E-business Planning Approach (EPA) : comprehensive realization approach for knowledge portals

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E-Business Planning Approach (EPA)
Comprehensive Realization Approach for Knowledge Portals

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Foreword

I was looking for a financially oriented e-business company in Eindhoven to do my graduation assignment. One of the organizations I contacted was Ordina Finance, which reacted very adequately and was the first to offer me an interesting project. From September 2001 to June 2002 I have worked on my graduation assignment at Ordina Finance in Eindhoven. Ordina Finance provides ICT services to financial institutions. They are using a method to realize e-business systems called the E-Business Planning Approach (EPA). EPA has been successfully applied in projects. My assignment was to validate, describe and evaluate EPA. I also was to look at the combination of EPA with other Ordina methods.
For the sake of simplicity I have limited the scope of the assignment to a specific type of e-business system. This report derives and defines EPA for knowledge portals. A knowledge portal is a site that offers employees, customers and business partners uniform and transparent access to the high-level information sources of an organization. In addition to this report I have written a manual for employees of Ordina on how to use EPA in a project and an article about the main ideas of EPA. Both have been included as an appendix. The article has been accepted for presentation at the conference SCI 2002 in Orlando.
I would like to thank Natasja Paulssen for sharing with me her ideas about EPA and her experience in knowledge portal realization projects. I have learnt a lot from her structured way of thinking. I would like to thank Ad Aerts for his guidance on both the content of my report as well as on the process of graduation. The regular meetings with him were very useful due to his critical questions, helpful references and concise language corrections. Furthermore I would like to thank Henk Jan Pels and Paul de Bra for taking place in my examination board. For the interviews I had with them about the context of EPA and e-business system realization I would finally like to thank Mathieu Weggeman, Eric de Rooij, Ronald Verschueren, Harold Roumen, Bert Kessels, Richard Schut, Hub Achten, John Verhees, Flip van Pruissen, Joris Wels, Martijn Blankestijn, Marcel Marijnen, and Roger Peters.
The nine months were over before I realized it, because there were so many aspects of e-business to look at. I found my assignment very stimulating and interesting and I hope this report will be the same to the reader.

Petra Heck
Eindhoven,
June 2002

Summary

The Internet economy is a fast changing information economy. Customer orientation, knowledge sharing as business process and portals are three trends in the information economy that are combined in the customer-oriented knowledge portal. A knowledge portal is a site environment that offers employees, customers, and business partners uniform and transparent access to the high quality information sources of an organization. The challenges organizations face when realizing a knowledge portal require a structured approach. We have developed E-Business Planning Approach (EPA): a comprehensive approach for the realization of knowledge portals that provides a solution to these challenges.

EPA starts after the strategy has been defined and delivers a fully functional knowledge portal, including processes and people to keep it operational. We have built EPA around a product matrix with workflows to overview all products needed to realize the knowledge portal and the dependencies between these products. We have grouped the products in six areas: User, Content, Business, Functionality, Technology, and System, and five time phases: Analysis, Conceptual Design, Development & Testing, Deployment, and Evaluation. We have derived these areas and time phases and we have compared them with other methods.

We develop the products on all areas concurrently to comply with the demands of the fast changing Internet world and use an interdisciplinary team to manage the dependencies between the products. Other principles we have based EPA on are user-centeredness, content orientation, minimal impact on organization, maintenance preparation, and Design for Change. These principles guide the development process and differentiate EPA from other design and development methods like IAF, e-DSDM, and methods for ERP implementation. We have included a comparison with these methods.

EPA must be embedded in a project management method and can be used in combination with other Ordina methods like Dream@venture, Align and SMART. We indicate how this could be done.

EPA is specifically suited for short-cyclic knowledge portal projects, but can easily be adjusted for other types of projects, like the rising e-learning environments.

The evaluation of EPA that we have done shows that EPA can be further elaborated with standard products and workflows, but most important is that the knowledge about how to use EPA is documented. This will enable more people throughout Ordina to apply this successful method.

Table of Contents

1 Introduction 9
1.1 Ordina Finance Consulting BV. 9
1.2 Assignment 9
1.3 Research Questions 10
1.4 Report Outline 12
2 Requirements for the Realization of a Knowledge Portal 13
2.1 E-Business Sites 13
2.2 The Internet Economy 13
2.3 Trends in the Information Economy 14
2.3.1 Customer Orientation 14
2.3.2 Knowledge Sharing as Business Process 14
2.3.3 Portals 15
2.4 Customer-Oriented Knowledge Portals 15
2.5 Knowledge Portal Realization Challenges 16
3 E-Business Planning Approach (EPA) 19
3.1 Precondition 19
3.2 Result 19
3.3 Structure 19
3.4 Principles 20
4 EPA areas 23
4.1 Strategic Alignment 23
4.2 EPA areas 23
4.3 User 25
4.4 Content 25
4.5 Business 26
4.6 Functionality 27
4.7 Technology 28
4.8 System 28
4.9 Comparison of EPA Areas with Other Methods 28
5 EPA Phases 31
5.1 Plan, Do, Review 31
5.2 Concept Phase 31
5.2.1 Analysis Phase 31
5.2.2 Conceptual Design Phase 31
5.3 Implementation Phase 32
5.3.1 Development & Testing Phase 32
5.3.2 Deployment Phase 32
5.4 Evaluation Phase 32
5.5 Comparison of EPA Phases with Other Methods 32
6 EPA Matrix 35
6.1 Product Matrix 35
6.2 Interdisciplinary Team 36
6.3 Workflows 36

6.4 EPA Project 38
7 EPA Combined with Other Methods 41
7.1 EPA and PRINCE2 41
7.2 Dream@venture 41
7.3 Align 42
7.4 EPA and Ordina SMART 42
8 Evaluation of EPA 45
8.1 Implementation of Principles and Requirements 45
8.2 EPA Compared to Other Methods 47
8.2.1 Architecture Frameworks 47
8.2.2 Enterprise Resource Planning Introduction Method 48
8.2.3 E-DSDM 49
8.2.4 Comparison with EPA 49
8.3 Application Area of EPA 50
8.4 The Future of EPA 51
8.5 Evaluation Summary 52
9 Conclusion 55
Afterword 57
Definitions 59
Literature 60
Appendix 1: The University Supersite 63
Appendix 2: Article for SCI 2002 67
Appendix 3: Concept EPA Manual (Dutch) 79

List of Figures and Tables

Figure 1: Organization chart Ordina 9
Figure 2: Example first EPA matrix 10
Figure 3: EPA portal areas 24
Figure 4: EPA time phases 31
Figure 5: Example EPA matrix 35
Figure 6: The project manager leads the different area teams 36
Figure 7: Example of partial EPA workflow 37

Table 1: Comparison of EPA with [Donnelly, 2001] and [Skyrme, 2001] areas 29
Table 2: Comparison of EPA phases with DSDM and RUP phases 33
Table 3: Positioning of Ordina methods 43
Table 4: EPA fulfills the requirements 46
Table 5: EPA compared to other methods 50

1 Introduction

This chapter describes Ordina for which the graduation assignment has been done, the problem that had to be solved during the graduation period and the outline of this thesis.

1.1 Ordina Finance Consulting BV.

Ordina is an ICT service provider. Ordina is divided into different sectors: Finance, Public, Social Securities, Trade - Transport & Industry, and Utilities - Telecom & Media. Ordina Finance BV. is the division that provides ICT services to financial institutions. Ordina Finance Consulting BV. is the subdivision that provides ICT management and consultancy services to those financial institutions. I was positioned at the Business and Management Consultancy unit of Ordina Finance Consulting BV. This unit is located both in Amsterdam and Eindhoven. I was located at the Eindhoven office.

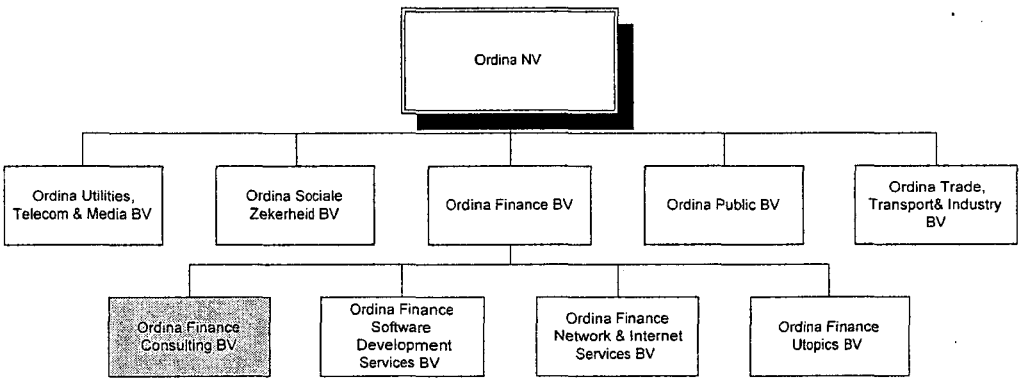

Figure 1: Organization chart Ordina

1.2 Assignment

When I started my assignment, there was a project matrix, in which products that are to be delivered during an e-business project can be placed. The matrix had six themes/viewpoints: organization, content, communication, technology, site development applications, and reporting. It divides the project into seven phases: definition, design, realization, implementation, start, evaluation and redesign. For each theme, several products have to be delivered in all phases of the project. The themes together with the phases form a matrix, in which the products can be placed. For an example matrix see figure 2.

This matrix had been developed by Ir. Natasja Paulssen and Mr. Harold Roumen and they called it the E-business Planning Approach. To accompany the matrix there was a short commercial description of EPA and a presentation that gave a short description of each area and phase. The rest of the knowledge that was used to perform e-business projects was all inside the heads of Harold and Natasja. That meant that each project would need the involvement of at least one of them.

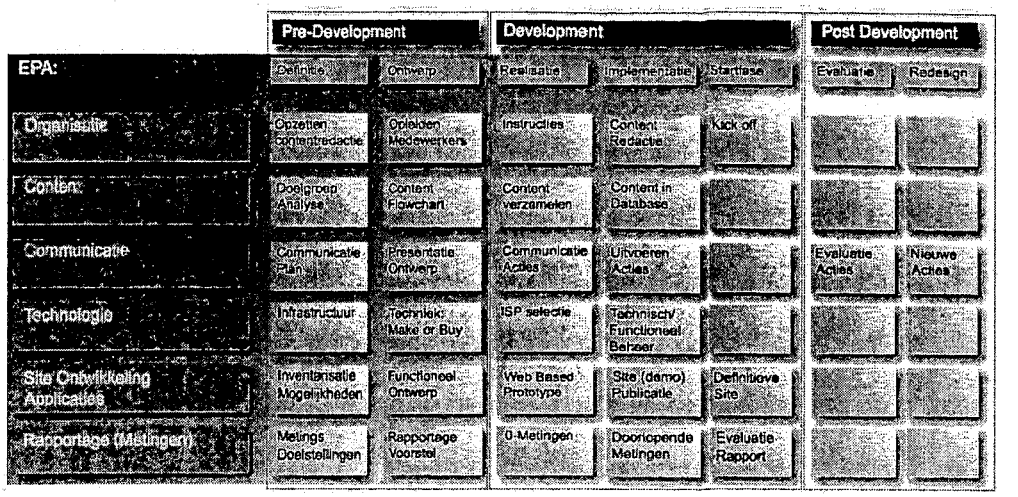

Figure 2: Example first EPA matrix

Ordina Finance Consulting think the approach with the matrix very promising and they would like to apply it in as many projects as possible. Therefore the matrix has to be newly derived and the result has to be combined with the knowledge about e-business projects into a standard approach. This approach will be called EPA and has to be described in such a way that others can use it. The approach has to be validated and evaluated to show how successful it is and will be.

The knowledge about e-business projects and the matrix that Ordina has, has to be put into an approach called EPA, so that other people can also work with it. For that EPA has to be provided with a more theoretic basis. After EPA has been defined, described and evaluated, it would be preferred to investigate the combination of EPA with other tools, methods, and standards that are used by Ordina.	Assignment

1.3 Research Questions

The goal of the assignment is to develop a feasible approach for e-business projects. The first month I have spent talking to Harold and Natasja to get a better idea of my assignment. After this first month I had a preliminary plan of what to investigate and how to do that. The field of e-business is very broad, so it seems necessary to limit the scope for the assignment to knowledge portal realization projects. This limitation of scope is because that is where most experience of Ordina lies.
I will start to newly derive the matrix. Ordina is very curious if the matrix is feasible or if it needs more/other themes and phases. I decided to call the themes 'areas' from now on and start with the following research questions:

- Which should be the areas? Which should be the time phases?
  Describe the areas and how I chose them. Describe the time phases and how I chose them.

As input for the derivation of areas and phases I will have interviews with Natasja, Harold and people from inside and outside Ordina who all had there expertise on different aspects of e-business (marketing, infrastructure, software development, usability, etc.). Their comments will help me decide which are important factors in e-business projects and what problems have to be avoided. The areas should address all aspects of an e-business project.

Once the matrix has been derived, it will be necessary to look at the way the matrix is filled with products. This leads to the following research question:

- How will the matrix be used?
  Describe each cell and their mutual relations. Describe the processes in the project and an example of an instantiated matrix.

The input for the products that are needed in the cells of the matrix and the way these products are dependant on each other, will also come from the interviews with people that have expertise on the areas that have been chosen for the derived matrix.
At this point I will have a filled matrix, but now I will need to define how this matrix is put into a standard approach. The approach will have to be developed and described in an accessible manner. The research question is:

- What is EPA?
  Build EPA as an approach around the newly derived matrix. Define EPA, give a short description of EPA and position EPA.

I will look into when the EPA matrix can be used and what is needed before it can be used. I will need to find a way to describe the basis of the approach, looking at the way other approaches have been described. I will have to decide which of the previously collected knowledge has to be incorporated in the approach and how to summarize this knowledge in the approach.
At this point the approach will have been newly developed, but then it will have to be validated and evaluated. The first step will be to show why EPA is needed. This leads to the following research question:

- Which problem does EPA solve?
  Describe why EPA has been developed, what the context of EPA is, what the main focus of EPA is and what the current status of EPA is.

By talking to professionals from the field of e-business and reading literature I will be able to indicate the relevance of knowledge portals and identify current problems with knowledge portal projects. EPA will be an approach for knowledge portal projects and thus will have to avoid these problems.
The next step will be to compare EPA with other methods and approaches to see if something similar already exists and to indicate strengths and weaknesses of EPA. The research question is:

- How does EPA compare to other methods and approaches?
  Compare the EPA areas with other area divisions and assess disadvantages and advantages. Compare the EPA phases with other time phase divisions and assess disadvantages and advantages. Compare the approach as a whole to other approaches that use an area division and indicate differences.

These other methods will have to be found in literature. The way EPA has been described will have to provide a basis for comparison with other methods.
The last step will be an evaluation of EPA. Research questions will be:

- What are the limits of EPA? What is the strength of EPA? What is the future of EPA?
  Describe the application area of EPA (size and type of projects) and how it is embedded in a project method. Do a SWOT-analysis of EPA. Describe the way EPA can be adjusted or elaborated.

The evaluation of EPA will be based on my personal findings and the opinion of people who have experience in projects. The validation of EPA will be done by showing that EPA solves the problems that were identified in the beginning.
Information that is nice to have for Ordina is how they can combine EPA with other methods that are used within Ordina. As this is the least important aspect of the assignment I will treat this at the end. The research question is:

- How do the methods and tools of Ordina combine with EPA?
  Describe the methods and tools of Ordina and how they fit into the matrix.

For this part of the assignment I will need contacts within Ordina that can tell me which other methods exist. I will use the existing contacts of Natasja and hope they will be able to help me further.
I estimated the answering of the above questions to take about six months (one, three, eight, eight, and five weeks respectively per phase). After these six months there are two more months to translate the findings about EPA into a format that can be used in practice by Ordina, to finish this report, and to prepare for the graduation presentation.
I expected to find the answers to the questions by reading literature, searching on the Internet, and interviewing people inside and outside Ordina. The main source of information about EPA and past projects is Natasja Paulssen, who is my coach at Ordina. She also offered me the opportunity to participate in one of the EPA projects to get a better view of the practical problems.

1.4 Report Outline

In practice EPA had only been used in projects that realized a knowledge portal. We have decided to focus the thesis on this type of sites. We have analyzed the e-business environment to demonstrate that this limitation of scope is feasible from the current trends in the information economy (Chapter 2).
Knowledge portal realization may seem simple from the point of view of software development, but we have described the challenges to show that a structured approach is needed and we have derived requirements for such a structured approach from the challenges (Section 2.5). EPA is such a structured approach, which fulfills the requirements to address the challenges. We have summarized EPA by describing input, output, and a number of structure techniques and principles (Chapter 3). The principles indicate how the structure techniques are to be used to reach the output from the input. EPA divides the knowledge portal realization project into areas and phases. Chapters 4 and 5 show how these areas and phases have been identified and describe each of them. The EPA matrix (Chapter 6) combines these areas and phases.
We have investigated how EPA can be combined with project management and other Ordina methods (Chapter 7). We show how EPA fulfills the requirements that were derived at the start and to conclude we evaluate EPA, based on a comparison with other similar methods, an analysis of the future relevant e-business developments, and an analysis of the application area of EPA (Chapter 8).

2 Requirements for the Realization of a Knowledge Portal

This chapter describes the context of the E-business Planning Approach (EPA). We will first analyze three trends in e-business with respect to knowledge-intensive organizations. Then we will describe the challenges organizations face in the area of these combined trends, illustrated by a university example (see Appendix 1). The challenges led to the development of EPA.

2.1 E-Business Sites

The E in EPA stands for E-business. The broadest definition of e-business is "The application of electronic means to support business" [Hemmen and Appelboom, 2000]. Computer, fax, calculator, and mobile phone are all electronic means to support business. The computer, however, offers the most versatile application.
The application of the computer has evolved from stand-alone applications to systems to networked systems. One form of networked systems is the Internet. The Internet is often the first thing that people associate with e-business.
Internet technology can be applied in a number of ways. A current trend is that every organization is forced to be present on the World Wide Web, just to keep up with competition. This presence is called a Web site. Web sites started as simple translations of the organization's brochure and evolved to complete Web stores where customers can obtain goods and services from the organization.
We will limit the scope of our definition of e-business to "The employment of sites to support business". These sites include Internet sites, which are available to everyone, intranet sites, which are available to an organization's employees, and extranet sites, which are available to the organization's business partners.

2.2 The Internet Economy

Five of the trends in the Internet economy Tiggelaar introduces in his book about Internet Strategy are [Tiggelaar, 2000]:

1. A super-fast world. People do not wish to be constrained by the factor time. Everything can and must be faster in current society. This is visible in business as well as every-day life.
2. Services exceed products. The share of the service industry in the gross national product continues to grow. Services are added to more and more products. Customers decide for a specific product on basis of the added services. Parts of these services will be based on information.
3. Informatization of the product. Information as added value in and around products is gaining more and more importance.
4. The complex world. As a consequence of individualization, fragmentation, acceleration, decreasing distances and the growing information and product offering, the world becomes more and more complex for organizations.
5. The digital information world. The amount of information keeps increasing and the way that information is transported keeps getting quicker and more reliable.

The first trend shows that the Internet economy is fast. The second and third trend make it clear that information is becoming an important factor in the Internet economy. The last two trends show how the abundance of information on the Internet adds a new degree of complexity for organizations.
From the five mentioned trends we can see that the Internet economy is a fast changing information economy. Organizations try to control their information flows in a way that adds value to their business. Internet makes it easier for organizations to connect with the world outside the organization's boundaries. They do not only try to support information exchange among their employees, but also with their business partners and customers. Through Internet, intranet or extranet sites they try to offer a central place where customers, employees, or business partners can exchange information with the organization or among each other.

2.3 Trends in the Information Economy

When we look at organizations that use sites for information exchange, we can identify three trends that influence them. We will use these trends to identify the type of sites we will focus our approach on.

2.3.1 Customer Orientation

On the web, customers can easily check sites (and products) of different organizations and compare them. Above all, the organization has no direct influence on customers to make them use the site. This makes it important for an organization to analyze the requirements of the customer and try to fulfill them as well as possible.
Web customers expect that sites are easy to use and fast. This is a difficult problem to solve, because there is not one single type of customer. Customers that access a site can have different technical environments, personal skills and reasons to visit the site. They are unknown to the organization.
The employees of an organization are known to the organization, and can be influenced much more directly. However, a process like exchanging information between an organization's employees is highly voluntary. Employees cannot be forced to use the site to exchange information and must be treated as if they were customers. This means they have to be attracted to use the site. This same reasoning goes for business partners that an organization wants to exchange information with.
These customers, employees, and business partners together we will call users. The movement that has the objective to develop software that fulfills the requirements of (groups of) users is called "user-centered design" [Pearrow, 2000] [Henry, 1998].

2.3.2 Knowledge Sharing as Business Process

Information is the combination of signals and symbols. Knowledge is formed on the basis of information. Knowledge is the combination of experiences, facts, believes, concepts, expectations, methods, etc. obtained by induction and deduction, of which the holder believes that they are true. [Tiggelaar, 2000]
Sites offer information to people. Visitors of a site use this information to increase their knowledge, but they also use their knowledge to increase this information. This process is called knowledge sharing.

Organizations realize that web sites should be used to share knowledge (interact) with customers to attract them to the sales channels of the organization and to keep them as customers after they made their purchase.
Sharing knowledge among employees and with business partners is a way to increase efficiency of other business processes. It also creates a better bond among and with employees and business partners.

2.3.3 Portals

Traditionally the term "portal" was used for Web "supersites" that offer a variety of services and links to other sites. Literally "portal" means "a doorway or gate, esp. a large and elaborate one" [Allen, 1990]. From this definition, the term is currently used for every site that has a considerable size and exceeds the simple translation of brochure-ware. All of these sites are gateways to information that is located elsewhere [Skyrme, 2001].
Organizations discovered that when realizing a portal attention has to be paid to more than only the physical site. The entire system of site, infrastructure, people, and processes that supports the portal function (e.g. knowledge sharing) has to be realized. When we speak of a portal we imply this entire system.

2.4 Customer-Oriented Knowledge Portals

Putting the three trends in the previous paragraph together, we arrive at "customer-oriented knowledge portals". We will use the shorter term "knowledge portals". By our definition a knowledge portal offers employees, customers or business partners access to high quality information sources of an organization; uniformly: through one single interface, and transparently: without required knowledge about location and format of systems or information.
Knowledge portals are operated by knowledge-intensive organizations and offer convenient access to information for knowledge workers. A knowledge-intensive organization is an organization where knowledge is an important production factor and thus knowledge sharing is an important process.
Knowledge portals have two types of users to consider: the end users of the site (visitors) and the end users of the system that delivers the content to the site (publishers) [Donnelly, 2001]. The first group comes to the site to find information, the second group to provide information. The portal should provide a usable interface to both groups.
The features found on a typical portal include [Skyrme, 2001]:

- Structured knowledge
- Search facilities
- Personalization
- News
- Communities

The portal also contains features for maintenance and content publishing.
Examples of knowledge portals are:

- Employee Knowledge Network: an organization wants to provide their employees with a site where they can find and share the information needed to perform their jobs more efficiently.

- Government Knowledge Repository: a government organization wants to provide civilians with all information they need to apply for subsidiaries. They share information about all kinds of regulations and processes with "customers" outside the organization.
- University Supersite: a university needs to support knowledge sharing among its own employees, with its customers (the students) and with its business partners (other universities, research institutes or companies). This knowledge ranges from schedule information for the students to research results.

The complexity in setting up such a university supersite is explained in Appendix 1.

2.5 Knowledge Portal Realization Challenges

From the description of the Internet economy and the university example in Appendix 1 a number of challenges can be identified that organizations face when they decide to realize a knowledge portal:

1. **Not only hard- and software have to be developed**
   The set up of a knowledge portal is not merely a question of programming the site and setting up the servers, but also requires a change in employee mentality and working processes. The development team has to posses or obtain knowledge of all aspects. This involves software engineers, information architects, marketers, business analysts, etc. Every team member or expert considers the portal from his own viewpoint. A good coordination mechanism is needed between them to unite the different views into a whole.
2. **The knowledge economy is highly complex and changes rapidly**
   As we said, the knowledge economy changes rapidly. Organizations form their e-business strategy based on the current environment and their vision of the future. In his book about Internet Strategy Tiggelaar identifies four phases in the Internet strategy cycle [Tiggelaar, 2000]:
   1. Vision and Mission: analysis of the world and decision which role the organization wants to fulfill in it; plan for ten years, evaluate every two years.
   2. Strategic analysis: analysis of the competitive environment and the organization's position with regard to competitors; plan for three years, evaluate every year.
   3. Strategic choice: generation and selection of ideas to improve the competitive position of the organization; plan for three years, evaluate every six months.
   4. Strategy implementation: execution and evaluation of projects; plan for one year, evaluate every month.

   The realization of a portal takes place in phase four after the strategic choice has been made. Because the evaluation, and possible adjustment, of plans takes place every month, the realization of a portal is highly insecure. It is impossible to incorporate all the changes in the same realization project. To keep the discrepancy between the realized knowledge portal and the e-business strategy as small as possible, the realization project should be kept as short as possible.
3. **Different departments have to be involved**
   Traditionally the implementation of IT systems has been housed within the ICT department of an organization. Because a portal is a communication medium to customers, there will be a lot of influence from the Marketing department. It is a

challenge for the organization to house the project within the correct department(s) and make departments work together to realize the portal [Sano, 1996].

4. **The information offered stems from multiple heterogeneous sources**
   Another problem we have with departments is that the information needed on the portal will be divided over different departments, as with the faculties of the university. The knowledge portal offers transparent access to the information that is present in the organization. This information is not only stored in several different types of information systems, but also in the heads of employees. The systems and employees may belong to different departments of the organization. Different departments can use different technologies in their information systems and different information systems can have different owners. The knowledge portal should form the central place from which all information is easily accessible. The information should be presented in a uniform way. This creates a complex information structuring and management problem.
5. **User cooperation is necessary**
   Knowledge sharing is a two-way process for which the cooperation of the users to provide information is essential. But even sites that only provide information to the users are only successful as long as enough users visit them. The World Wide Web has given an unprecedented power to the customer. It makes it possible to compare organizations and switch between them with one mouse-click. When the Web Site of an organization is chaotic or too slow, the customer will go to the competitor to get what he wants. Organizations offer information at the portal as an added service to customers. Customers are under no obligation to use the knowledge portal. Organizations have more control over their employees and business partners than over customers. However, the sharing of knowledge is a voluntary process. An organization can enforce knowledge sharing only to a certain extent. There is no way to keep employees and business partners from getting the information they want from other places and from keeping information they have to themselves.
6. **The knowledge portal has to be kept operational and is never finished**
   After the knowledge portal has been realized, it will have to be kept operational. This means the software, the hardware and the content have to be maintained. The information offered should be kept up-to-date and relevant over time. The organization should also respond to the reactions of the users and adjust the portal to their changing requirements. The knowledge portal project continually cycles through design, implementation, and evaluation.

The challenges indicate that a knowledge portal has a lot of different aspects and that it has to be realized in a chaotic environment. To reduce the complexity of knowledge portal realization, a structured approach is needed [Donnelly, 2001]. We will present the E-Business Planning Approach (EPA) as a comprehensive approach for the realization of knowledge portals that provides a solution to these challenges.

The challenges can also be formulated as requirements for the realization of a knowledge portal:

[RQ1] Address all aspects of the portal (software, hardware, processes, people)

[RQ2] Keep the project short

[RQ3] Get balanced input and cooperation from all people involved

[RQ4] Pay attention to information structuring and management
[RQ5] Attract the user to the portal
[RQ6] Plan for maintenance and change of the portal

We have based our approach on a number of techniques and principles to fulfill the requirements. EPA and its techniques and principles will be explained in the next chapter. We start with a description of EPA, we then explain how other methods can be combined with EPA and we end with an evaluation of EPA, where we show how the requirements have been fulfilled.

3 E-Business Planning Approach (EPA)

This chapter explains the techniques and principles of the E-Business Planning Approach (EPA). It describes what is needed before EPA is started and what will be the end result of EPA. Various aspects of EPA will be explained in more detail in the next chapters.

3.1 Precondition

Before EPA can be put into practice, the e-business strategy must have been defined. This also includes the general security policies. EPA provides an implementation of the strategy through the portal; we will call this knowledge portal realization. EPA does not describe the project management products and activities. EPA has to be embedded in a project management method that ensures project quality. Product quality is ensured by the definition of specific, measurable, achievable, relevant and time-related (SMART) goals that have been derived from the portal strategy and the constant monitoring of these goals during the project.

3.2 Result

An EPA project delivers a fully functional knowledge portal. The portal that is delivered at the end of the EPA project consists of:

- Site with supporting infrastructure and technology;
- Content administration;
- ICT administration;
- Quality goals and measurement systems;
- Training programs and instructions to work with the site and a first group of trained employees;
- Procedures to work with the site;
- Security policy for the site;
- Communication plan to attract users to the site (and keep them there), of which a number of actions have been performed during the EPA project.

This is everything needed to keep the portal operational. The end result will fulfill the SMART goals that have been defined at the start of the project (see paragraph 3.1). If use of the portal gives rise to drastic changes, a new EPA cycle could be started to adjust (areas of) the portal.

3.3 Structure

The previous chapter stated that to reduce the complexity of knowledge portal realization a structured approach is needed. EPA uses the following techniques to create a structured overview of what needs to be done when and by whom:

Product-Based Planning

Breaking down a product into its constituent sub-products helps clarify and identify all necessary work for its creation. The "product" is the end deliverable of the project and may be tangible or intangible [CCTA, 1998].

The end deliverable of EPA (see the next paragraph) is the knowledge portal with its supporting system. EPA identifies all products needed to realize the knowledge portal in all its aspects and the dependencies between the products. Planning and control of the

project is done on basis of the delivery of products. Examples of products and dependencies can be found in chapter 6.

Portal Areas

The end result as described in paragraph 3.2 consists of products that all concentrate on a different aspect of the portal (e.g. users or infrastructure). EPA divides the (sub)products of the knowledge portal over areas that concentrate on the same main aspect. The six EPA areas will be explained in the next chapter.

Time Phases

To make the development of the portal less complex, EPA divides it into time phases. The end of a phase forms a milestone. Products are delivered and have to be approved and the decision whether or not to start the next phase is taken. The five EPA phases will be explained in chapter 5.

Overview Matrix

A matrix [Gevers and Zijlstra, 2000] is formed of the six portal areas together with the five phases. The products needed for the realization are positioned in the cells of this matrix, to give an overview of what is needed when and in which area. The set of products is largely the same in all knowledge portal realization projects, but should be adjusted to meet the specific requirements of each individual project. The matrix and example products will be discussed in chapter 6.

Workflow

The division of products over matrix cells does not eliminate the dependencies between them. Products are needed as input for activities that create other products. We call the sequence of activities that connect products that have input-relations with each other a workflow. All activities together form one big workflow. Workflows identify coordination issues within the project. An example partial workflow can be found in chapter 6.

3.4 Principles

The implementation of the structure techniques in the previous paragraph is based on the following principles. These principles are also used to guide the decisions that have to be made during the project. The principles have been derived from the requirements in paragraph 2.5.

1. Fast development of all portal aspects

A fully functional portal requires not only a Web site but also supporting processes, people, and technology. By supporting system we do not only mean the physical infrastructure, but also the organizational structures and processes around the site. Not only the Web site has to be built, but also the organizational change needed to incorporate the knowledge portal is important. Because the time-to-market has to be short, Web site, infrastructure, processes and structures should be developed in parallel (a principle already applied in Concurrent Engineering [Hartley, 1992]). The cultural organization change needed to make the knowledge portal a success has to be an important point of attention during the whole project.

2. Collaboration of disciplines

A lot of different disciplines need to work together on the realization of the knowledge portal as described in paragraph 3.2. The project involves for instance a graphical designer to design the user interface, a marketing specialist to promote the site to the

users and a system engineer to build the infrastructure of the site. Their viewpoints and products need to be combined into the portal. Each discipline should be involved where its expertise is needed and the input from all disciplines should be balanced.

3. Content-orientation

We define content as the information that is offered through the Web site. The quality of the content determines the quality of the Web site. The content, which comes from different sources, has to be inventoried and collected. The collected content will be in different formats and has to be converted to the common format for the portal. The content on the site is based on the information need of the users. To make content easy to find for the user of the portal, the site should be based on an extensive Information Architecture.

4. User-centeredness

Because users are not obligated to use the portal, it has to be made as attractive as possible for them to use and add content. This is achieved by adjusting all aspects of the portal to the requirements of the user. The user should be the central starting point for the design of the portal and explicit efforts should be made to promote the portal to the prospective users, whether employees, business partners or customers.

5. Minimal impact on organization

The processes around the portal, like content management and user support, involve tasks that do not differ much from tasks that have already been implemented in the organization. By adapting existing processes and setting up as few extra processes as possible, the impact of the introduction of the portal is minimized.

6. Prepare for maintainability

Technologies, people and procedures have to be set up as early as possible to keep the content up-to-date and relevant after the Web Site has been published. This is called Content Management. The facilities needed to maintain functionality and infrastructure of the site should receive the same early attention.

7. Design for Change

To keep development time short, changes as result of the changed environment during the project have to be incorporated in later releases of the knowledge portal. This is possible due to a flexible architecture and a Design for Change [Morville, 1996] approach to all portal aspects.

Concurrent Engineering

Concurrent Engineering (CE) is the systematic approach to the integrated, concurrent design of products and related processes, including manufacturing and support. Vital elements include [Hartley, 1992]:

- Multidisciplinary taskforce (EPA interdisciplinary team)
- Product defined in customer's terms (EPA user-centeredness)
- Parameter design to ensure optimization for quality (EPA Design for Change)
- Design for manufacture and assembly (EPA prepare for maintainability)
- Simultaneous development of the product, the manufacturing equipment and processes, quality control, and marketing (EPA concurrent development)

This demonstrates the EPA principles are viable principles that are also used outside the field of ICT.

The philosophy behind EPA is formed by the structure techniques and the principles. The next three chapters will explain how the structure techniques have been implemented and chapter eight will show how the principles have influenced this.

4 EPA areas

This chapter explains how we chose the areas of EPA. For each area a separate description is given.

4.1 Strategic Alignment

The alignment of business and I(C)T has been an issue for the past years [Henderson and Venkatraman, 1993] [Boar, 1994] [Luftman, 1996] [Strassmann, 1997]. Information is an important factor in the business-ICT relationship. The importance of information as a strategic resource has been widely recognized [Tom, 1987], even as an external one [Skyrme, 2001]. Strategic alignment considers the need of modern organizations to address information and communication processes and the underlying technology in relation to their overall business strategy. The present position of many CIO's at the Board level is reflecting this interest [Maes, 1999].
Knowledge portals are ICT tools used for information management and thus also have to consider the Business, ICT and Information strategy. Knowledge portals aim to implement these strategies. The objective of a knowledge portal is to improve the execution of user tasks (making them more efficient, effective or innovative) by fulfilling the information need of the users. This objective indicates that the need of the users also plays an important role with respect to knowledge portals. Improved execution of user tasks is not only reached by effective use of technology (ICT), but also by effective use of data (Information).

4.2 EPA areas

In the previous paragraph we identified four factors in strategic alignment with respect to knowledge portals:

- Business – improved execution of user tasks
- ICT – effective use of technology
- Information – effective use of data
- Users[1] – fulfillment of needs

These factors indicate the main aspects of a knowledge portal. EPA groups the products needed to realize the knowledge portal in six areas that have been derived from these main aspects.
Knowledge portals are in essence information systems. We will refer to the information in these systems as Content, thus renaming the Information area to Content area within EPA.
ICT is the combination of software and hardware (infrastructure). Within e-business projects, the ICT infrastructure is a critical success factor [Harmon et al., 2001]. It has to be adjusted to 24 x 7 availability, high performance expectations, a variety of platforms, etc. It is also important that the infrastructure that is developed is not only suited for the current portal, but also supports changes to the portal and the development of new portals. The functionality (software) is only created for the current portal. This means the

[1] Remember that we consider customer-oriented (=user-centered) knowledge portals

technology of the portal has a different scope, and thus view, on the knowledge portal. We have split the ICT area into two separate EPA areas: Functionality and Technology. Some products do not relate to one specific area of the knowledge portal, but to the combination of these areas. They consider the portal system as a whole. By this we mean a system in the broadest sense: people, processes, content and ICT. Examples products are security and quality management products. For these system products we created a sixth EPA area called System.
The six EPA portal areas are:

- User
- Content
- Business
- Functionality
- Technology
- System

The grouping into areas identifies the different aspects of the knowledge portal that should be considered during realization. On each area a number of disciplines is active to create the products in that area. The disciplines within one area have a common view on the knowledge portal, because they concentrate on the same main aspect of the portal. A good integration of all areas, and thus of the views of different disciplines, is needed to develop a successful portal. The six areas are shown in figure 3. The following sections will describe each of these areas in more detail and explain the links between them that are indicated by the lines in figure 3. Chapter 6 will explain how EPA coordinates the different discipline areas to fulfill the same mission.

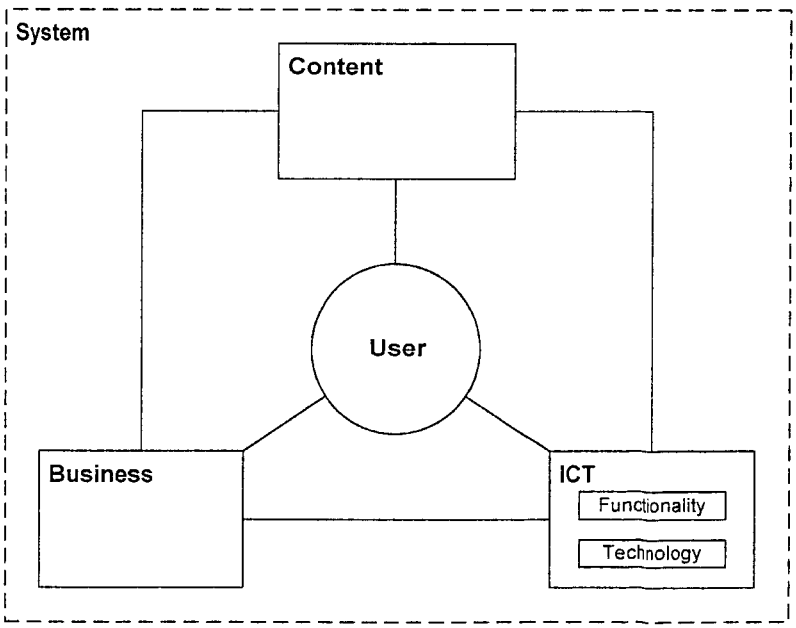

Figure 3: EPA portal areas

4.3 User

By user we mean the employees, customers and/or partners for whom the organization deploys the portal. Employees are internal users. They are known to the organization and can be pressured to use the portal. Customers and business partners are external users. Customers are often unknown, which makes it hard to analyze or influence them. They cannot be forced to use the portal.
The organization has to develop a marketing plan to attract users to the site. To keep them there, content that interests them is needed and the ICT has to be set up in such a way that e.g. performance and security are sufficient. If finding the right information takes too long, a customer can easily go to a competing site.
The user is also able to add content to the site (for example a document he wrote, personal info he had to provide during a registration, or comments he made on a discussion forum) and can provide the organization with a lot of feedback through media like e-mail and help desk (phone).
Important is that the user is put in the center [Nielsen, 1999], because the success of the portal depends on the number of users. They will only use the portal if it has been adjusted to their requirements. Business, Content, and ICT will have to be integrated in a way that fulfills the wishes of the users. What makes this difficult is the fact that there is no single type of user. Especially when the portal is developed for customers, it has a diverse population of target users. The portal has to offer something for all these user groups.

The user area involves the following disciplines and their products:

- **User Analysis**. To be able to realize a portal targeted at the user, a detailed analysis of the user has to be made. The problem with most portals is that there is no single type of users. This means the users must be divided in types and will then be analyzed in groups.
- **Marketing & Communication**. After the targeted users are identified, a communication plan has to be made to attract them to the site and keep them there. A number of actions in this plan will be performed during the project, but it also contains actions that have to be performed when the portal is operational. With regard to security it is important that a privacy policy is developed that is suited for the users of the portal. This policy has to be communicated to the users in a clear way.
- **Usability Testing**. To constantly check the portal is fulfilling the wishes of the user, user testing is necessary. This means users are confronted with (a prototype of) the portal to check if they can perform every desired action and if they can perform those actions easily (so called "usability testing" [Krug, 2000] [Rosenfeld and Morville, 1998]).

4.4 Content

By content we mean the information that the organization offers to the user through the portal.

Content is the most important part of the portal. Users visit the site for what they can find there. Besides that it is important in what way the content is offered to the user. This is the functionality area of ICT.
The organization has to supply the content, but also has to maintain it. Content that is out of date or not interesting will not attract users to the portal. The organization has to provide people who are responsible for the administration of the content.

The content area involves the following disciplines and their products:

- **Content Management.** Content management orchestrates the development, testing, review and deployment of content. It combines a mechanism to store the content with processes that seamlessly mesh with the activities of people and machines within an organization. [Nakano, 2002]
- **Content Acquisition.** The collection of content must start as early as possible. The organization has to decide if they want to buy part of the content from third parties or develop everything themselves. This also involves legal aspects like copyrights. Data can be stored in (legacy) information systems and it has to be decided what content has to be included in the portal.
- **Content Modeling.** The organization has to start by making an inventory of the content they have available. It is important to know, where and in what format the content is stored. After the organization has decided what content they want to offer through the portal, an information architecture has to be made [Rosenfeld and Morville, 1998]. An information architecture structures, organizes and labels information to help people find and manage information.
- **Content Maintenance.** Another important process that has to be started is the set up of an editorial team. These people are responsible for proofing copy that others submit to the portal. They should also stimulate others to submit copy. Their task is the maintenance of the content after the portal is launched.

4.5 Business

By business we mean the entire system of processes, culture, organizational structure and people in an organization that offers information through the portal.
Goals of the portal are to support the processes of the organization and the working practice of the users by providing information. Examples are an online helpdesk, an online information repository or the possibility to apply for subsidies online. The introduction of a portal will influence processes and organizational structure, require new or changed processes and organizational structure for maintenance and other support, but also the culture of an organization will have to change to let employees accept the portal as part of their working practice.
Usually the information and processes needed to support the portal are divided over different departments. It is a hard task for the organization to integrate them.
The organization will have to supply content, as mentioned before, and set up content administration. Another important administration object is the site itself (the ICT). Functionality, applications and technical infrastructure have to be administered.

User and organization have to interact continuously. The organization makes an inventory of the user requirements, but also evaluates the use of the portal to adjust it to the (changed) wishes of the user.

The business area involves the following disciplines and their products:

- **Process Engineering**. The organization has to start by analyzing its current processes. These processes have to be redesigned and reorganized. New processes have to be designed for the administration of the portal.
- **Employee Training**. Training has to be developed for employees, if the skills needed for the new processes are not present. A first group of employees have to be trained to work with the portal.
- **Change Management**. Another important process that has to take place is the cultural change of the organization. The employees have to accept the portal as part of their working practice. This cannot so much be defined in terms of products, but management commitment to the portal from the start of the project is very important.

4.6 Functionality

By functionality we mean the web site application of the portal. The functionality is adjusted to the user requirements and the content that has to be offered. This content comes from different data sources and has to be displayed in the same format and style. Functionality is needed for this conversion and integration process. Another important part of the functionality is the graphical user interface.

The functionality area involves the following disciplines and their products:

- **Graphic Design**. A first design sketch of the pages is made as early as possible. The graphic design is presented in a prototype and implemented in the application.
- **Software Development**. The starting point is a wish list with the functionality that is desired for the portal application. This functionality ranges from data source integration to search engines. Navigational and functional designs are made and included in a prototype together with the graphic design. The organization has to decide what they want to develop themselves (make or buy decision) and what tools they will use. Development starts with detailed design and ends with a completed application. Another possibility is that the organization decides to buy the needed functionality. In this case the development will consist of the customization and integration of the bought products.
- **Testing**. During and after development the functionality of the application is tested against the specifications (wish list). Functional testing can be done serially or incrementally, developing one functional unit at a time.
- **Maintenance**. In parallel an organizational structure has to be created for the maintenance of the site after it has been launched. These people are responsible for maintaining the functionality of the site and for updating the portal applications whenever necessary.

4.7 Technology

By technology we mean the infrastructure of the portal. This includes hardware and software needed to support the web site application. The technology supports the functionality and together they have to be administered within the organization. The Internet is an important part of the technology. The Internet is outside the control of the organization, which challenges security and performance.

The technology area involves the following disciplines and their products:

- **Infrastructure Engineering**. Starting from the current technology standards in the organization, a new infrastructure has to be designed and developed to support the portal. This includes important activities like the selection of an Internet Service Provider to host the portal site.
- **Maintenance**. In parallel an organizational structure has to be created for the maintenance of the infrastructure after the portal has been launched. These people are responsible for maintaining the Internet connection, the network, the databases and other supporting systems and applications.

4.8 System

By system we mean the portal and its supporting system together. The system consists of the Web site, supporting processes, people, and technology. User, Content, Business, Functionality, and Technology all belong to what we call System. The disciplines in the system area view the portal from the combination of these areas. The system area contains the products that are targeted at the entire portal system.

The system area involves the following disciplines and their products:

- **Product Quality**. The success of the portal is defined by how well it fulfills the goals the organization has set for it. The process of obtaining product quality begins by defining SMART goals for the portal. After that a monitoring system for these goals has to be designed and implemented. The results of monitoring have to be translated to adjustments to the portal. Product quality is realized on the system level, but all products can be specialized to the different areas. The evaluation of the different EPA areas is based on the goals and the monitoring proposal in the system area.
- **Security**. Providing portal security begins by analyzing what the risks are. Depending on how important those risks are security measures are defined to reduce them. After that it is important that security is constantly monitored to see if the measures have been effectively implemented.

4.9 Comparison of EPA Areas with Other Methods

[Donnelly, 2001] describes a website development process. The description concentrates on the analysis phase. The four areas on which analysis takes place are:

- Business: scope, directions, and priorities of the site
- User: what the user would like to do and how he would like to do it
- Content: characteristics of the information that will be published
- System: website and content management system

[Skyrme, 2001] contains a website project plan checklist. This checklist groups the activities needed for planning and developing a website into the following areas:

- Preparation and planning: business case, project planning, and user research
- Content development: content, layout, and navigation
- Content enrichment: functionality, and integration with other systems
- Technical: servers, systems, and supporting processes and standards
- Testing and going live: content, application, and technical testing
- Marketing: site promotion, feedback, and data collection
- Sustenance: content, feedback, application, and infrastructure
- Management processes: project management, user liaison, legal aspects, performance, process descriptions, documentation

Table 1 contains a comparison of the areas. For each EPA area we have identified the area(s) of the other two methods that contain(s) similar products.

EPA	[Donnelly, 2001]	[Skyrme, 2001]
System	Business (site goals)	Management processes (performance)
User	User (no marketing)	Preparation & Planning (user research) Testing and going live Marketing Sustenance (feedback) Management processes (user liaison)
Content	Content	Content development Testing and going live Sustenance Management processes (legal aspects)
Business	Business (roles & responsibilities) User (task flows)	Management processes
Functionality	System (no maintenance)	Content enrichment Testing and going live Sustenance
Technology	System (no maintenance)	Technical Testing and going live Sustenance

Table 1: Comparison of EPA with [Donnelly, 2001] and [Skyrme, 2001] areas

The following differences stand out from the above comparison:

- EPA has a separate area for system (quality and security) products. This is because it is very important that e.g. goals and performance measures are formulated with a holistic view of the portal system.
- The system area of [Donelly, 2001] has not been divided into a Functionality area and a Technology area like in EPA. EPA does this because of the importance of a flexible and scalable infrastructure.
- Testing and sustenance are separate areas of [Skyrme, 2001], where EPA has divided this over the relevant areas (User, Content, Functionality, Technology). EPA does this because of the huge difference between e.g. content sustenance and technical

sustenance. Different forms of testing and sustenance should be prepared and executed by people with experience on the subject that is tested or sustained.

The areas from [Donnelly, 2001] form a good backing for the four factors (Business, ICT, Information, Users) we deduced the EPA areas from. The areas from [Skyrme, 2001] back up the splitting of Functionality, Technology and Content (content enrichment, technical, and content development) and the importance of marketing. We conclude by claiming that for each of the differences we have given a plausible reason.

5 EPA Phases

This chapter describes the time phases of EPA and compares them to the phases of a number of other development methods.

5.1 Plan, Do, Review

EPA is divided in a Concept (Plan), Implementation (Do), and Evaluation (Review) phase. During and after the end of the Concept phase it can be decided to not start with the Implementation phase (go/no-go decision), but the Implementation phase is always followed by an Evaluation phase.
The Concept and Implementation phases have been divided into sub-phases as will be explained in the next two paragraphs.
When a phase is completed, it is not possible to go back to earlier phases. After the Evaluation phase it is possible to start a new EPA project at the Concept phase. This means EPA does not iterate between phases.

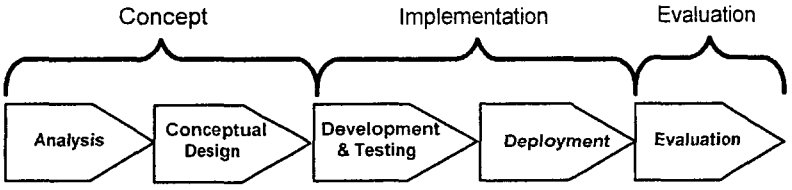

Figure 4: EPA time phases

5.2 Concept Phase

The Concept phase is the phase during which the organization's current state and their goals for the portal are analyzed. In the analysis the portal is considered as a black box and the interaction with is environment is considered. After that a conceptual design of that black box is made to show what is needed to achieve the goals. To make this difference more clear, we have divided the Concept phase into an Analysis phase and a Conceptual Design phase.

5.2.1 Analysis Phase

The organization's goals for the portal are defined. The current and desired state on all portal areas is analyzed. These analyses are used to decide whether it is feasible to achieve the goals and continue with the project.
Important is that the management shows commitment to the portal from the beginning of the project.

5.2.2 Conceptual Design Phase

High-level designs are made. These designs show how the project will provide the transition from current to desired state on all portal areas.
All important supporting processes (training, maintenance and an editorial team) are outlined.

Content collection and acquisition is started as early as possible, because this is a bottleneck activity in the project.
At the end of this phase the decision to continue with implementation of the portal has to be made, based on the feasibility of the design fulfilling the organization's goals for the portal.

5.3 Implementation Phase

In the Implementation phase the conceptual design of the previous phase is converted into a detailed design. The portal (on all six areas) is developed according to the detailed design. The portal has to be tested in the development environment and is then brought live in the organization. To make the transition from the development to the production environment clear, we divided the Implementation phase into a Development & Testing phase and a Deployment phase.

5.3.1 Development & Testing Phase

The high-level designs have to be translated in detailed designs and the portal has to be developed and tested on all areas. This can be done sequentially or incrementally. If the decision has been made to buy the software this software has to be customized for the organization.
At the end of this phase the portal is ready to put in the hands of end-users.

5.3.2 Deployment Phase

The portal is transferred from the development environment to the production environment and all supporting processes are started. Employees are trained and instructed, the site is launched and maintenance is started.
At the end of this phase the performance of the portal is measured, to serve as starting point for the Evaluation phase.

5.4 Evaluation Phase

The Evaluation phase is not divided into sub-phases. During the evaluation phase the operational portal is evaluated. It is checked if the goals that where defined during the Analysis work stage have been achieved. In the Evaluation phase there is ongoing monitoring and maintenance. At the end of the Evaluation phase it is decided if redesign of (parts of) the portal is necessary and a new EPA project has to be started.

5.5 Comparison of EPA Phases with Other Methods

Rapid Application Development (RAD) is an approach to building and maintaining computer-based systems, which combines effective use of tools and techniques, prototyping, and tight project delivery timescales [Martin, 1991]. The DSDM consortium (http://www.dsdm.org) developed a vendor-independent framework for Rapid Application Development called "Dynamic Systems Development Method" (DSDM).
The DSDM lifecycle has five phases [DSDM, 2000]:

1. **Feasibility study**: definition of the problem to be addressed; assessment of likely costs and technical feasibility of delivering a computer system to solve the business problem

2. **Business study**: identification of business processes to be automated and their information needs; identification of the classes of users who will be affected in any way by the introduction of the system; identification of system architecture that will be used
3. **Functional model iteration**: refinement of the business-based aspects of the computer system through an analysis model and software components which contain the major functionality
4. **Design & build iteration**: engineering of the computer system to a sufficiently high standard to be safely placed in the hands of the users
5. **Implementation**: cutover from the development environment to the operational environment; summarization what the project has achieved in terms of its short term objectives

After the Design & build iteration it is possible to go back to the Functional model iteration. After the Implementation phase it is possible to go back to any of the other phases.

The Rational Unified Process (RUP) is a customizable platform of software development best practices for the full lifecycle.

The RUP lifecycle has four phases [Kruchten, 1996]:

1. **Inception**: establishment of the business case; specification of the project scope
2. **Elaboration**: more thorough analysis of the problem domain; definition and stabilization of the architecture, addressing the highest risk elements of the project
3. **Construction**: fleshing out the architecture baseline and evolving it in steps or increments toward the final product
4. **Transition**: putting the product in the hands of its end users; analysis of project performance

RUP does not iterate between phases.

Table 1 contains a comparison of EPA, DSDM and RUP phases on their main objectives:

EPA	DSDM	RUP
Analysis	Feasibility Study	Inception
Conceptual Design	Business Study	Elaboration
Development & Testing	Functional Model Iteration	Construction
	Design & Build Iteration	
Deployment	Implementation	Transition
Evaluation		

Table 2: Comparison of EPA phases with DSDM and RUP phases

Three differences stand out from Table 2 and the above descriptions:

- DSDM divides Development & Testing in two separate iteration phases. EPA does not permit the iteration between phases. EPA does, however, permit the iteration within phases. The fact that the Development & Testing phase is not split, makes it possible to iterate between Functional Model and Design & Build within EPA.
- Both DSDM and RUP take the Deployment and Evaluation phases together in one phase. EPA has separated these phases because it is important to evaluate both the project and the product. In the Evaluation phase the decision has to be made if the

product goals have been achieved and EPA emphasizes this with a separate phase that monitors the operational portal.

- With DSDM it is possible to go back to earlier phases after the Implementation phase. With EPA it is after the Evaluation phase only possible to start a new EPA cycle. EPA projects are kept short, so any changes to goals during the project, can easily be saved for the next EPA cycle.

We conclude by saying that our EPA phases seem not very unusual compared to DSDM and RUP, and that where EPA is different from the other methods, we have a plausible reason for that.

6 EPA Matrix

This chapter describes how the areas and phases of EPA are put together into a matrix with products and explains how EPA coordinates the product dependencies.

6.1 Product Matrix

EPA uses a product-based planning method. From the EPA end result in paragraph 3.2 products can be derived. These products indicate what is needed to realize a fully functional knowledge portal. Variation in the products is possible for each individual project. To structure the products for easier project management, we have put the areas and phases together in a matrix. Every cell of the matrix contains the products that need to be completed in the corresponding phase and area. When we fill in the matrix with the products mentioned in the previous two chapters, we get the following example matrix:

	Concept		Implementation		Evaluation
	Analysis	Conceptual Design	Development & Testing	Deployment	
System	▪ SMART goals ▪ Security risk analysis	▪ Monitoring proposal ▪ Security measures	▪ Goals evaluation ▪ Security tests	▪ 0-Measurements	▪ Monitoring reports ▪ Goals evaluation ▪ Redesign-decision
User	▪ User (group) analysis	▪ Communication plan ▪ Privacy policy	▪ Communication actions ▪ User tests	▪ Site launch promotion	▪ User feed-back ▪ User evaluation
Content	▪ Content inventory ▪ Content analysis ▪ Legal aspects	▪ Information architecture ▪ Collected content ▪ Editorial team outline	▪ Converted content ▪ Proofed content	▪ Editorial team	▪ Content evaluation
Business	▪ Process analysis ▪ Management commitment	▪ Process design ▪ Training plan	▪ Organized processes ▪ Procedures ▪ Training material	▪ Trained employees ▪ Instructed employees	▪ Business evaluation
Functionality	▪ Wish list ▪ Screen design sketches	▪ Make or buy decision ▪ Conceptual design ▪ Navigational prototype ▪ Maintenance outline	▪ Detailed design ▪ Site Software ▪ Functional tests	▪ Functional maintenance ▪ Site	▪ Functionality evaluation
Technology	▪ Standards ▪ Infrastructure analysis	▪ Infrastructure design ▪ Maintenance outline	▪ ISP Selection ▪ Infrastructure	▪ Technical maintenance	▪ Technology evaluation

Figure 5: Example EPA matrix

The instantiation of the matrix will be different for every project, although there are products that are common to a lot of projects. The above matrix can be used as a starting point to negotiate additions with stakeholders and potential project members.

The development of the products in each portal area will take place in parallel. To make this manageable, EPA uses an interdisciplinary team.

6.2 Interdisciplinary Team

As explained, each area involves a number of disciplines. Experts from various disciplines have to collaborate to deliver a common product [Siegel, 1997] [Skyrme, 2001]. We call this an interdisciplinary team. For each area a representative is chosen that leads the team of professionals in his area. This team manager reports to the project manager and communicates the decisions back to his team. In this way, the project manager only has to deal with a maximum of six people (different areas could have the same representatives) and at the same time all major decisions are made by representatives from each area. The team managers can consult a member of their team when a specific discipline is needed for a decision. The exact configuration of the teams can differ between project phases, depending on the needed and most important expertise.

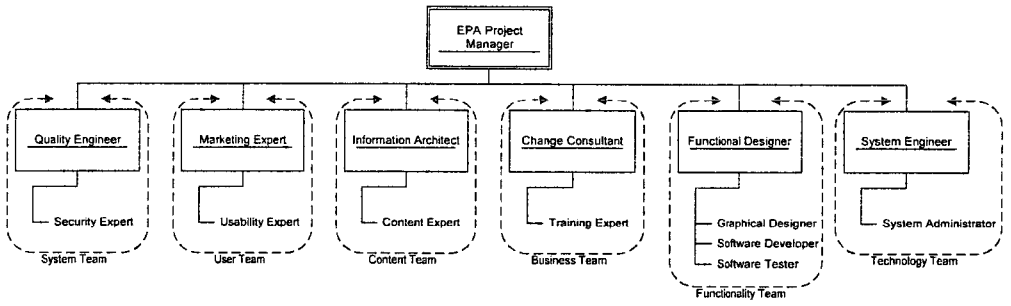

Figure 6: The project manager leads the different area teams

Figure 6 shows an example of how the roles needed in an EPA project team are divided in area teams. Of each role more than one person can be member of the project team, and one person can perform multiple roles. The EPA project manager leads a central interdisciplinary team with a quality engineer, marketing expert, information architect, change consultant, functional designer, and system engineer as the representatives of the different interdisciplinary area teams. For example, the functional designer leads the functionality area team that consists of a graphical designer, software engineers, and software testers. Depending on the size of the project it could be decided to group different area teams under one single representative.
Working with interdisciplinary teams for Web development is common practice and requires special management techniques [Burdman, 1999] [Friedlein, 2001] [Norton, 2001].

6.3 Workflows

The division of products over matrix cells does not eliminate the dependencies between them. Products are needed as input for activities that create other products. We call the sequence of activities that connect products that have input-relations with each other a workflow. All activities together form one big workflow with the knowledge portal as resulting product.

Figure 7 shows part of the workflow in the matrix from paragraph 6.1. Products are presented by rectangles with the product names. An arrow from product A to product B means that the activity to create product B needs product A as input.
There are three types of coordination issues with respect to the products:

- **Horizontal**: The products have to be finished in the order of the time phases they have been placed in. This is standard project management procedure [CCTA, 1998] that can be handled by the team manager of the area.
  See figure 7: the user group analysis has to be completed before the communication plan.
- **Diagonal**: Products within one area and time phase can be input for activities that create products in a different area and the same or next time phase. The coordination in time is still standard project management procedure [CCTA, 1998], but now the team members from different areas have to collaborate. The central interdisciplinary team helps to obtain input from other area disciplines where needed.
  See figure 7: the user group analysis is needed as input for the information architecture. The alignment of these two products can be improved by involving the information architect in the user analysis.
- **Vertical**: Products within the same time phase have to be finished at the same moment. The project manager leads the central interdisciplinary project team with the representatives of each area. These interdisciplinary team meetings realize vertical synchronization.
  See figure 7: the user group analysis has to be completed at the same time as the other analysis. All analyses have to be completed (the Analysis phase), before the Conceptual Design phase can be started.

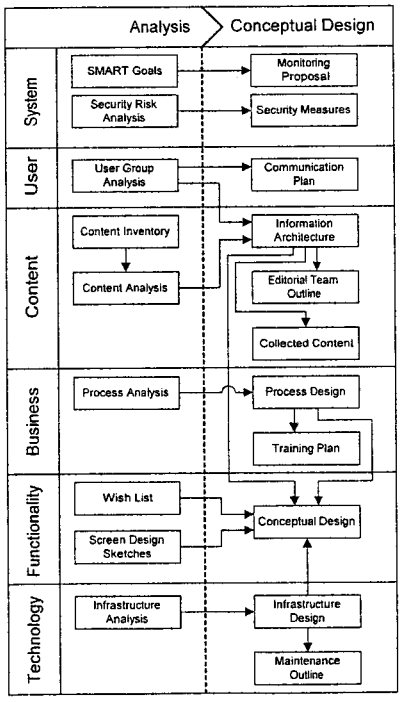

Figure 7: Example of partial EPA workflow

The matrix with the products helps identify all dependencies of the three types in a realization project. The interdisciplinary team in combination with standard project management techniques [CCTA, 1998] can be used to manage them.
The techniques we use may sound fairly obvious, but the complexity is in the identification of all required products and their dependencies, and in the management of the workflows.

6.4 EPA Project

EPA is the combination of product matrix and principles. We have explained both, but the difficulty of EPA lies in the application of all this in an actual project. This can already be seen in the description of the EPA areas and phases in the previous two chapters. There is a lot that needs to be done in a cohesive manner by a group of people from different disciplines. We will describe some aspects of an EPA project.

Type of Project

There are two ways in which EPA projects differ. They can be software development projects or the customization of standard software. They can deliver a new release of the existing knowledge portal or they can deliver the first knowledge portal for an organization. Between software development and customization the products in the functionality area will differ somewhat. For instance the designs will be much more elaborate in case of development. Between first and next release the products will be the same but the emphasis will differ. For instance in a first release a lot of content has to be created and less collected, which is the other way around in a next release.

Project Start

A project starts with an empty matrix that has to be filled with the required products. A partially filled matrix will be presented to the organization, based on previous experience in similar projects and assumptions on the current project. Together with the organization it will be decided what products have to be (re)moved or added for their specific situation. After the products have been identified, the workflow can be established based on the dependencies between the different products. The Analysis phase continues with the definition of goals for the portal and an analysis of the users of the portal.

Planning

The duration of the project depends on the number of project members and how much can be done concurrently. A rough guideline is that the consecutive phases are in the ratio of 1 to 2 to 3 to 1 to 1. This means most time is taken by design and development. In the Analysis phase, most effort is put into the formulation of the SMART goals because this involves convincing the management team of the organization. In the Design phase most effort is put into the process designs, because this involves the whole organization.
In the Development & Testing phase most effort is put into content collection and software development (or into customization in case of a buy-decision). Content collection takes a lot of time because most content will not be in the desired format to be published on the site and software development/customization is the implementation of all previously made designs. In the Deployment phase most effort is put into technical site launch and communicating site launch to the users. When the technology and

functionality are tested together in the deployment environment a lot of unexpected problems arise and it takes a lot of time to convince users to use the site.
The effort in the Evaluation phase is more or less equally divided over all areas.

Product Quality

The Analysis phase defines the SMART goals (see paragraph 3.1) that also serve as the acceptance criteria for the end result. These SMART goals will contain measurable translations of the EPA principles. Measures will be implemented to monitor how well the portal fulfills the goals and all aspects of the portal are tested. This includes copy proofing, user testing, and functional tests. The project ends with an evaluation period and is only successful if all portal goals have been realized.

Principles

The first two EPA principles (fast development and collaboration of disciplines) result in concurrent development and the interdisciplinary team. The rest of the EPA principles together with the SMART goals will guide the design process. This means design decisions will be made based on the principles and the priority they have within the project. If the portal does not adhere to the principles it will never be successful in the long term.

7 EPA Combined with Other Methods

This chapter explains how other methods can be combined with EPA. As we said, a project management approach is needed in combination with EPA to ensure project quality. EPA does not include products needed for project planning, project organization, or project execution. We looked at the combination of EPA and a standard project management method called PRINCE2* [CCTA, 1998].
An investigation into methods developed by Ordina that are applicable in the field of e-business identified three methods: Dream@venture, Align and Ordina SMART. We will concentrate on the system development method of Ordina, called Ordina SMART.

7.1 EPA and PRINCE2

Among the key features of PRINCE2 are:

- A defined organization structure for the project management team. EPA recommends interdisciplinary teams and an active user role. This active user role is also required with PRINCE2. Within PRINCE2 it is also possible for the project manager to delegate tasks and responsibilities to team managers as in the central interdisciplinary team of EPA.
- Its product-based planning approach. The overview of products that are needed and their dependencies can be taken from the EPA matrix.
- Its emphasis on dividing the project into manageable and controllable stages. The division and number of stages within PRINCE2 is flexible, which allows for the use of the EPA phases.

EPA addresses product quality in the system area. PRINCE2 addresses both project and product quality and defines the additional products and activities needed. PRINCE2 demands for instance the definition of quality criteria for each product.
Other necessary processes handled by PRINCE2 are risk management and change control.
EPA needs a product-based management approach. EPA defines which products are needed and provides a number of best practices for knowledge portal realization. The project management approach ensures that the products are delivered in a way that satisfies the customer. The best practices of EPA guide the way in which the project is set up.

7.2 Dream@venture

A Dream@venture is a "brain session", specifically suited for the participating organization. Goal of the session is to inspire board and business management with new e-business ideas, to generate concrete opportunities for their organization, and to make an initial translation towards realization.
Interviews are used to analyze the organization. Cases are presented to stimulate the generation of ideas. The workshop of one day has a follow-up meeting where the first actions for realization of the ideas are identified.

* PRINCE2 was chosen because of relevance for Ordina, but other product-based project management methods would lead to similar conclusions.

Dream@venture results in the strategy that is needed as starting point for EPA. If one of the new business ideas needs the set up of a knowledge portal, EPA can be used after Dream@venture to realize this.

7.3 Align

The Align method is an integral approach for Business/ICT alignment. It starts by defining a strategic framework and delivers a transition plan from the current architecture to the target architecture. The business and ICT architecture are defined by considering business and ICT from five perspectives:

- **Business**: the business architecture divides the organization into business domains and describes the organization in terms of logical service units
- **Process**: the process architecture is a further refinement of the business functions from the business architecture and describes how the business functions are executed
- **Application**: the application architecture describes the ICT support of business functions including processes and information needs
- **Information**: the information architecture describes the global information model of the organization, i.e. the business concepts with their mutual relations, the information need to execute the business functions and the ownership and use of information
- **Technology**: the technical architecture describes the technical, infrastructural aspects of ICT. This includes infrastructure and system development

Note that these perspectives of Align show some similarity to the EPA areas. The important point is that Align also recognizes information as an important factor between business and ICT. Ordina already has conducted a small investigation into the combination of Align and EPA. The conclusion was that EPA could be used after Align when the business strategy has an e-business component. EPA is then used for the project implementation of the e-business part.

7.4 EPA and Ordina SMART

Ordina SMART is an approach for fast system development of modern applications [Hoogendoorn, 2002]. It is based on DSDM (see paragraph 5.5). Ordina SMART is primarily focused on the realization of automated functionality to support business processes. Ordina SMART provides services for project management, standards, guidelines, audits and trainings on four areas:

- **Process**: the Ordina SMART process is based on DSDM and consists of six phases: feasibility study, business study, planning, design, build, and implementation. For each phase activities and corresponding roles have been defined.
- **Modeling**: Ordina SMART uses modeling techniques like UML to create a set of models and detail them iteratively during the process.
- **Architecture**: Ordina SMART applications are based on a scalable service-oriented architecture.
- **Tools**: Ordina SMART is independent of the chosen development tool. It offers support for the most widely used tools like PowerBuilder, Visual Basic, and Delphi.

We will investigate the combination of Ordina SMART and EPA further in the remainder of this paragraph.

EPA and Ordina SMART have some similarities and differences in approach:

Similarities

- The user-centered approach of EPA is not contradicted by the active user involvement approach of Ordina SMART
- Both approaches expect unclear or changing specifications during the process
- Both approaches result in short-cyclic projects
- The phases of EPA and Ordina SMART match (see EPA and DSDM, paragraph 5.5)

Differences

- The scope of EPA is knowledge portals; the scope of Ordina SMART is all modern applications (which includes knowledge portals)
- Ordina SMART builds applications to support all kinds of business processes and starts after the process has been defined; EPA is focused on the knowledge sharing process, which is defined in parallel with the application
- EPA considers all aspects that have to be realized for a knowledge portal; Ordina SMART primarily considers the automated functionality (software)

There is a clear overlap between EPA and Ordina SMART: the realization of automated functionality for knowledge portals. Ordina SMART can be executed within the Functionality area of EPA, as a subproject. EPA adds development of business and user aspects to the software development of Ordina SMART. It will have to be investigated how the products of Ordina SMART fit within the EPA workflows. This will probably lead to an adjustment of Ordina SMART for e-business systems (in the way e-DSDM is an extension to DSDM, see paragraph 8.3.3).

We conclude this chapter by placing the different methods in the Internet Strategy Cycle of [Tiggelaar, 2000] we discussed in paragraph 2.5:

<table>
<tr><th></th><th>Organization-wide methods</th><th>Project-specific methods</th></tr>
<tr><td>Vision and Mission</td><td rowspan="3">Dream@venture</td><td rowspan="3"></td></tr>
<tr><td>Strategic Analysis</td></tr>
<tr><td>Strategic Choice</td></tr>
<tr><td>Strategic Implementation: ICT change requirements</td><td>Align</td></tr>
<tr><td>Strategic Implementation: Project planning</td><td rowspan="3"></td><td>PRINCE2</td></tr>
<tr><td>Strategic Implementation: Project implementation</td><td>EPA</td></tr>
<tr><td>Strategic Implementation: Software development</td><td>Ordina SMART</td></tr>
</table>

Table 3: Positioning of Ordina methods

8 Evaluation of EPA

This chapter contains a validation of EPA and an evaluation of a number of aspects of EPA. We show how the elements of EPA as mentioned in chapter 3 have been implemented and how EPA fulfills the requirements that were derived in chapter 2. We evaluate EPA, based on a comparison with other similar methods, an analysis of the future relevant e-business developments, and an analysis of the application area of EPA.

8.1 Implementation of Principles and Requirements

We have based EPA on a number of structure techniques and principles. Each of these has advantages and disadvantages. We will explain how the techniques and principles have been implemented in EPA and show that the disadvantages of each have been solved by one of the others.

Structure Techniques

- Product-based planning: EPA identifies the products that have to be delivered for the knowledge portal system and places these products in the overview matrix. The EPA project is managed on basis of the delivery of products.
  - +: strong focus on end results
  - –: tasks have to be derived from the products; for this the workflow is used
- Matrix with areas and time phases: EPA overviews its products in a matrix with six portal areas and five time phases.
  - +: all aspects of the portal are addressed; complexity is reduced by division in subprojects for each area
  - –: the dependencies between the areas and time phases have to be managed; for this the interdisciplinary team is used
- Workflow: EPA identifies the dependencies between its products. A product is produced by an activity that needs one or more input products.
  - +: the dependencies between the products are clear
  - –: it is not easy to identify all dependencies; the matrix helps to give an overview when doing this

Principles

- Concurrent development: EPA develops the products on each of the areas in parallel according to the time phases.
  - +: fast development
  - –: the coordination of the project is complex; for overview the matrix is used, for coordination the workflow and the interdisciplinary team are used
- Interdisciplinary approach: EPA forms an interdisciplinary team to implement the project.
  - +: collaboration of disciplines, coordination over areas, input from all areas
  - –: the viewpoints of different disciplines are likely to clash; decisions should be made based on the common user-centered viewpoint and the SMART goals that have been defined at the beginning of the project
- User-centeredness: the EPA matrix has a separate User area and the project starts with an analysis of the user groups form which other products will be derived
  - +: users are likely to be attracted to the site because it fulfills their wishes

  - –: users are often unknown and thus hard to analyze; input from marketing experts and maybe user representatives is used in the user analysis, users could be part of the interdisciplinary team
- Content-orientation: the EPA matrix has a separate content area and an information architecture is used to design the navigation.
  - +: the site is structured and contains useful content
  - –: content management is needed to keep the content useful; this is indicated by the maintainability principle
- Minimal impact: the procedures and processes for the portal are based on the analysis of current processes, with a goal to change as little as possible.
  - +: employees will except the portal more easily and cooperate; less training is needed
  - –: a good understanding of all relevant current processes is needed; this understanding is reached by doing a thorough process analysis in the beginning of the project
- Maintenance preparation: the editorial team and the maintenance for functionality and technology are already set up during the design phase of the project.
  - +: a maintainable portal is developed; a maintained portal is operational
  - –: it is hard to determine the responsibilities and ownership of objects; these follow from process analysis (current) and process design (future)
- Design for change: the technology is treated apart from the functionality and the design phase is given elaborate attention.
  - +: a flexible, scalable portal is delivered
  - –: more time and effort has to be put into the design phase; this will be compensated by the fact that less time will be needed to implement changes to the portal

The above analysis shows that all principles have been implemented and that their disadvantages are addressed by other aspects of EPA. To conclude we will show that the requirements we identified in paragraph 2.5 have been fulfilled by the structure and principles of EPA:

Requirement	Fulfilled by
RQ1: address all portal aspects	Matrix with portal areas
	Interdisciplinary team
RQ2: short project	Concurrent development
	Structure techniques (reduced complexity)
	Minimal impact on organization (less change)
RQ3: balanced input and cooperation	Interdisciplinary team
	Minimal impact on organization
RQ4: information attention	Content-orientation
	Maintenance preparation
RQ5: attract users	User-centeredness
	Content-orientation
RQ6: plan for maintenance and change	Maintenance preparation
	Design for Change

Table 4: EPA fulfills the requirements

8.2 EPA Compared to Other Methods

During our initial investigations, we have discovered a number of methods that also use a division in areas. We have investigated three of these methods that all came from a different field and compared them to EPA. They are all methods used in software development that propagate an integrated approach. Each method is described and then compared to EPA. This section ends with a table that summarizes the comparisons.

8.2.1 Architecture Frameworks

About twenty years ago John Zachman introduced his Enterprise Architecture Framework [Zachman, 1996] [Zachman, 1997]. This matrix is a logical structure for classifying and organizing the descriptive representations of an enterprise that are significant to the management of the enterprise as well as to the development of the enterprise's system. The matrix is built of five perspectives (planner, owner, builder, designer, sub-contractor) and six product abstractions (what, who, when, where, why, how). The utility of such a classification scheme is to enable focused concentration on selected aspects of the enterprise without losing a sense of the contextual, or holistic, perspective.
However the Zachman Framework is argued to be outdated [Van 't Veld, 2001]. It does not take notice of time or change and the aspects of the important factor information have been distributed throughout the framework without explicit attention.
As a contrast [Van 't Veld, 2001] mentions the ODP (Open Distributed Processing) ISO standard. This is a set of standards that allow the benefits of distributing information processing services to be realized in an environment of heterogeneous IT resources and multiple organizational domains. ODP uses five viewpoints to cover all the domains of architectural design (enterprise, information, computational, engineering, technology) [ISO, 1998]. The information viewpoint indicates that ODP does pay explicit attention to information aspects.

Integrated Architecture Framework (IAF)

The architecture framework we investigated in more detail to be able to compare it with EPA is the Integrated Architecture Framework (IAF) designed by the University of Amsterdam and Cap Gemini Institute [Goedvolk, 1999].
The IAF relates the architectural description of the business architecture with that of the ICT system architecture that supports the business. IAF has three dimensions that relate the systems of which an ICT enabled Enterprise is comprised and the products and views of the architectural description:

- Four main architecture areas (business, information, information systems, technology infrastructure)
- Five architecture design phases (contextual, conceptual, logical, physical, transformational); each design phase serves the creation of a part of the architectural description of the systems in the four architecture areas
- Specific architectural viewpoints that add the necessary methods for creating views (e.g. security and governance)

The system of interest may vary from a complete ICT enabled enterprise over all four areas to the design of (a part of) the technology infrastructure or an information system (like a knowledge portal). IAF only relates the different parts of the architectural

description of an ICT enabled enterprise or system. It does not prescribe the process of architectural design. The specific added value and benefits of IAF are in the design and assessment of the relationships, interactions, and dependencies among the architecture areas and not as much in the architectural design of the individual areas.
The architecture areas can be compared to the discipline areas of EPA. The Information area can be seen as the equivalent of EPA's Content area, the Information Systems area is the equivalent of EPA's Functionality area. IAF does not have a User area, because business roles (e.g. marketing) and their information needs form the starting point for the design. IAF does not have a System area, although its philosophy can be found in the special viewpoints of IAF, which also look at the system from all areas together. Like with EPA, the architectures on each area are designed concurrently in each phase. The team consists of architects from different disciplines (business, information, IT) and thus is not as interdisciplinary as with EPA, although the architects collaborate with other disciplines in each design phase. The transformational phase serves the architectural design of the life cycle of the systems. This includes the development of a new system, the transformation or migration of existing systems to a new system, and the evolution and maintenance of the system during operation. Together with the elaborate attention for architecture, this indicates a Design for Change approach. The transformational phase and the special governance viewpoint indicate a preparation for maintenance already during architectural design.

8.2.2 Enterprise Resource Planning Introduction Method

Enterprise Resource Planning (ERP) is a software solution that addresses the enterprise needs taking the process view of an organization to meet the organizational goals tightly integrating all functions of an enterprise. The aim is to improve the cooperation and interaction between all the departments such as the products planning, purchasing, manufacturing, sales and customers service department.
We investigated the method KPMG (a Dutch consultancy firm) uses when implementing ERP packages [Koedijk and Verstelle, 2001]. They identify five phases: Conceive, Design/Build, Develop, Deploy, and Evaluate/Support. They also identify six work streams: Business Process, Application Development, Technical Infrastructure, Change Management, Training & Education, and Project Management. These phases and work streams together form the "KPMG Matrix of Key Client Deliverables". The matrix is filled with products and activities needed to implement an ERP package.
The phases of the KPMG method are the same, in both number and meaning, as the EPA phases. The KPMG method, like EPA, stresses the importance of an integrated approach with work streams on business processes, change management and training. Other common points are the concentration on business benefits and stressing the importance of maintenance & administration.
Different is that the KPMG method includes project management as a work stream. ERP implementations contain a big portion of data integration and conversion, but the KPMG method does not have a separate content work stream. The data management is contained within the technical infrastructure work stream. An important difference is that the implementation of ERP packages is ordered by higher management. The users will be involved during the implementation, but are not put central. It is important that users

accept the new software, which is achieved through training and change management, but no separate communication plan is needed to attract users to the software. These differences come from the fact that ERP implementation is not, like EPA, user-centered and content-oriented, but process-oriented as can be seen from the definition of ERP.

8.2.3 E-DSDM

E-DSDM [DSDM, 2001] is a specialization of DSDM (see paragraph 5.5 and [DSDM, 2000]) to address the concerns of all e-business solution developments ranging from the production of simple websites to fully integrated e-business systems. E-DSDM is based on the same nine principles as DSDM. E-DSDM has six phases (vision, feasibility, business study, functional model iteration, design & build iteration, implementation). The vision phase has been added and delivers an e-business strategy and vision for project initiation. Products and their quality criteria have been defined in each phase. Existing products have been altered and new products have been added for security, style, vision, user attraction and system architecture. Roles have been defined that are needed to produce the products. The roles have been divided into business and IT roles. There are new roles and adapted roles. A product/role matrix provides suggestions as to who should be responsible for contributing to, reviewing/testing and accepting e-DSDM products. New techniques have been added for web testing and content management.
E-DSDM does not use areas, although the division of roles into business and IT is a start. This also implicates that there is no concurrent development. E-DSDM uses iterative development (see paragraph 5.5). This iterative development ensures that changes during the project are possible (Design for Change). The time phases of e-DSDM are comparable with the EPA phases (see paragraph 5.5). EPA starts after the vision phase of e-DSDM. Although e-DSDM defines products, it does not describe the dependencies (workflows) between them explicitly. The user is not seen as the central starting point for the development, but is given a lot of attention throughout the project. Active user involvement is one of the principles of e-DSDM and special user oriented products have been defined. The starting point for the development is the information need of the business processes, which have been established before e-DSDM is started. Content is considered in the content management process, but does not receive as much attention as within EPA. The same goes for maintenance, which has been addressed by the definition of the roles content manager, web master and administrator. We conclude by saying that e-DSDM's main focus is on system (soft- and hardware) development, as opposed to the integrated approach of EPA.

8.2.4 Comparison with EPA

As a summary we will present a table with the differences and similarities between the above methods and EPA on basis of the structure techniques and principles of EPA (see paragraph 3.2). A "+" means that the method also uses the EPA principle from the first column. A "-" means that the method does not use the EPA principle from the first column. The first row of the table describes the scope of each method.

EPA	IAF	KPMG ERP	e-DSDM
Knowledge Portal Realization	Business - ICT architecture	ERP implementation	e-Solution development
Product-Based Planning	- Not a planning method	+ Product-Based Planning	+ Product-Based Planning
Portal Areas	+ Architecture areas No user and system area Special viewpoints	+ No content, user, and system area More emphasis on change management	- No areas Business and IT roles
Time Phases	+ Architecture design phases	+ Same phases	+ Same phases plus Vision phase
Overview Matrix	- 3D framework	+ Product Matrix	+ Product/role matrix
Workflow Coordination	- No process prescribed	- No process prescribed	- No explicit dependencies
Concurrent Development	+ Concurrent Design	+ Concurrent Implementation	- Iterative development
Interdisciplinary Approach	+ Interdisciplinary architecture team	- Functional, communication, and IT teams	+ Interdisciplinary team
User-Centeredness	- Information need of business roles as starting point	- Achieve user acceptance	- Business processes as starting point Active user involvement
Content-Orientation	+ Information-orientation	- Process-orientation	- Business-orientation Content management recommendations
Minimal Organization Impact	- Major process changes possible	- Business Process Reengineering	- Processes established before project
Maintenance Preparation	+ Maintenance preparation	+ Maintenance preparation	+ Maintenance preparation
Design for Change	+ Design for Change	- Implementation	+ Design for Change

Table 5: EPA compared to other methods

8.3 Application Area of EPA

In paragraph 3.1 we mentioned that EPA should be applied after the strategy has been formed and that it should be embedded in a project management approach. In this section we further analyze the application area of EPA, which is not based on actual experiences. We try to identify the type and size of projects that EPA can be used in and the type of product that can be developed using EPA.

Type of projects

EPA can be used for both *innovative projects*, where there was no previous web site, and *follow-up projects*, where a new release of the web site or an integration of web sites is required. This is because EPA has an Analysis phase where the existing situation of the organization is inventoried. This existing situation is taken as the basis for the design of the new situation. EPA develops all portal aspects, so even an organization without any prior web site will have all ingredients within EPA to develop one. Of course the innovative projects will take more time and thought in the first EPA phases.

Size of projects

Past knowledge portal projects indicate that the size of projects must stay within forty-eight man months (six months with eight full time employees). Larger projects become too complex for concurrent development. A large project should be divided in a few short EPA cycles, developing the portal functions in small steps. Too small projects in time or size (like less than two months or 4 full time employees) become unnecessarily complex by the division in matrix cells.

Type of EPA result

The EPA time phases are universal and can be applied to the development of any kind of product.

The EPA areas have been derived from the four factors User, Content, Business and ICT. Other products that consist of these four factors include ERP implementation, e-learning sites and transaction sites, but exclude e.g. web services because they miss the user factor. The areas derived from these factors can be different from the EPA areas because the emphasis may be on other factors (e.g. business processes for ERP) than with knowledge portals (users and content).

Each of the EPA principles is also applicable in other situations, but the entire set of principles is tailored for knowledge portals. User-centeredness and content-orientation would be replaced for ERP implementation by process-orientation and the importance to achieve user acceptation. E-learning is also more process- than user-centered and for transaction sites EPA misses a principle about security. The latter quickly becomes too complex for concurrent development because the order fulfillment process reaches throughout the entire organization.

Conclusion

EPA has been developed for short-cyclic knowledge portal projects. We can think of no other product that would lead to the same matrix and principles, which makes EPA specific for knowledge portals. EPA would need changes to matrix and/or principles for the development of other types of end results.

8.4 The Future of EPA

The future of EPA depends on the future of e-business. [Scammell, 1999] contains visions of the information future from a number of authors. They identify the following trends:

- Information will be available everywhere and anytime; information overload will be a serious problem; intelligent agents and portals will be used to filter information
- User-centered services will be developed; customization and one-to-one marketing is the way to reach people on the Internet
- Users will be more and more empowered; they will become content publishers themselves and form communities to stand strong against suppliers
- The workforce becomes more flexible through telecommuting
- Information will be packaged and priced; information will be a profitable product
- Education will become customized, interactive, student-focused learning which exploits networks and the new media; e-learning environments will be developed

EPA is about knowledge portals. These portals help to filter information and can support a flexible workforce, because the Internet will be available on more and more devices. EPA is already user-centered and thus can take the empowerment of users into account. The payment for information has not yet been incorporated into the EPA matrix, but this could be done by the addition of some new products and the implementation of the payment process in security, technology and business.

The rise of e-learning environments is perhaps the most interesting development. We will use this example for an investigation on the flexibility of EPA. The matrix with areas and time phases will stay the same. Perhaps the Business area should better be renamed to Education to better indicate the type of processes and organizational structures that are

involved. This Education area would be the most important, because it contains the educational processes that are needed to get the content to the students (users). This means the "user-centered" principle of EPA has to be changed to "Education process-oriented". In this way it is relatively easy to derive a variant of EPA that is suited for the development of e-learning environments.
Thus EPA already supports or can be adapted to support the above trends.

8.5 Evaluation Summary

Before we summarize the evaluation of EPA, we will summarize what EPA is. EPA is the empty matrix as presented in chapter 6 that will be filled with products and workflows for each specific project, and the principles as presented in chapter 3 that will guide this and project execution. As we have concluded in paragraph 8.3, EPA is specifically suited for knowledge portals.
Features that distinguish EPA from other methods are:

- EPA is an integral method and takes a helicopter view of the knowledge portal; there is not one aspect leading during the project; all aspects are developed concurrently
- EPA is content-oriented; software development methods only consider data; content has to be written, collected, formatted, and adjusted to the user requirements
- EPA is user-centered; other methods (like ERP and IAF) also consider the user important but are more business-oriented
- EPA is a pure realization method and does not include a strategy phase
- EPA has a workflow coordination mechanism that explicitly defines the dependencies between products

As we have seen in paragraph 8.1, EPA fulfills all the requirements we have identified in chapter 2. This does not mean there is nothing to be improved about EPA. We will conclude by a SWOT-analysis of EPA to make clear in what way EPA could be further developed.

Strengths

- EPA fulfills all the requirements mentioned in chapter 2
- EPA quickly shows an organization which expertise needs to be involved in the project
- EPA quickly shows an organization where the risks of the project are
- EPA quickly shows an organization how complex the project will be
- EPA is a flexible method, because the instantiation of the matrix can be different for each project

Weaknesses

- EPA is not suited for all project sizes (however the portal areas indicate attention points for each project)
- There is no explicit description of the products needed in the EPA matrix
- Experience with knowledge portal projects is needed to manage EPA, although the matrix makes it seem simple

Opportunities

- EPA can be adjusted for other types of sites, by adjusting matrix and principles (see paragraph 8.3)
- EPA can be coupled with a standard project management method like PRINCE2 (see paragraph 7.1)

- EPA can be elaborated with standard products and workflows for easier project implementation

Threats

- The cells of the matrix could cause people to think in separate cells and forget the coordination of the whole (over-the-wall mentality)
- Lack of documentation makes it difficult for other people to use EPA
- Political issues within Ordina could hinder further development of EPA. Other methods (e.g. SMART) have been developed that receive more attention, investments are needed to improve EPA, and other sectors of Ordina are developing something like their own variant of EPA.

We think EPA very promising because the current application of EPA by Natasja Paulssen is already successful. The knowledge about the way EPA is applied in projects should be further externalized. To make EPA a success throughout all Ordina, a good practical documentation of EPA and more support within the organization is needed. To obtain this support it may be useful to further describe EPA products and develop variants of EPA for other types of sites.

9 Conclusion

The first part of the assignment was to newly derive the matrix and build an approach around it. Chapter 4 and 5 show how I have chosen the areas of the new matrix and have compared them to the areas/phases of a few other methods. When I compare the first EPA matrix (EPA[0] see figure 2) with the one I have derived (EPA[1] see figure 5) a number of differences stand out:

- EPA[1] has an area called "User". EPA[0] had a similar area called "Communication", but this was confusing because the project communication was often also added to this area. Because we have called the area User, it was only logical to move the user group analysis to this area.
- EPA[1] has an area called "System". EPA[0] had a similar area called "Reporting (Measurements)", in which all products were placed that did not belong to one of the other areas, without a good explanation. By naming the area System and explicitly stating that this area contains products that belong to all other areas, we avoid having an area just for products that cannot be placed elsewhere.
- EPA[1] has fewer phases than EPA[0]. In our opinion a short project should have as few phases as possible. For each division into sub-phases we have given a plausible reason, which was missing with EPA[0]. We have also stated that the Redesign phase of EPA[0] should not be part of the EPA project, but is in fact a new EPA project.

After I had newly derived the EPA matrix, I saw that the differences with EPA[0] were not that big, but now I had a good reasoning behind it.

To build the approach around the matrix I have used the description of EPA in structure techniques and principles. This gave us a good basis for the next part of the assignment: to validate and evaluate EPA. I have used the structure and principles to show that EPA fulfills the requirements for knowledge portal realization as stated in chapter 2. I have also used structure and principles to compare EPA with other methods that use a division in areas. EPA turns out to be a valid approach (see section 8.1). The evaluation of EPA in chapter 8 shows that EPA is a promising approach that still has possibilities for further improvement because of its flexibility. A more detailed description of the products in the matrix, how to work with EPA and how to adjust EPA to each specific situation is needed for EPA to be successful. This will all depend on the support EPA gets within Ordina.

The part of the assignment to combine EPA with other tools and methods of Ordina has been handled in chapter 7. This shows that on basis of their descriptions the methods seem combinable, but experience will be needed to prove this.

An adjustment I have made to the assignment is to limit the scope of e-business systems to knowledge portals. I want to make two remarks about that.

Firstly, we have talked about knowledge portals in general in this thesis. Actually, there is a broad range of knowledge portals. E-business sites evolve from information sites to interaction sites to trading sites to integrated systems [Skyrme, 2001]. I have thought of a similar evolution for knowledge portals:

1. Knowledge provision: provide information in a structured way
2. Knowledge collection: the user can add information to the structure
3. Knowledge exchange: real-time exchange of information (e.g. chatrooms)
4. Knowledge integration: integration of the portal with back-office information systems

I would like to remark that the knowledge portals developed until now with EPA have mostly been of category 2 and that this has influenced the way this thesis has been written. In an interview with Mathieu Weggeman (TU/e Faculty member of Management Science, with an expertise on knowledge management), he indicated that for knowledge sharing to take place online, a site should support communities of professionals. This is something that has not been mentioned in this report. It would be interesting to investigate if and how EPA needs adjustment for communities.
Secondly, I think that the reasoning we have made in this thesis could also have been made for other types of e-business systems. I believe that the EPA version that will be the result of this will not differ greatly from the one presented here, because almost any e-business system has the factors User, Content, Business, and ICT, although not in the same importance. It will be a nice exercise to derive the approach again and see what the differences are. The choice for knowledge portals has been made because Ordina had a lot of practical experience with them and I think this choice has given a good example of the possibilities of EPA.
I have described EPA as a comprehensive realization approach for knowledge portals and validated and evaluated this approach. I laid the basis for an EPA manual that will hopefully continue to be refined as EPA evolves (see Appendix 3). The application of EPA in many different projects and in combination with different other methods will give us the best information on how (well) EPA works.

Afterword

My initial plan has proven to be quite accurate, only the way in which the research questions have been answered, differed from time to time.
Due to financial problems a planned EPA project of Ordina did not go through. This project would have been ideal for me to take part in to collect some practical experiences with EPA. Now I had to collect these experiences from other people.
I had planned to present a detailed description of each matrix cell, but the derivation and evaluation of the approach has taken so much time that I have only been able to identify some standard products for each matrix cell. The detailed description and the development of templates for these products will be very useful for Ordina, but less interesting from the point of view of my assignment.
My intermediate presentation indicated that until now I had only described EPA, without indicating what the problem was that EPA solves. After that I have changed my report to include chapter 2 with the context of EPA and Appendix 1 with a case study of problems that have to be solved when realizing a knowledge portal.
In the extra time that was planned at the end of the project, I have written an introduction to EPA for Ordina employees (see Appendix 3). This "manual" contains a practical description of EPA, which gave me some new insights for the description in this thesis (e.g. section 6.4).
The question that has held me occupied the most during my assignment is what the application area of EPA is. This report proves that EPA is suitable for knowledge portal realization, but the way in which the manual describes EPA indicates that it can be used for all e-business systems with content and user aspects. I do not regret that I have limited the scope of my assignment, because it keeps the descriptions in this thesis focused and compact and I think it is not such a hard exercise to adjust the description for other types of e-business systems.
During my project I have had somewhat hinder of the political atmosphere within Ordina. The structure of Ordina is difficult to understand and there is no central knowledge repository. This made it difficult for me to find the people with the expertise I needed. Luckily, Natasja already had a broad contact base that I could use. The result was that the description and evaluation of other Ordina methods is less elaborate than I had expected. Another problem was that Natasja and Harold both had different views on the way to further develop EPA, which made it difficult for me to process the information from both of them. I tried not to meddle with this political issue and let others solve it. Because Natasja was my coach, I was mostly complying with her ideas.
An interesting discovery that I made during this assignment is that it is possible to derive and prove a method with just words. This is what my supervisor dr. Aerts called "Method Engineering". It was a way of working that attracted me, but it has not been simple, because each and every word has to be weighed before it is put down. The amount of writing in this assignment did not always please me.
Another aspect that I had to get used to is the fact that a graduation assignment does not have a defined end state. This sense of freedom made that the time was over before I knew it and that I was able to look into interesting aspects of the assignment when I discovered them.

Because I could not write at this thesis eight hours each day, I have borrowed a lot of books from Ordina and the TU/e library, which I read to pause between writing. These books have been about all kinds of subjects, from usability to infrastructure building. I have read these books to be able to form a picture of the environment EPA is used in. I have really enjoyed the vast amount of new information I have absorbed in this way. It was useful for this project, but will certainly come in handy in later projects.
I am very glad that Ordina gave me the opportunity to write an article about my findings already during my assignment period. It was a nice surprise to hear that this article has been accepted for SCI 2002 in Orlando and that I will be the one to give the presentation about the article. It was an interesting experience to write a scientific paper and I estimate that it will be even more interesting to present it, although I regret that my coaches will not be able to accompany me.
I will conclude by saying that I have enjoyed my graduation period and that the best appreciation for my results will be that Ordina promotes EPA to an Ordina approach and will use and further develop the documentation I have made about it

Petra Heck
Eindhoven,
July 2002

Definitions

Align	Ordina method; integral approach for Business/ICT alignment
CIO	Chief Information Officer
Content	Information that is offered through a site;
Dream@venture	Ordina method; brain session for new e-business ideas
DSDM	Dynamic Systems Development Method; framework for RAD
e-DSDM	Specialization of DSDM for e-business solutions
EPA	E-Business Planning Approach; comprehensive realization approach for knowledge portals
ERP	Enterprise Resource Planning; software solution that integrates all functions of an enterprise
IAF	Integrated Architecture Framework; architecture design framework
Information Architecture	Structure, organization and labeling of information to help people find and manage information
Knowledge Portal	Site environment that gives employees, customers and/or business partners access to the knowledge of an organization in a uniform, transparent way
Ordina SMART	Framework for system development developed by Ordina
Portal	Site environment that gives employees, customers and/or business partners access to an organization in a uniform, transparent way
PRINCE2	Projects IN Controlled Environments; project management approach
RAD	Rapid Application Development; approach to building and maintaining computer-based systems
RUP	Rational Unified Process; platform of software development best practices
Site Environment	The entire system of site, infrastructure, people, procedures and processes that supports the access function of the portal
SMART goals	Specific, Measurable, Achievable, Relevant and Time-related goals
SWOT-analysis	Strengths, Weaknesses, Opportunities and Threats analysis; management tool

Literature

Suggestions for Further Reading

The following books are useful to read in their entirety for people involved in web development projects related to knowledge management.

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This book describes how a team web project can be managed.

[Donnelly, 2001] Vanessa Donnelly, "Designing Easy-to-Use Websites. A Hands-On Approach to Structuring Successful Websites", Addison-Wesley, 2001
This book contains a structured approach to deliver usable Web sites.

[Friedlein, 2001] Ashley Friedlein, "Web Project Management: Delivering Successful Commercial Web Sites", Morgan Kaufmann, 2001
This book explains a time phase method for web projects

[Harmon et al., 2001] Paul Harmon, Michael Rosen, Michael Guttman, "Developing E-Business Systems and Architectures. A Manager's Guide", Morgan Kaufmann Publishers, 2001
This book describes how to transform the e-business strategy into an ICT architecture.

[Nakano, 2002] Russell Nakano, "Web Content Management: A Collaborative Approach", Addison-Wesley, 2002
This book describes an approach to web content management.

[Sano, 1996] Darrell Sano, "Designing Large-Scale Web Sites: A Visual Design Methodology", Wiley Computer Publishing, 1996
This book contains a web design methodology for HTML pages and identifies some unique characteristics of designing for the WWW.

[Siegel, 1997] David Siegel, "Secrets of Successful Web Sites", Hayden Books, 1997
This book contains a phased development method for web sites.

[Skyrme, 2001] David J. Skyrme, "Capitalizing on Knowledge: From e-Business to k-Business", Butterworth-Heinemann, 2001
This book identifies why and how the combination of knowledge and e-business has the future.

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Appendix 1: The University Supersite

This appendix offers a concrete example of the complexity of knowledge portal realization within an organization (see chapter 2).

Organization and Strategy

A university is divided into multiple departments. Each of these departments has its own building, library book collection, employees, research, events, courses, etc. There are services provided by the departments and central university services to support the departments in their functions.

For users of the services it is not important who provides the desired service. They just want to get what they need and thus need to know where they can get it. The Internet offers a good opportunity to the university to offer (information about) the services to the users. The Internet is widely accessible and easy to update with new information.

The strategy for the university would be to create a university supersite with for each department a subsite. This supersite should provide all general university information and offer easy access to the department subsites (through a central database, a search engine, or a good navigation structure).

Challenges

The next paragraphs will describe some challenges the university faces when realizing the university supersite. The challenges have been grouped in the EPA areas.

User

Users are the people that need the information on the site. Users are divided in user groups because there are different kinds of information needs, depending on the relation of the user to the university. User groups of the university site are: students, employees, future students, alumni and business people. From these user groups the students and employees are internal users. Alumni are external users, though known to the university. The university wants to attract future students to their education and business people to participate in research projects. The site could evolve from a knowledge provision site to a knowledge sharing site when the users start to provide information for other users. These are some examples of information needs and provisions of the different user groups:

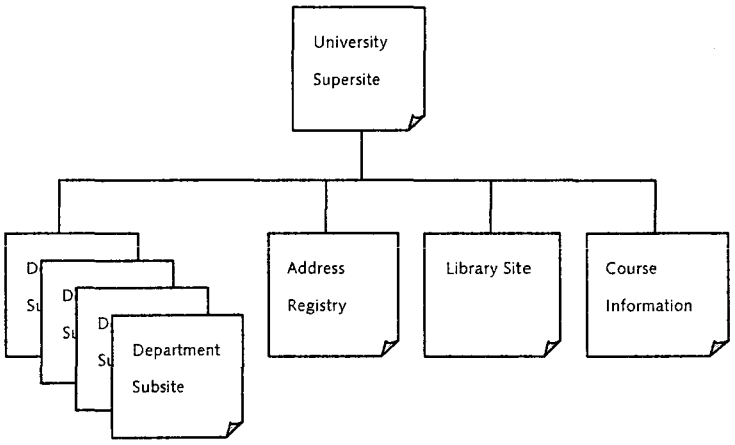
User Group	Needs	Provides
Students	- course information - study material	- personal study material (e.g. abstracts) - course evaluations
Employees	- research publications - provided services structure	- research information - course information
Future students	- education description - procedures for appliances	- interest ratings - frequently asked questions
Alumni	- expert community - information about former classmates	- feedback on education from job field - expert advice on problems
Business people	- research projects description - business training information	- job opening information - organization description

The site will only be a success if it is used. It is important to analyze the different user groups. This enables the university to offer the users what they need in a logical structure

and to target the necessary promotion of the site. The promotion and communication actions are described in the communication plan. These actions are executed during the realization project. Testing with representatives of each user group is a way to check if their requirements have been fulfilled.

Content

The university site will contain a lot of diverse information. Departments have their own information to offer, but some parts of that – like employee addresses and library databases – are best offered on the central university site. From the needs of the user groups it is derived what information is needed. Part of the site map that describes the structure in which the information will be offered may look like this:



An important and very difficult discussion is which functionality/content will be hosted centrally and which to delegate to the subsites. Once it has been decided what information will be offered on which pages, the collection and formatting of content is started. The content will have to come from many different owners and will be in many different formats. It has to be clear who will deliver what content in what format. The process of content creation and collection continues after the realization project. This means an editorial board has to be set up. There will be a central editorial board that is responsible for the central site content and supervises the different editorial teams for the subsites. It is important that departments and other services are authorized to maintain their own Web sites, because this makes them faster in response to changes. Above all it is impossible for the central editorial board to administer the accumulated content of all subsites.

Business

The site is built to fulfill the user needs, but a number of procedures and processes need to be set up to embed it in the university. The most important process is the publication process. This describes how employees of the university provide new information to the site and how the quality of information is controlled. If employees receive new, unknown tasks in the new processes, training has to be provided for them.

The university supersite with subsites integrates a lot of information from different departments. Employees from different departments will have to cooperate to build and maintain the site. They will all have their own ideas about the site. They should put their own interests aside and work together to fulfill the information need of the user groups.

The commitment of management and employees is of invaluable importance for the success of the site. There are a number of actions that might increase the commitment:

- Start small to focus on the commitment of a small group of people; once convinced, they can make other people enthusiastic
- Offer a concept as soon as possible so everyone can see what the site will be like
- Approach the different members of the editorial team individually to let them accept the ideas; ask input from everyone, so they feel involved; they will promote the site within their own department or unit
- Start with examples on the central site; use these examples to convince subsite owners to follow them

Functionality

The functionality that is needed on the site depends on the way the information will be offered to the users. It will include search functions on pages and in databases and contact forms. For some parts of the site it may be required to protect access with username and password. The site has to be developed and tested according to a structured software development process.

An important part of the functionality is the user interface of the site. This user interface has to be intuitive and the university supersite has to provide information from all departments to all user groups in a uniform way. The subsites have to look more or less the same and it should be clear that they belong to the supersite. This means a style guide has to be developed with the basic design rules (e.g. font size, screen layout) for all subsites.

The functionality is a specialist product, so the responsibility for this will be with a central team. Subsite owners can request new functionality and site changes other than content from this central team. Procedures are set up for this.

Technology

The site will use existing information systems like personal records, library databases and course description to provide the users with needed information. These information systems have different technologies. The site must be able to connect to each of them.

The university has to decide how the site will be hosted and maintained. The whole site can be on a central server, or each subsite could have its own server. All these issues will be solved in the infrastructure design that is made.

Like with functionality, there will be one central team responsible for infrastructure maintenance.

System

From the strategy of the university, goals for the site are derived. These goals have to be monitored and the site has to provide the corresponding indicators. The site will only be a success when the goals have been achieved. Examples of concrete goals are:

- All research employees have put their résumé on their personal page
- All pages are available in Dutch and English
- The database of graduated students contains at least 1000 addresses
- There is no information on the site that is outdated more than two working days

Aside from the product quality the security of the whole system will have to be monitored based on a risk analysis. Questions like what parts of the site are accessible by who have to be answered.

Appendix 2: Article for SCI 2002

A Comprehensive Approach to the Realization of Knowledge Portals

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ABSTRACT

A fully functional knowledge portal requires not only a Web site but also supporting processes, people, and technology. This means the collaboration of different disciplines is needed to realize a knowledge portal. A structured approach is needed to coordinate the complex multidisciplinary realization project.
Our approach uses a matrix to manage all products needed to realize a knowledge portal together with its supporting system. This matrix combines portal areas with time phases. Workflows connect different products in the matrix. The coordination between the cells of the matrix is handled by using an interdisciplinary team.
From the challenges in the field of knowledge portals five requirements for the realization of a knowledge portal can be identified: product overview, concurrent development, design for change, content management, and user-centered design. The matrix with the workflows demonstrates that our approach addresses all five requirements mentioned.

Keywords: knowledge portal, concurrent development, design for change, content management, user-centered design, interdisciplinary team

1. INTRODUCTION

A knowledge portal, in our view, is a Web site that offers customers, employees and business partners access to high quality information sources in an organization; uniformly: through one single interface, and transparently: without required knowledge about location and format of systems or information. The term knowledge indicates that the portal exceeds the simple information offering of a company brochure. Knowledge portals offer convenient access to information for knowledge workers.

More and more organizations become aware of the possibilities of knowledge portals. Employees can share knowledge to improve productivity and efficiency. Customers can be attracted to products and services by the added value of information. Business partners can be tied to the organization by providing them with useful knowledge. As with other types of sites [1, 2], organizations discover that realization of a knowledge portal is quite complicated [3]. We will concentrate on three challenges that organizations may face:

1. The realization period of the knowledge portal has to be as short as possible, because of the fast changing Web environment.
2. The knowledge portal involves multiple departments of the organization. The information from different sources has to be presented in a uniform and transparent way.
3. Interaction with the users is needed to make the portal a success. The knowledge portal has to present the information the users want in a way that makes sense to them and it also has to be easily accessible for users in order to add information to the portal.

The next paragraph describes the challenges in detail. The challenges indicate that a knowledge portal has a lot of different aspects and that it has to be realized in a chaotic environment. To reduce the complexity of knowledge portal realization, a structured approach is needed. This approach should identify all subproducts needed to realize the knowledge portal in all its aspects and manage the dependencies between the subproducts. We have developed such a product-based approach for projects that take approximately six months (from analysis through evaluation) with a capacity of eight fulltime project members. Our approach is applied after the definition of the e-business strategy and the business case. We will concentrate on projects that are started to implement the business case. We will call this knowledge portal realization.

From the challenges we identified five requirements for the realization of a knowledge portal. We will describe our approach and demonstrate that it addresses all five requirements. We will conclude our paper with experiences and research issues.

2. KNOWLEDGE PORTAL CHALLENGES

The following challenges have to be faced in the field of knowledge portal realization:

1. *The Internet environment is highly complex and changes rapidly*
   The technology used for building Web Sites changes rapidly [4]. New technologies offer new business opportunities. Together with the increasing demand from society for more, better and quicker, this makes that the e-business economy changes fast. Organizations form their e-business strategies based on the current environment and their vision of the future. The realization of a knowledge portal is an implementation of that e-business strategy. The environment, and thus the vision of the future, will inevitably change during the realization project, which could make the organization's e-business strategy

change. It is impossible to incorporate all the changes in the same realization project. To keep the discrepancy between the realized knowledge portal and the e-business strategy as small as possible, the realization project should be kept as short as possible.

2. *The information offered stems from multiple heterogeneous sources*
   The knowledge portal offers transparent access to the information that is present in the organization. This information is not only stored in several different types of information systems, but also in the heads of employees. The systems and employees may belong to different departments of the organization. Different departments can use different technologies in their information systems and different information systems can have different owners. The knowledge portal should form the central place from which all information is easily accessible. The information should be presented in a uniform way. This creates a complex information structuring and management problem.
3. *The cooperation of users has to be obtained for the success of the knowledge portal*
   The World Wide Web has given an unprecedented power to the customer [4]. It makes it possible to compare organizations and switch between them with one mouse-click. When the Web site of an organization is chaotic or too slow, the customer will go to the competitor to get what he wants. Organizations offer information at the portal as an added service to customers. Customers are under no obligation to use the knowledge portal.
   Organizations have more control over their employees and business partners than over customers. However, the sharing of knowledge is a voluntary process. An organization can enforce knowledge sharing only to a certain extent. There is no way to keep employees and business partners from getting the information they want from other places and from keeping information they have to themselves.

3. REQUIREMENTS FOR A KNOWLEDGE PORTAL REALIZATION APPROACH

To face the challenges and reduce the complexity of knowledge portal realization, a structured approach is needed. From the challenges in the previous paragraph we deduce the following requirements for an approach to realize a knowledge portal:

1. *All products needed to realize the knowledge portal have to be clear from the outset*
   A product-based approach identifies products that are needed to reach the end product. To keep development time as short as possible, it should be clear to everyone involved in the project what product has to be finished when and by whom. The scope of the projects needs to be clear and definite from the outset. Enough time should be spent at the beginning of the project to identify all products needed and the result should be a clear overview to use as project communication tool.

2. *The portal and supporting system have to be developed in parallel*
   A fully functional portal requires not only a Web site but also supporting processes, people, and technology. By supporting system we do not only mean the physical infrastructure, but also the organizational structures and processes around the site. Not only the Web site has to be built, but also the organization has to change to incorporate the knowledge portal [4]. Because the time-to-market has to be short, there is no time to first change the organization and then build the Web Site. Web Site, infrastructure, processes and structures have to be developed in parallel. The cultural organization change needed to make the knowledge portal a success is an important point of attention during the whole project.
   To make the development period as short as possible, software development methods like Rapid Application Development [5] can be used. However, the principles from these methods should be extended to the whole supporting system of the site.
3. *The knowledge portal has to be designed for change*
   To keep development time short, changes as result of the changed environment during the project have to be incorporated in later releases of the knowledge portal. This calls for a flexible architecture and a Design for Change [6] of all portal aspects.
4. *The management of information and information sources has to be accounted for*
   We define content as the information that is offered through the Web Site. The content comes from different sources and has to be inventoried and collected. The collected content will be in different formats and has to be converted to the common format for the portal. To make the content easy to find for the user of the portal, a good Information Architecture [7] is needed.
   After the Web site has been published the content has to be kept up-to-date and relevant. Technologies, people and procedures have to be set up to do this. This is called Content Management [8].
5. *The user has to be attracted to use the portal*
   Because users are not obligated to use the portal, it has to be made as attractive as possible for them. This can be achieved by adjusting all aspects of the portal to the requirements of the user, which makes User-Centered Design and Usability Engineering [9, 10, 11] important.
   The user should be the central starting point for the design of the portal and explicit efforts should be made to promote the portal to the prospective users, whether employees, business partners or customers.

We have developed an approach to the realization of knowledge portals to meet challenges like the ones we mentioned in the introduction. Our approach is based on the above requirements and will be explained in the next paragraph.

4. AN APPROACH TO THE REALIZATION OF A KNOWLEDGE PORTAL

Our approach provides a structured overview of the products needed to realize a knowledge portal and its supporting system. The dependencies between the different

products can be identified and managed. An interdisciplinary team should be used to execute the project, which averagely will take about six months. We will explain our "divide and conquer" approach in the following paragraphs.

Knowledge Portal Areas

A lot of different disciplines need to work together on the knowledge portal and its supporting system. The project involves for instance a graphical designer to design the user interface, a marketing specialist to promote the site to the users and a system engineer to build the infrastructure of the site. Together the disciplines realize all aspects of the knowledge portal. The disciplines can be divided in groups that concentrate on a common area of the portal. We identified six areas:

- *User*: the user of the portal. Involves user analysis, marketing & communication and usability testing.
- *Content*: the information offered through the portal, including both static content and data generated from different data sources. Involves content management, content acquisition, content modeling and content maintenance.
- *Business*: the primary process and structures the portal supports and the secondary processes and structures that support the portal. Involves change management, process engineering and employee training.
- *Functionality*: the software of the portal. Involves graphic design, software development & testing, and maintenance.
- *Technology*: the infrastructure of the portal. Involves infrastructure engineering and maintenance.
- *System*: the portal with its supporting system. Involves quality and security. Note that this sixth area combines the disciplines that concentrate on the first five areas.

The approach realizes the knowledge portal on all six areas in parallel.

Realization Matrix

To reduce the complexity of the realization, we divide the project into five phases: Analysis, Conceptual Design, Development & Testing, Deployment, and Evaluation. We create a matrix of the six portal areas together with the five phases:

	Analysis	Conceptual Design	Development & Testing	Deployment	Evaluation
User					
Content					
Business					
Functionality					
Technology					
System					

We position the products needed for the realization in the cells of this matrix, to give an overview of what is needed when and in which area. The set of products is largely the same in all knowledge portal realization projects, but should be adjusted to meet

the specific requirements of each individual project. We have currently identified over sixty different products.

Interdisciplinary Team

As explained, each area involves a number of disciplines. Experts from various disciplines have to collaborate to deliver a common product. We call this an interdisciplinary team. For each area a representative is chosen that leads the team of people in his area. This team manager reports to the project manager and communicates the decisions back to his team. In this way, the project manager only has to deal with a maximum of six people (different areas could have the same representatives) and at the same time all major decisions are made by representatives from each area. The team managers can consult a member of their team when a specific discipline is needed for a decision.
Thus we have a central interdisciplinary team above the different interdisciplinary area teams. Working with interdisciplinary teams for Web development is common practice and requires special management techniques [12, 13, 14].

Workflows

The division of products over matrix cells does not eliminate the dependencies between them. Products are needed as input for activities that create other products. We call the sequence of activities that connect products that have input-relations with each other a workflow. All activities together form one big workflow that we have divided in sub-workflows.
As in [15] we use the notion that coordination can be defined as managing dependencies among activities. There are three types of coordination issues with respect to the sub-workflows:

- *Horizontal*: The sub-workflow falls within one area. The products have to be finished in the order of the time phases they have been placed in. This is standard project management procedure [16] that can be handled by the team manager of the area.
- *Diagonal*: The sub-workflow can go across areas. Products within one area and time phase can be input for activities that create products in a different area and the same or next time phase. The coordination in time is still standard project management procedure [16], but now the team members from different areas have to collaborate. The central interdisciplinary team helps to obtain input from other area disciplines where needed.
- *Vertical*: All sub-workflows have to be synchronized. Products within the same time phase that belong to different workflows, have to be finished at the same moment. The project manager leads the central interdisciplinary project team with the representatives of each area. These interdisciplinary team meetings realize vertical synchronization.

The matrix with the products helps identify all dependencies of the three types in a realization project. The interdisciplinary team in combination with standard project management techniques [16] can be used to manage them. The techniques we use may sound fairly obvious, but the examples in the next paragraph will show that the

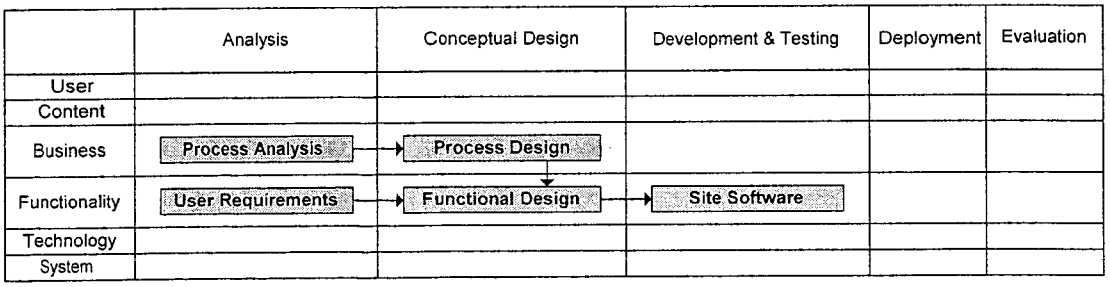
complexity is in the identification of all required products and their dependencies, and in the management of the workflows.

5. EXAMPLE WORKFLOWS

We have developed a number of best practices for the instantiation of the matrix in our projects. To illustrate these best practices we define standard products and describe the dependencies between them. All dependencies together form one big workflow, but we have identified various sub-workflows within the matrix. We will describe three sub-workflows that illustrate how we face the challenges we mentioned in our introduction. The complete matrix contains over sixty products, but for the sake of readability we only show relevant products. An arrow from product A to product B symbolizes an activity that has A as input and B as output.

Develop Site Functionality and Business Processes in Parallel

As said, in traditional software projects the software is developed after the business processes have been set up. When building a Web site the development time has to be kept as short as possible. The functionality of the site therefore has to be developed in parallel with the business processes to shorten the project. Primary business process is the sharing of knowledge and secondary business processes are for example the publication process, the maintenance process and the editorial process. The functional design is partly derived from the user requirements, and partly from the process design. First making the part of the functional design that is derived from the user requirements and continuing with the other part of the functional design when the process design is ready can achieve concurrent development. The processes can be designed in parallel with the first part of the functionality.
Matrix 1 shows the sub-workflow that demonstrates concurrent development.

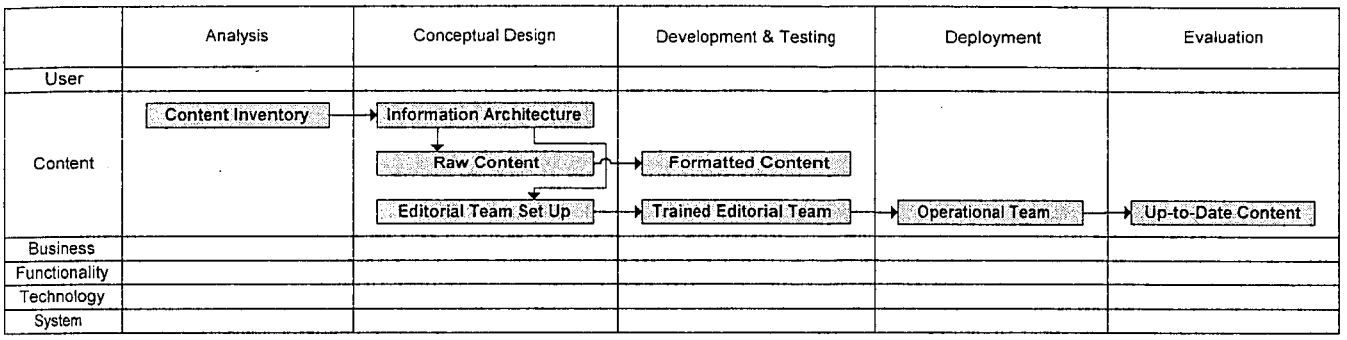


Matrix 1: Concurrent Development

Structure and Manage Content

The problem of users getting lost in the site can be solved by using a good Information Architecture [7] to base the site structure on. As soon as it is clear what content is needed on the site, the content collection should start. There is no time to wait with content collection and conversion till after the Web site is finished [12].

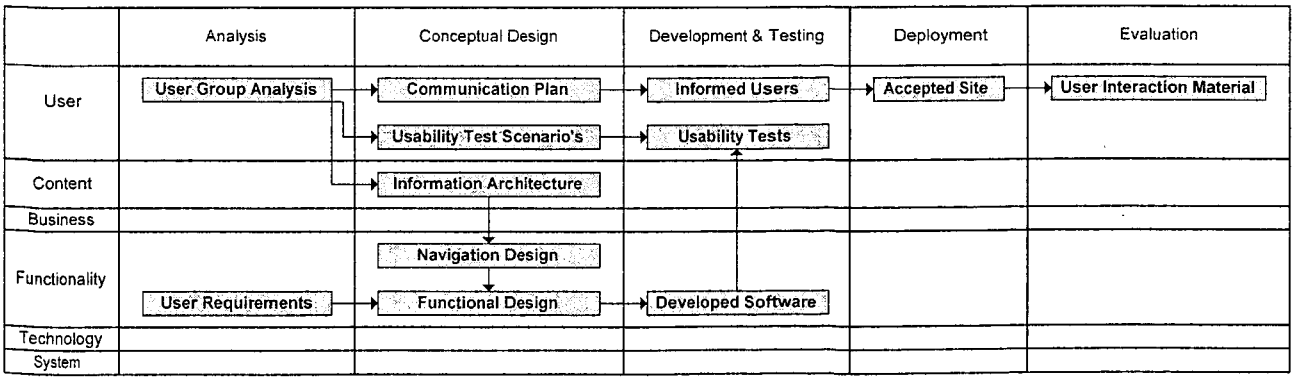
To keep content up-to-date an editorial team should be set up. This team is responsible for the maintenance and quality control of the content. The structure and processes for the editorial team can be set up in parallel with the rest of the knowledge portal. The information architecture indicates for which content areas team members are needed.
Matrix 2 shows part of the content modeling and management sub-workflow.



Matrix 2: Content Modeling and Management

Attract the Users

To attract the users to the site, it should be actively promoted. This means a communication plan has to be developed that describes the actions that will be taken. When the site has been launched, continuous interaction with the users is needed to check if the portal still fulfills their wishes.
To make it attractive for users to use the site, they should be put at the center of the design of all knowledge portal aspects. The information architecture mentioned in the previous example should be made on basis of the needs of the user groups and the functionality of the site should be based on the users' need as well. During and after the development, the portal will be tested by representatives of the users, to check if it fulfills their requirements and expectations.
Matrix 3 shows the sub-workflow that demonstrates the user-centered design and the promotion of the portal.



Matrix 3: User-Centered Development

6. FULFILLING THE REQUIREMENTS

As we stated in paragraph 3, for the realization of a knowledge portal a structured approach is needed, which fulfills at least the five requirements we mentioned. Our approach is based on these five requirements, as can be seen from the matrix and the way we fill it with products:

- Overview of all products needed is given in the matrix. The matrix is used during the project to communicate which products have to be completed when and by whom.
- Concurrent development is achieved by dividing the products in areas that all follow the same time phases. The sub-workflow in paragraph 5.1 shows the parallel development of processes and functionality.
- Design for change is emphasized by the separate conceptual design phase, where designs on each area are made. Analysis and design take one third of the project time. The separation of functionality and technology areas stimulates infrastructure engineers to not only consider the current knowledge portal, but the entire present and future ICT initiatives of the organization. This builds a flexible infrastructure.
- Content modeling and management are given explicit attention in the separate Content area. Paragraph 5.2 shows the corresponding content sub-workflows.
- User-centered design is emphasized by the separate User area. The user-centered sub-workflow (paragraph 5.3) shows the user analysis and requirements as the starting point for design and promotion.

Our approach is structured because the filled matrix gives a complete overview of all products needed to realize the portal, but this is done in a way that makes it possible to divide the overall project in manageable portions. The coordination between these portions is handled by the central interdisciplinary team.

7. CONCLUSIONS

The basis of our approach is the use of areas and time phases to group products, and an interdisciplinary team as coordination mechanism. We have investigated some similar approaches. The Integrated Architecture Framework [17] has a division in areas, but only addresses architectural design. e-DSDM [18] has a division in time phases, but does not group disciplines into areas. Our approach is different from software development methods like (e-) DSDM [18, 19] and Rational Unified Process [20] because it addresses the realization of the knowledge portal in all its aspects, including e.g. promotion, content management and a monitoring system.
Our approach has been used in several projects that Ordina N.V. has carried out for customer organizations (for an example see the knowledge portal at http://www.novem.nl). These organizations were all very enthusiastic about the approach, because it gave them a clear overview from the outset of what needed to be done for the realization of the portal. The projects have given us a lot of input to improve our approach and the products we identified.

The approach presented here only describes what needs to be done and not how it should be done. We are currently trying to synthesize and standardize the most common products in the matrix. We try to fit frequently used tools and techniques to the cells of the matrix. We realize that the challenges we identified are not unique for knowledge portals. We are investigating if and how the matrix and products have to be changed, when our approach is used for other sites than knowledge portals. We continue to apply our approach in real-life projects to assure that it stays up-to-date and relevant.

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Appendix 3: Concept EPA Manual (Dutch)

Deze handleiding is bedoeld voor Ordina medewerkers die nog niet bekend zijn met EPA. Er wordt uitgelegd wat EPA is en hoe er projecten mee uitgevoerd kunnen worden zodat men kan bepalen of EPA geschikt is voor een uit te voeren project. Zowel consultants die EPA moeten verkopen, projectleiders die het overzicht over een EPA project moeten houden, als uitvoerende specialisten binnen een EPA project kunnen nuttige informatie in deze handleiding vinden.

Wat is EPA?

EPA is een gestructureerde totaalaanpak voor het realiseren van e-business systemen. Er wordt niet alleen aandacht besteed aan ICT-aspecten, maar ook aan informatie- en organisatieaspecten. De EPA-visie is dat deze aspecten gelijkwaardig zijn.
EPA waarborgt de kwaliteit van het gerealiseerde systeem door de doelstellingen van het systeem specifiek, meetbaar, acceptabel, realistisch en transparant te formuleren bij de start van het project en regelmatig te evalueren.

Waarom EPA?

- *"E-business is nog vaak technolgy-driven, de ICT-afdeling bepaalt de oplossing"*
  Het realiseren van een e-business systeem houdt meer in dan alleen software ontwikkelen. Zo moeten bijvoorbeeld ook processen worden ingericht voor het onderhouden van het systeem en moeten gebruikers enthousiast gemaakt worden om het systeem te gaan gebruiken. EPA besteedt niet alleen aandacht aan de ICT-aspecten, maar ook aan de informatie- en organisatorische aspecten van het e-business systeem.
- *"E-business systemen zijn vaak verouderd voor ze op de markt komen"*
  E-business projecten moeten worden uitgevoerd in een snel veranderende omgeving. Door ze zo kort mogelijk te houden, kunnen de veranderingen die gedurende het project optreden worden uitgesteld tot de volgende versie zonder een verouderde site op te leveren. EPA ontwikkelt de aspecten van het e-business systeem waar mogelijk parallel om de projecten zo kort mogelijk te houden.
- *"E-business vereist een integratie van informatie en processen die in de organisatie zijn verspreid over verschillende afdelingen"*
  Om toch een mooi geheel op te leveren zal een goede samenwerking tussen de verschillende afdelingen nodig zijn. EPA werkt met een team waarin mensen met expertise uit verschillende afdelingen op een gestructureerde manier samenwerken.

EPA biedt een gestructureerd overzicht van wat er geproduceerd moet worden om aan het eind van het project een volledig operationeel e-business systeem op te leveren. Verder omvat EPA een aantal principes die aangeven hoe de producten gecreëerd moeten worden.

Wanneer EPA?

EPA is toepasbaar bij de realisatie van alle e-business systemen met de factoren Gebruiker, Content, Organisatie en ICT. Concrete voorbeelden zijn transactiesites, e-learning omgevingen, en kennisportalen. Het maakt daarbij niet uit of er al een versie

aanwezig is in de organisatie of niet. EPA is ook toepasbaar bij projecten waar standaardpakketten in een organisatie ingevoerd moeten worden.
EPA-projecten kosten tot ongeveer 50 manmaanden aan inspanning (vaak 8 maanden doorlooptijd met 8 projectleden). Grotere projecten zullen opgedeeld moeten worden, waarbij steeds delen van de functionaliteit van het systeem opgeleverd worden.

Wanneer niet EPA?
EPA is minder geschikt voor kleine projecten omdat die daardoor onnodig complex worden. Ook is EPA niet geschikt voor webprojecten waar de gebruiker geen belangrijke factor is, zoals bijvoorbeeld de koppeling van twee systemen via XML.

Wat is nodig naast EPA?
EPA is een pure realisatiemethode. De strategische beslissingen moeten al genomen zijn voordat aan EPA begonnen wordt. EPA zorgt voor een systeem dat de strategie invult. In het begin van het project worden specifieke, meetbare, acceptabele, realistische en transparante doelstellingen voor het systeem afgeleid van de strategie.
Voor het inrichten en beheersen van het project is een projectmanagementaanpak nodig waarbinnen EPA gebruikt wordt als overzicht van de op te leveren specialistische producten. Zie voor meer informatie "EPA en projectmanagement".

Waaruit bestaat EPA?
EPA bestaat uit een matrix met daarin de te realiseren producten en een aantal principes waarop de realisatie gebaseerd is.
EPA-produkten
Om de operationele site te realiseren, dienen een aantal producten opgeleverd te worden. Voorbeelden hiervan zijn een opleidingsplan, een prototype, een redactieraad, een prestatiemetingssysteem, een infrastructuurontwerp, een doelgroepanalyse. EPA identificeert alle benodigde producten, waardoor het totale werk in overzichtelijke stukken wordt opgedeeld.
EPA-matrix
Om de grote hoeveelheid producten die opgeleverd dient te worden te structureren, worden ze in een matrix geplaatst. De matrix deelt het project op in een aantal tijdsfasen en aandachtsgebieden. De tijdsfasen vormen afgebakende perioden met een duidelijke doelstelling. Het eind van elke tijdsfase is een mijlpaal die eerst bereikt moet worden voordat met een volgende fase gestart kan worden. Veranderingen worden uitgesteld tot een volgend project omdat er niet teruggegaan kan worden naar een eenmaal afgeronde fase. De aandachtsgebieden geven de verschillende aspecten van de site aan waarvoor producten opgeleverd moeten worden. Producten in verschillende gebieden en dezelfde tijdsfase worden waar mogelijk parallel geproduceerd.
EPA-fasen

- Analyse: vaststellen van de doelstelling voor het systeem, inventariseren van de huidige staat en de gewenste resultaten. Aan het eind van deze fase wordt besloten of de doelstellingen haalbaar zijn (go/no-go beslissing)

- Globaal Ontwerp: ontwerpen van het systeem op een hoog niveau. Aan het eind van deze fase wordt besloten of de organisatie klaar is om met ontwikkelen (of invoeren van een pakket) te beginnen.
- Ontwikkelen & Testen: invullen van het globaal ontwerp op detailniveau, ontwikkelen en testen van het systeem of standaardpakket aanpassen en testen. Aan het eind van deze fase is het systeem klaar om over te gaan in de handen van de gebruikers.
- Invoering: systeem overbrengen van de ontwikkelomgeving naar de productieomgeving, starten van ondersteunende processen zoals opleidingen, een redactieraad en systeembeheer. Aan het eind van deze fase wordt een nulmeting uitgevoerd als basis voor de evaluatie.
- Evaluatie: evalueren van het operationele systeem op basis van de aan het begin gestelde doelstellingen. Aan het eind van deze fase wordt besloten of herontwerp van (delen van) het systeem nodig is en een nieuw EPA-project gestart moet worden.

EPA-aandachtsgebieden

- Gebruiker: analyseren van de gebruikers(groepen), gebruikers enthousiast maken voor het systeem, systeem testen met gebruikers, promoten van het systeem, feedback verzamelen.
- Content: inventariseren en analyseren van de aanwezige content, verzamelen of kopen van de gewenste content, vormgeven van de content, opstellen van de informatiearchitectuur, controleren van de content, opzetten van een redactieraad.
- Organisatie: analyseren van de bestaande processen, ontwerpen van de benodigde processen, opleidingsplan opstellen en uitvoeren, gewenste organisatiecultuur bevorderen.
- Functionaliteit: gewenste functionaliteit inventariseren, gebruikersinterface ontwerpen, navigatie-prototype maken, globaal ontwerp, detail ontwerp, make-or-buy beslissing, software ontwikkelen of pakket implementeren, testen functionaliteit, functioneel en applicatiebeheer opzetten.
- Technologie: technische standaards inventariseren, infrastructuur ontwerpen en invoeren, technisch beheer opzetten.
- Kwaliteit: doelstellingen systeem opstellen, prestatiemeetsysteem inbouwen, metingen uitvoeren, evalueren, risicoanalyse uitvoeren, beveiligingsmaatregelen treffen.

Op de volgende pagina volgt een voorbeeld van een ingevulde EPA-matrix. De vetgedrukte producten zijn verder uitgewerkt in de productenlijst.

EPA-team

Op elk aandachtsgebied zijn een aantal disciplines actief. Experts van die disciplines moeten samenwerken om het systeem te realiseren. Dit noemen we een interdisciplinair team. Op elk aandachtsgebied wordt een vertegenwoordiger aangewezen die leiding geeft aan zijn team. Die vertegenwoordigers vormen samen het centrale interdisciplinaire team onder leiding van de projectmanager. De projectmanager overlegt dus steeds met maximaal zes personen die ieder overleggen met hun eigen team. De samenstelling van de teams verschilt per projectfase en een persoon kan lid of vertegenwoordiger zijn van meerdere teams tegelijk.

	Concept		Implementatie		Evaluatie
	Analyse	Globaal Ontwerp	Ontwikkelen & Testen	Invoering	
Kwaliteit	▪ SMART doelstellingen ▪ Risicoanalyse	▪ Evaluatieplan ▪ Beveiligingsmaatregelen	▪ Evaluatie doelen ▪ Veiligheidstest	▪ 0-metingen	▪ Meetrapporten ▪ Evaluatie doelen ▪ Herontwerpbeslissing
Gebruiker	▪ Doelgroepanalyse	▪ Communicatieplan ▪ Privacy policy	▪ Communicatie acties ▪ Gebruikerstests	▪ Promotie systeemlancering	▪ Feedback gebruikers ▪ Evaluatie Gebruiker
Content	▪ Contentinventarisatie ▪ Contentanalyse ▪ Juridische aspecten	▪ Informatiearchitectuur ▪ Verzamelde content ▪ Redactiestatuut	▪ Geconverteerde content ▪ Gecontroleerde content	▪ Redactieraad	▪ Evaluatie Content
Organisatie	▪ Procesanalyse ▪ Toewijding management	▪ Procesontwerp ▪ Opleidingsplan	▪ Georganiseerde processen ▪ Procedures ▪ Opleidingsmateriaal	▪ Opgeleide medewerkers ▪ Geïnstrueerde medewerkers	▪ Evaluatie Business
Functionaliteit	▪ Wensenlijst ▪ Schermontwerp	▪ Make-or-buy beslissing ▪ Globaal ontwerp ▪ Navigatieprototype ▪ Opzet beheer	▪ Detailontwerp ▪ Systeemsoftware ▪ Functionele tests	▪ Functioneel beheer ▪ Systeem	▪ Evaluatie Functionaliteit
Technologie	▪ Standaards ▪ Infrastructuuranalyse	▪ Infrastructuurontwerp ▪ Opzet beheer	▪ ISP selectie ▪ Infrastructuur	▪ Technisch beheer	▪ Evaluatie Technologie

Voorbeeld van ingevulde EPA-matrix voor kennisportaal

EPA-productstroom

De producten in de matrix hebben onderlinge afhankelijkheden: bepaalde producten zijn nodig als input voor het realiseren van andere producten. Zo vormen alle producten samen een grote productstroom van afhankelijkheden. Daarbij zijn er drie soorten afhankelijkheden die elk op hun eigen manier beheerst dienen te worden:

- Horizontaal: producten moeten worden opgeleverd in de volgorde van de tijdsfasen waartoe ze behoren. De vertegenwoordigers van elk team beheersen dit en rapporteren aan de projectmanager.
- Verticaal: producten in dezelfde tijdsfase moeten op hetzelfde moment af zijn. De projectmanager coördineert dit met het centrale interdisciplinaire team.
- Diagonaal: producten uit een bepaald aandachtsgebied en tijdsfase zijn input voor een ander aandachtsgebied in de volgende tijdsfase. Dit wordt gecoördineerd door mensen uit de verschillende teams te laten samenwerken via het centrale interdisciplinaire team.

In de matrix kunnen alle afhankelijkheden geïdentificeerd worden. Ze kunnen beheerst worden met standaard projectmanagementtechnieken en het interdisciplinaire team.

EPA-principes

Bij het realiseren van de producten in de matrix wordt uitgegaan van de volgende principes:

1. *Stel de gebruiker centraal*

Gebruikers moeten gestimuleerd worden om het systeem te gebruiken. Dit kan onder andere bereikt worden door het systeem te realiseren vanuit de wensen van de gebruikers. Daarvoor is een goede analyse van wie de gebruikers zijn en wat ze willen met het systeem noodzakelijk. Ook moet er aandacht besteed worden aan het promoten van het systeem bij de gebruikers.

2. *Besteed aandacht aan de content*

Content is het belangrijkste onderdeel van het systeem. De aanwezige informatie is de reden dat gebruikers het systeem nodig hebben. De content moet altijd relevant, vers en makkelijk te vinden zijn.

3. *Beperk de organisatieverandering*

Om te zorgen dat het systeem zo goed mogelijk geaccepteerd wordt, moet het zo ver mogelijk geïntegreerd worden in de bestaande processen van de organisatie. Dit betekent dat er zo min mogelijk nieuwe processen worden opgezet.

4. *Zorg voor een flexibel ontwerp*

Het systeem zal voortdurend aan veranderingen onderhevig zijn en daar moet vanaf het begin al rekening mee gehouden te worden. Er zal steeds feedback van gebruikers komen en nieuwe technologieën zullen opduiken. Het ontwerp van het systeem zal makkelijk aanpasbaar moeten zijn om te voorkomen dat het veroudert of oninteressant wordt voor gebruikers.

5. *Vergeet onderhoud en beheer niet*

Als het systeem eenmaal gebouwd is zal het voortdurend beheerd en onderhouden moeten worden. Er zullen wijzigingen aan de functionaliteit en infrastructuur nodig zijn omdat de gebruikers nieuwe wensen hebben of er simpelweg meer gebruikers komen. Ook zal voortdurend nieuwe content gepubliceerd moeten worden. Het beheer en onderhoud van ICT en content moeten al in een zo vroeg mogelijk stadium voorbereid en opgezet worden.

Welke expertise is nodig bij een EPA-project?

Een lid van het projectteam kan meerdere soorten expertise in zich verenigen en op sommige expertisegebieden zullen meerdere leden nodig zijn. Een en ander hangt af van de grootte van het project en waar de zwaartepunten in de projectfase liggen. In de analysefase zijn de gebruikersanalyse en het opstellen van de doelstellingen voor het systeem belangrijk; in de ontwerpfase het ontwerpen van de informatiearchitectuur, de organisatieprocessen en de gebruikersinterface; in de ontwikkelfase het ontwikkelen van de software en het verzamelen en ontwikkelen van de content; in de invoeringsfase het promoten van het systeem, het trainen en instrueren van gebruikers en het in productie nemen van de infrastructuur; in de evaluatiefase het beheren van het systeem.
De onderstaande tabel geeft weer welke expertise wanneer nodig is (door middel van sterretjes) en waar de zwaartepunten in elke fase liggen (door middel van twee sterretjes in plaats van één).

		Analyse	Globaal Ontwerp	Ontwikkelen & Testen	Invoering	Evaluatie
Kwaliteit	Systeemkwaliteit & beveiliging	**	*	*	*	*
Gebruiker	Gebruiksvriendelijkheid	**	*	*		*
	Gebruikersvertegenwoordiging	**	*	*	*	*
	Marketing & communicatie	*	*	*	**	*
Content	Analyse & inf.architectuur	*	**			
	Creatie		*	**		
	Beheer		*		*	**
Organisatie	Processen	*	**	*	*	
	Opleidingen		*	*	**	*
Functionaliteit	Software ontwikkelen & testen	*	*	**	*	
	Grafisch ontwerp	*	**	*		
	Beheer		*		*	**
Technologie	Infrastructuur ontwikkelen	*	*	*	**	
	Beheer		*		*	**

Wat is het resultaat van een EPA-project?

Een EPA-project levert een volledig operationeel systeem op. Dit systeem bestaat uit de volgende elementen:

- Kwaliteitsdoelstellingen met meetsysteem
- Beveiligingspolicy voor het systeem
- Communicatieplan om gebruikers te stimuleren het systeem te gebruiken (een aantal acties hieruit zijn reeds uitgevoerd)
- Redactieraad voor contentbeheer
- Procedures om met het systeem te werken
- Opleidingsmateriaal en een eerste groep opgeleide medewerkers
- Software (meestal een Web informatiesysteem) met ondersteunende infrastructuur
- Functioneel, applicatie en technisch beheer

Dit resultaat omvat alles wat nodig is om het systeem operationeel te houden.

Hoe is EPA te gebruiken?

Offertes

EPA kan al ingezet worden tijdens het offertetraject. Een gedeeltelijk ingevulde matrix kan samen met de klant aangepast en uitgebreid worden voor het specifieke project. Het is de klant dan meteen duidelijk wat er allemaal moet gebeuren en dus wat er aan resources nodig is. Ook worden meteen de verantwoordelijkheden van de klant (bv. het verzamelen van content) duidelijk.

Projectorganisatie

De projectmanager komt uit de organisatie van de klant. Een Ordina-consultant is in ieder geval vertegenwoordiger van de aandachtsgebieden die door Ordina worden verzorgd (vaak functionaliteit). De EPA-consultant zit in het centrale interdisciplinaire team om toezicht te houden op het EPA-proces en de projectmanager te ondersteunen

met EPA. De vakinhoudelijke expertise van de consultant kan ook worden ingezet door lid te worden van teams op de aandachtsgebieden.
Voor de communicatie binnen het project wordt een projectsite gebruikt. Daar worden alle laatste versies van documenten bewaard. Dit is nodig omdat het projectteam niet helemaal uit één organisatie komt en zo de documenten toch voor iedereen toegankelijk zijn.

Tijdsplanning

Een goede schatting voor de fasen van een EPA-project is: de Analysefase 1 maand, de Ontwerpfase 2 maanden, de Ontwikkelfase 3 maanden, de Invoeringsfase 1 maand en de Evaluatiefase 1 maand. Dit omdat niet overal met fulltime projectleden wordt gewerkt. Binnen elke fase kan een schatting gemaakt worden voor de benodigde tijd per product. Omdat er parallel gewerkt wordt is het ook belangrijk de productstroom te definiëren. Dit geeft aan in welke volgorde producten gemaakt kunnen worden en waar het kritieke pad ligt.

Projectstart

Een EPA-project start altijd met een inventarisatie (Analysefase). Het projectteam hoeft dan nog niet groot te zijn. Input uit de verschillende gebieden wordt verkregen door middel van workshops met medewerkers en gebruikers.
Met de klant moeten de doelstellingen voor het systeem worden vastgesteld. Deze doelstellingen dienen specifiek, meetbaar, acceptabel, realistisch en transparant te zijn. Gedurende het project zal steeds gemeten worden of men nog bezig is de doelstellingen te bereiken. Zie voor voorbeelden van doelstellingen "EPA en kwaliteit".
Aan het begin wordt geïnventariseerd wie de gebruikers zijn en hoe hun taken met het systeem ondersteund kunnen worden. Gedurende het project zal steeds evaluatie met gebruikers plaats vinden om te kijken of het systeem nog aan hun eisen voldoet en of ze het makkelijk kunnen gebruiken.

Softwareontwikkeling

De fasen van EPA worden afgewerkt als in een waterval methode. Dit betekent dat elke fase expliciet wordt afgesloten en dat er niet zomaar terug kan worden gegaan naar een vorige fase. Binnen een fase kunnen de producten echter op elke gewenste manier geproduceerd worden. Voor softwareontwikkeling betekent dit dat binnen de fase Ontwikkelen & Testen een incrementele aanpak gevolgd kan worden waarbij steeds delen van de functionaliteit worden geïmplementeerd en getest. Dit is een gebruikelijke methode voor de snelle webontwikkeling.

EPA en projectmanagement

EPA geeft een structuur en richtlijnen voor het realiseren van producten die nodig zijn voor het eindsysteem. Daarnaast zullen een aantal producten moeten worden geproduceerd die nodig zijn om het project in goede banen te leiden. Het project zal moeten worden ingericht en beheerst. Voor het managen van een project bestaan een aantal standaardmethoden. EPA laat het projectmanagement buiten beschouwing zodat het toepasbaar is in combinatie met een willekeurige methode. De gebruikte projectmanagementaanpak zal echter wel aan de volgende voorwaarden moeten voldoen:

- Het projectteam moet kunnen worden opgedeeld in subteams waarvan de vertegenwoordigers een centraal team vormen. Dit is het interdisciplinaire team van EPA.
- Het moet mogelijk zijn het project te sturen op basis van producten die opgeleverd moeten worden. Deze producten worden uit de EPA-matrix gehaald.
- De projectfasen moeten vertaald kunnen worden naar de EPA-fasen of geheel zelf te definiëren zijn

Een binnen Ordina veel gebruikte methode die aan deze voorwaarden voldoet is PRINCE2. Deze methode regelt onder andere projectkwaliteit, risicomanagement en wijzigingsbeheer.
Binnen de gekozen projectmanagementaanpak wordt de EPA-matrix gebruikt voor een overzicht van wat wanneer opgeleverd dient te worden.

EPA en andere methoden

Onderstaand overzicht geeft aan hoe EPA met andere methoden gecombineerd kan worden.

	Organisatiebrede methoden	Projectspecifieke methoden
Strategievorming	Dream@venture	
Strategie-implementatie: ICT verandereisen	Align	
Strategie-implementatie: Projectplanning		PRINCE2
Strategie-implementatie: Projectimplementatie		EPA
Strategie-implementatie: Softwareontwikkeling		Ordina SMART

PRINCE2 is een projectmanagementaanpak (zie "EPA en projectmanagement").
Dream@venture is een 'brainsessie' ontwikkeld door Ordina. Doel van de sessie is directie en business management van bedrijven te inspireren met nieuwe business ideeën, concrete opportunities voor hun eigen onderneming te genereren en een eerste vertaalslag voor realisatie te maken. Deze methode kan gebruikt worden om de voor EPA benodigde strategie te formuleren.
Align is een door Ordina ontwikkelde integrale aanpak voor Business/ICT alignment. Align hanteert daarbij de architectuurbenadering. Align kan gebruikt worden om een algemene ICT-architectuur te ontwikkelen waarbinnen het door EPA opgeleverde systeem past.
Ordina SMART is een aanpak voor snelle systeemontwikkeling van moderne systemen. Ordina SMART kan als aanpak voor het produceren van de producten op het EPA-aandachtsgebied functionaliteit worden ingezet.

Vragen en feedback

EPA is nog volop in ontwikkeling. Zo ook deze handleiding. Er is een globale uitleg gegeven van wat EPA is en hoe het toegepast kan worden. Deze uitleg zal aan de hand van ervaringen, vragen en opmerkingen aangepast en uitgebreid worden.
Neem voor meer informatie, vragen en opmerkingen dus vooral contact op met:
Ir. Natasja Paulssen, Partner Ordina Finance BV, natasja.paulssen@ordina.nl

Definitielijst

Align	Integrale aanpak voor Business/ICT alignment ontwikkeld door Ordina
Content	De informatie die via een e-business systeem wordt aangeboden
Dream@venture	Brainsessie voor nieuwe businessideeën ontwikkeld door Ordina
EPA	E-Business Planning Approach; integrale aanpak voor het realiseren van e-business systemen ontwikkeld door Ordina
Informatiearchitectuur	Structuur, organisatie en labeling van informatie om mensen te helpen die informatie te vinden en te beheersen
Ordina SMART	Raamwerk voor systeemontwikkeling ontwikkeld door Ordina
PRINCE2	Projects IN Controlled Environments; projectmanagementaanpak

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[Harmon et al., 2001] Paul Harmon, Michael Rosen, Michael Guttman, "Developing E-Business Systems and Architectures. A Manager's Guide", Morgan Kaufmann Publishers, 2001
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[Nakano, 2002] Russell Nakano, "Web Content Management: A Collaborative Approach", Addison-Wesley, 2002
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BIJLAGE: Productenlijst

Een aantal producten die nodig zijn voor het realiseren van een e-business systeem mogen in geen enkel project ontbreken. Deze producten worden hieronder beschreven.

Communicatieplan	
De acties die ondernomen gaan worden om de gebruikers enthousiast te maken voor het systeem	
Doel	Commitment verkrijgen bij alle toekomstige gebruikers
Input	Doelgroepanalyse
Criteria	▪ Hoe wordt bekendheid aan het systeem gegeven voorafgaand aan de lancering van het systeem? ▪ Hoe wordt de lancering van het systeem gepromoot? ▪ Hoe worden na lancering nieuwe gebruikers getrokken? ▪ Hoe wordt gereageerd op feedback van gebruikers?
Expertise	Marketing & communicatie
Opmerkingen	Gebruikelijke acties zijn nieuwsbrieven, posters, workshops met gebruikers, etc.

Doelgroepanalyse	
De verwachte gebruikers van het systeem	
Doel	Het systeem laten aansluiten op de wensen van de gebruikers
Input	
Criteria	▪ Wie zijn de verwachte gebruikers? ▪ Bij welke taken gebruiken ze het systeem? ▪ In welke omgeving/situatie gebruiken ze het systeem? ▪ Hoe gebruiken ze het systeem? ▪ Welke terminologie gebruiken ze?
Expertise	Gebruiksvriendelijkheid, Gebruikersvertegenwoordiging, Marketing & communicatie
Opmerkingen	Interviews met toekomstige gebruikers kunnen vaststellen hoe ze het systeem willen gaan gebruiken (gebruikersscenario's)

Evaluatieplan	
Voor elke doelstelling van het systeem de acties die nodig zijn om het succes te meten	
Doel	De doelstellingen van het systeem halen
Input	SMART doelstellingen
Criteria	▪ Hoe wordt het succes van een doelstelling gemeten? ▪ Wanneer wordt de voortgang gemeten? ▪ Door wie wordt de voortgang gemeten? ▪ Welke extra middelen zijn nodig voor de evaluatie? ▪ Welke extra functionaliteit is nodig voor de metingen?
Expertise	Systeemkwaliteit & beveiliging
Opmerkingen	

Globaal ontwerp	
Hoog niveau ontwerp van functionaliteit, structuur en gebruikersinterface	
Doel	Vastleggen van de systeemspecificaties
Input	Informatiearchitectuur, Evaluatieplan, Doelgroepanalyse, Navigatieprototype
Criteria	▪ Hoe ziet de gebruikersinterface eruit? ▪ Welke taken kan een gebruiker met het systeem uitvoeren? ▪ Uit welke stappen bestaan die taken? ▪ Wie is bevoegd welke taken uit te voeren? ▪ Hoe zijn de schermen van het systeem aan elkaar gekoppeld? ▪ Welke informatie bevind zich waar in het systeem?
Expertise	Software ontwikkelen & testen, grafisch ontwerp
Opmerkingen	

Informatiearchitectuur	
Structuur, organisatie en labeling van informatie	
Doel	Gebruikers helpen informatie te vinden en te beheersen
Input	Doelgroepanalyse
Criteria	▪ Welke informatie zit in het systeem? ▪ Hoe hangen informatie-items met elkaar samen? ▪ Hoe wordt die informatie geclassificeerd? ▪ Hoe kan gezocht worden naar informatie? ▪ Welke labels worden voor onderdelen van het systeem gebruikt?
Expertise	Analyse & informatiearchitectuur
Opmerkingen	De labels die in de informatiearchitectuur gebruikt worden zijn afkomstig uit de terminologie van de gebruikers zoals vastgesteld in de doelgroepanalyse

Navigatieprototype	
Werkend voorbeeld van schermontwerpen met koppelingen (links)	
Doel	Inzichtelijk maken hoe de gebruikersinterface gaat werken
Input	Informatiearchitectuur
Criteria	▪ Hoe zien de schermen van de gebruikersinterface eruit? ▪ Welke informatie bevindt zich op welk scherm? ▪ Hoe kan van het ene scherm naar het andere genavigeerd worden?
Expertise	Grafisch ontwerp
Opmerkingen	

Opleidingsplan	
Leerdoelen en uitgewerkte opleiding voor gebruikers	
Doel	Drempels wegnemen voor het gebruik van het systeem
Input	
Criteria	▪ Welke vaardigheden en expertise zijn nodig om het systeem te gebruiken?

	▪ Welke kennis is nog niet aanwezig bij de gebruikers? ▪ Hoe kan de ontbrekende kennis worden aangevuld? ▪ Hoe kunnen nieuwe gebruikers bekend gemaakt worden met het systeem?
Expertise	Opleidingen
Opmerkingen	

Redactiestatuut	
Taakbeschrijving en vergaderschema's voor de redactieraad	
Doel	Kwaliteit content waarborgen
Input	Informatiearchitectuur
Criteria	▪ Hoeveel redacteuren zijn nodig? ▪ Wat is de structuur van de redactieraad? ▪ Wat is de taak van elk van de redacteuren? ▪ Uit welke stappen bestaan de taken? ▪ Wie is waarvoor verantwoordelijk? ▪ Wanneer en hoe overleggen de redacteuren?
Expertise	Processen, Contentbeheer
Opmerkingen	De informatiearchitectuur geeft wat de informatie in het systeem is en daaruit kan worden afgeleid op welke gebieden redacteuren nodig zijn. Redacteuren zijn inhoudelijke experts die informatie controleren en classificeren.

Risicoanalyse	
De risico's die gelopen worden dat het systeem misbruikt wordt	
Doel	Inschatten welke beveiligingsmaatregelen nodig zijn
Input	
Criteria	▪ Welke informatie in het systeem is niet openbaar? ▪ Wie heeft toegang tot het systeem? ▪ Wie mag absoluut geen toegang hebben tot het systeem? ▪ Hoe kan het systeem misbruikt worden? ▪ Wat zijn de kosten van een dergelijk misbruik?
Expertise	Systeemkwaliteit & beveiliging
Opmerkingen	

SMART doelstellingen	
Specifieke, Meetbare, Acceptabele, Realistische en Transparante doelstellingen voor het systeem	
Doel	De acceptatiecriteria voor het systeem vastleggen
Input	
Criteria	▪ Wat wordt er van de doelgroep verwacht? ▪ Wat wordt er van de informatie in het systeem verwacht? ▪ Wat wordt er van de prestaties van het systeem verwacht? ▪ Wat wordt er van de betrouwbaarheid van het systeem verwacht?

Expertise	Systeemkwaliteit & beveiliging
Opmerkingen	Voorbeelden van SMART doelen zijn: ▪ "Van alle medewerkers is persoonlijke informatie in het systeem opgenomen" ▪ "Er staat geen incorrecte informatie in het systeem die ouder is dan 1 dag" ▪ "Minimaal 80% van de medewerkers gebruikt het systeem als primaire informatiebron bij zijn/haar werkzaamheden"