solution of Cordeo will be coupled to the document management, creation and ordering processes of the customer.	Activities that re linked between the two organizations on one side the ordering activity (Cordeo) and on the other the actual printing and delivery of documents (print-service supplier).	Activities that re linked between the two organizations on one side the ordering activity (Cordeo) and on the other the actual printing and delivery of documents (print-service supplier).	Marketing materials of Cordeo are used by the consultancy organizations to attract new customers, but after acquisition the customer is passed on to Cordeo.
Resource ties:	The customers are using the POD software solution as resource in their own business processes.	Cordeo addresses the printing activity as a resource in their process, and the print-service supplier uses the support provided by Cordeo as a resource in their business processes.	Cordeo addresses the printing activity as a resource in their process. Print partners are using the POD software of Cordeo to offer their own customers a POD solution to explore a broader market.	Consultancy organizations see Cordeo as a resource for marketing materials and a suitable solution for potential customers.
Actor bonds:	Depending on the amount of support and additional work needed,	For a number of print-service suppliers the relations have expanded to personal contacts	Throughout this relation strong commitments and personal relations have formed between the two	Personal relations will develop between Operations of Cordeo and the consultants of the

		between Cordeo and the printer. However, this is not the case for every print-service supplier within the business network.	organizations.	consultancy organizations that market the XLdoc solution.
Relation functions				
The combination:	Issues that the customer had concerning document management, creation or publication have been solved by the software solution.	Connecting multiple customers to a print-service supplier, to expand the business network.	Allow distribution of the XLdoc software together with a full printing and delivery service.	Expanding the relation between both organizations involved, creating loyalty.
Individual organization:	The customer organization is solving issues they have with documents in their organization; Cordeo has a new customer for whom resources and time have to reserved.	For the print-service supplier, creating new printing relations without having to perform acquisition itself. Cordeo can use this print-service supplier for other customers, thus expanding the business network.	Cordeo has gained another way to distribute the XLdoc software. The print partner has gained another competence through which they can create value.	The consultancy organization can use the knowledge created through the relation with Cordeo in other relations within their business network. Cordeo has opportunities to distribute their solution to new customers without having to do acquisition themselves.
Third parties:	Connected print-service suppliers to Cordeo can gain print-orders for the new customer, however existing printing relations between the customer and a print-service supplier can be severed.	Other customers of Cordeo can use the print-service supplier for their own printing activities.	Organizations in the business network of the print partner gain a more efficient opportunity for document creation and management.	Other customers of the consultancy organization have the possibility to benefit from the knowledge created in the relation with Cordeo.

APPENDIX B – DETAILED DESCRIPTION OF THE PARTNER TOOLS

Each partner tool is described using the following format:

Description	A description of the scope of the partner tool, describing its purpose and general requirements and information.
Functions	Describing the functionality of the partner tool.
Requirements	Each partner tool has its own requirements dependent on its function.
Technology	Describing the technological aspects of the partner tool.
Delivery method	A motivation of how the partner tool is delivered to the partner organization.

Each partner tool is based on identified requirements and/or the software architecture design that both have been described earlier in this thesis.

Metadata configuration

Adding more specific document-types and such, without affecting the solid structure.

Description

Metadata is configured through configuration-files, though if something goes wrong with these files, the database could become corrupt and render the application useless. Thus, validation is necessary before new metadata can be applied to the application. It also requires validation on the database, as changes in the metadata imply changes on the underlying database, which the application relies on.

This tool can be used in two scenarios: during the implementation phase of the application for a customer, and when a customer has requested changes in the running application.

Functions	Adding new types in metadata;
	Deleting types in metadata;
	Validating metadata;
	Show database changes.
Requirements	Changed metadata should be valid;
	Changes on the database should not result in loss of existing data, unless intentional.
Technology	This tool should allow downloading the existing metadata, and when uploaded to the server should result in a validation report and show the changes to the database. These changes should be made clear to the person configuring the application, because that person has to approve the changes. A rollback to the old metadata should be possible.
	After the validation step the one configuring the meta
Delivery method	A motivation of how the partner tool is delivered to the partner organization.

Application configuration

With this tool it is possible to configure a specific customer application, based on metadata and the requests of a customer. This tool should also allow the enabling and disabling of system languages, where can be chosen from pre-configured languages.

Functions	Add new application
	Remove application
	Edit application
	Validate configuration
	Add language
	Remove language
Requirements	New application configurations should be able to add quite easy, specifying standardized properties.
Technology	This tool should be based on the same technology as the application itself; this shows consistency in implementing the application.
Delivery method	Web-based, or edits through a personal html-editor.

Sales tool

This tool supports the sales process of the partner organizations with various sales materials, such as promotional material and other assets that can be used in the sales process.

Support the sales people of the partner with material and other things. Also considered here is a tool that focuses on financial benefits for organizations.

Description

These tools need to support the sales process of the partner to sell XLdoc to their customers, which includes promotional material and worksheets that allow seeing how much an organization can save when using XLdoc.

Partner should be able to grade the items.

Functions	Deliver promotional material
	Deliver financial worksheets to calculate ROI (return on investment), show differences with existing activities.
	Grading items: This is functionality that allows the users of the information provided here to grade if the information was any good.
Requirements	This tool should create a platform on which the sales-department of the partner organization can rely on when attracting new customers. The items provided through the sales tool should be consistent for every partner organization, however differences on which items are available for a partner can rely on the license. This requirement would call for a single point of access for all partner organizations, allowing access through a login.
Technology	This tool should be using web-technology for the items delivered.
Delivery method	Web-based, as this tool can be connected to the knowledge exchange tool. If an organization wishes to become partner organization of XLdoc, it should be provided with access to this specific tool.

Online training

This tool focuses on the online training of users, being a second moment at which end-users can learn or remember what they can do with the system. This tool is based on the requirement of providing customer support by the partner organization.

Online training can be offered through multiple web-based media: based on text and images, based on (streaming) video, and based on interactive media.

When enabling the use of video-material in this tool, this has quite an impact on the physical aspects of the software system. Videos are generally quite large files, requiring a high bandwidth if numerous users are requesting videos simultaneously. However, bandwidth is not the only factor, the physical hardware should also be able to keep up with the demand. This requires a scalable hardware solution, to allow for expansion of the service.

Functions	Adding new training materials;
	Editing training materials;
	Removing training materials;
	Grading training materials;
Requirements	Training materials should be available in the languages of the application;
	Materials should be available, with the same requirements as the operating software.
Technology	Online training facilities are the transferral of knowledge towards the end-users and the partner organization. This can be performed in different methods, such as textual (i.e. through documents), but also through video. This latter requires a high-performance server and a high bandwidth internet connection.
Delivery method	Web-based, allowing all partner organizations and customers to use the system. However, there is a difference between the delivery of textual training documents and training videos.

Knowledge sharing between partners

The application of this tool addresses the issue of knowledge that is not always available for partner organizations. For a clear and unambiguous support for all customers, the partner organizations have access to the same information needed to support their customers.

Through this tool experiences from other partners can also be shared within the business network, which in most cases come from a high-level partner organization such as Cordeo. In a later stage it might be that also partners with a lower-level are willing to share their knowledge, however an incentive should then be applied to motivate the partner organizations to share.

The same discussion of section 4.1.6 applies also in this case; why should partner organizations that might be competitors in their markets share knowledge? For organizations in this situation the value of additional information to better support their customers can be a deciding factor in the value offering of the organization.

Description

This tool allows partner organizations to share knowledge with each other, with knowledge encased in different media formats. Examples are streaming video, and digital documents.

Functions	Add new knowledge asset; Edit existing knowledge asset; Grade existing knowledge assets;
Requirements	A incentive service should be in place, to motivate partners to aid each other. Partners should be enabled to share knowledge.
Technology	A web-based technology should be used, as this allows the partner organizations within the business network to connect to the same source of information. A web-based technology allows also the use of distribution across multiple servers to handle a growing load.
Delivery method	Web-based.

Interface branding

With different partner levels defined in the licenses, "private label"-partners should be able to apply their own style to certain graphical elements of the software application.

Functions	Create a new graphical style;
Requirements	The organization should be able to perform a functional configuration for a specific XLdoc deployment.
Technology	Cascaded style sheets (CSS) and images are the source of the themes. Partner organizations should be able to configure these technologies.
Delivery method	An additional piece of knowledge acquired through training, showing a partner organization that through customizing CSS and images a new theme can be provided.

Wizard creation

Most functions in a publish-on-demand application are combinations of separate functions; with this tool functionality to create custom combinations of these functions is added. These workflows are often regarded as wizards.

Functionality to create new workflows within the application, this also includes the creation of new wizard-functionality.

Functions	Workflow management; Wizard management;
Requirements	Overview of existing system functions; Overview of existing asset types and order data;
Technology	Configuration of meta-data, through a personal editor.
Delivery method	Web-based tool, to allow it to be provided to partner organizations on the same platform as the XLdoc solution.

Management reports tool

The creation of management reports through this tool is for a partner organization to show how much a specific customer deployment has been used within a certain timeframe. These reports are automatically created by this tool and can be exported in a preconfigured format, such as Microsoft Excel, CSV, XML or HTML. These reports can be used within an invoicing process for a more efficient workflow.

Functions	Show current usage statistics; Export statistics to Excel (comma-separated, proprietary format), a predefined XML-format, HTML and PDF;
Requirements	Required to show correct statistical data; Configurable for periodic separation (weekly, monthly, yearly);
Technology	This tool should be able to fetch data from a specific configuration on the XLdoc platform, and provide an interface to select the output format. The management reports should be downloadable to be used on the users local computer for further application.
Delivery method	Web-based.

Print partner tool

Provide up-to-date information to partners of which print-service suppliers are in the network of XLdoc. Providing ways to create a business relation between the partner and the print-service supplier.

Functions	Add new print-service suppliers;
	Remove print-service suppliers;
	Show contact information;
	Provide standardized contracts and agreements;
Requirements	Provide up-to-date information;
Technology	Apply the technology of the XLdoc platform to provide the possibility of configuration of print service suppliers.
Delivery method	Provide the partner organization with this tool through the XLdoc platform.

Financial support

Allowing creation of invoices for specific customers based on system usage reports.

Functions	Retrieve system reports;
	Create invoices;
Requirements	Input of the data should be consistent, and true;
	Collect usage statistics of a specific configuration on the XLdoc platform.
	Input of date-range for invoices.
	Output multiple formats (HTML, MS Word, MS Excel, XML, PDF).
Technology	Through a rendering engine the invoices should be created, based on usage statistics within a specific period.
Delivery method	Web-based.