Applying DEMO to Design a Generic Portal for Entrepreneurs in the Netherlands

Master's Thesis in Computer Science

by

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May 2009



Delft University of Technology Information System Design group Faculty of EEMCS Applying DEMO to Design a Generic Portal for Entrepreneurs in the Netherlands

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Title

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Executive Summary

Becoming an entrepreneur is always attractive but challenging. Consequently, it would be convenient to have a place where entrepreneurs can find enough support to turn their idea into real business. The Generic Portal for Entrepreneurs (Business Portal in short) has been a project using ICT to build this place. To develop this portal, choosing an appropriate software development procedure is a crucial factor for its success.

Having compared with other methodologies, Rapid Application Development (RAD) has been chosen as the software development procedure of the portal. However, the fact that the failure rate of software projects keeps increasing [2] forces us to improve this procedure. Two of the main reasons for this failure are the poor business process modeling and the vague requirement definition. Design and Engineering Methodology for Organizations (DEMO) - a methodology that has proven itself successful in capturing business processes in organizations - is a good candidate for this purpose.

The aim of this master thesis is to combine RAD and DEMO in a new framework for the analysis phase of software development process. This framework has been applied to develop the Business Portal concepts. On that scope, the thesis report is organized in eight chapters, in which the first chapter has provided the overview of the thesis. The second chapter has discussed the thesis's background about RAD procedure and DEMO methodology. The main work of this thesis has been stated in the next six chapters and will be shortly summarized in the following parts.

Firstly, the concept of the Business Portal has been clarified through its goals, the current situation and the desired situation. Since the organization structure of the business portal has not been developed yet, the current situation has been analyzed by reviewing the difficulties and related aspects of an aspirant entrepreneur. In the desired situation, five phases in the entrepreneurship life have been identified. Each phase has captured the functions that the entrepreneur wants from the portal. As the result of these analyses, the vision of the Business Portal is clear. Before transferring the Business Portal's concepts to the design, a new framework for the analysis phase of software development process has been developed.

The design of the framework has started with identifying the difficulties in the software requirements definition. To solve these identified difficulties, we have found that the activity diagram in RAD can be updated by the Interaction Model and the Process Model in DEMO methodology. These DEMO models have been added to generate a new framework which has combined traditional RAD's steps and DEMO's steps. In each step, its purpose, techniques, results and added values have been discussed.

Besides, the practical contribution of this framework has been verified in this part where we have applied every step of this framework to the Business Portal concepts. These concepts have been transformed to a list of requirements. Then, the business processes of the portal have been captured by the storyline, Interaction Model and the Process Model. Finally, by comparing between the requirements and business steps in Process Model, the missing requirements have been identified and updated. From this point, all business activities of the portal have been taken into account in its design and implementation.

Fourthly, building a prototype that satisfies the above mentioned identified requirements takes a lot of time and effort. Due to the limited time in the thesis project, eight (8) key requirements and two (2) optional requirements has been chosen for a prototype of the portal. Besides the analysis performed by steps in the framework, the analysis of this prototype has been captured by its use case, class diagram and sequence diagram. All these analyses have become the input for the design and the implementation in the next phase.

Both the design and the implementation of the prototype have followed the steps in RAD methodology. In the design section, the three main parts are: the question list, the website structure and the interface design. Within the question list design, a semantic network has been developed to support the communication between the businessmen and the question list designer. In the implementation section, Ruby on Rails has been chosen as the development platform. Based on above design, the prototype has been coded in Ruby language. The documentation, testing and installation of the prototype have also been discussed in this section.

Finally, all the work has been summarized in the conclusion part. In short, our thesis has answered the proposed questions in the beginning of this thesis. It has successfully proved the feasibility of building the Business Portal and constructed a new framework for software development process. This framework is evaluated by applying to the Business Portal concepts and the result of this process is a prototype where the main concepts of the Business Portal are implemented. This thesis has ended with the discussion about the future research directions.

Preface

Although doing a master study is always challenging for students especially in my case when I live thousands kilometer far from my family, this period of study helps me largely improve my understanding. I have got knowledge about Computer Science from EEMCS faculty as well as Management from TPM faculty. It is also very positive to work in an academic environment where I can get valuable support, feedback, and discussion from instructors and fellow students.

In particular, I would like to thank my supervisor for his help. It would have been impossible to finish this report without the guidance from Bernard Sodoyer, my supervisor at TU Delft. Knowledge, books he gave me when I started my thesis and many discussions helped me choose the right direction to carry on the rest of the project.

I would like to express my gratitude to Jan Dietz, who provided me valuable comments and feedback on my DEMO models. In addition, I want to thank Jan van den Berg for introducing me to this project at the early time and his feedback in the later time.

My thanks also go to Rutger M. Deurvorst, Eldert van Schagen, Peter J. van Eeten, Sya Titia Kleijer and all other members in our Business Portal project. The knowledge from the business side, good communication and contributed work during the project play a very important role for finishing my thesis.

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List of abbreviations

TU Delft EEMCS TPM		Delft University of Technology Electrical Engineering, Mathematics and Computer Science faculty Technology, Policy and Management faculty
RAD ICT SRS SDLC UML		Rapid Application Development ¹ Information and Communications Technology Software requirements specification Systems Development Life Cycle Unified Modeling Language
DEMO IAM ATD		Design and Engineering Methodology for Organizations Interaction Model Actor Transaction Diagram Transaction Result Table
CM PM		Construction Model Process Model
	rq pm st	request promise state
AM SM	ac	Action Model State Model
The ac	tors in t	he business portal
	V	Visitors: people who browse into the portal
	AE	Aspirant entrepreneurs: people who have some ideas for starting their own business.
	E EP	Entrepreneurs: people who have the real business Business experts: The one who creates and manages the knowledge base of the business portal
	M S	Site Managers: Administrator of the portal Stakeholders: Other people who have interactions with the portal
BP		Business Portal
DDL ORM		Data definition language Object relational mapping

¹ Because there are different kinds of RAD methodology, after comparing those in Appendix A, we choose "RAD methodology with prototyping" as our software development methodology. Therefore, we use RAD to refer to "RAD methodology with prototyping" in this thesis

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1 Introduction

Business world is always attractive, especially for the youth. Every year, thousands of students who have studied (or graduated) from a university want to start their own business. However, starting a business is not an easy job for anybody, especially for young people who do not have enough experience to operate a business.

Before starting a business, one has to compare different alternative ways to make a living. He needs to decide whether he refers to have his own business or wants to become an employee. Once he has decided to start a business, the major step when starting a business is to write a business plan. Though, writing it with many "business terms" requires a lot of effort. Getting suggestions and assessments for the business plan is even more difficult for the starters. Therefore, it would be convenient to have a place where young entrepreneurs can find all the support for their business, and Generic Portal for Entrepreneurs (Business Portal) is the project designed for creating this place.

On the one hand, Business Portal is an ICT project whose main purpose is to develop a web portal for enterprising people where they can find the support to turn their ideas into real business. On the other hand, this web portal should provide a rapid independent evaluation of the business plan's contents and the skills of the entrepreneurial team that will carry out this plan. In that way, the entrepreneurs can have all support during their business life.

Although using the Business Portal to support the entrepreneur can have many advantages, the success of this software project itself is unknown due to the fact that the failure rate of software development processes is still high. According to Joseph Barjis [2], the failure rate of software projects keeps increasing in the last two decades. The data from the survey of Stadish Group [18] stated that only 29% of all software projects succeeded; and the main reason for software projects failing is poor conceptual modeling or, in other words, poor requirements' definitions. Another research project from Lorin J. May [14] provides the same results, although he separated the reasons for software project failure into "poor user input" and "vague requirements". Determining the correct software requirements is the key factor behind the success of every software development project. Nevertheless, defining exactly what to build is still very difficult.

Like other software development projects, the Business Portal project also has all the above mentioned difficulties. Moreover, it is harder to complete the requirement definition in this project because at the moment, the business process of this portal has not yet been defined. Besides, we do not have an organization's structure to clarify this process. Therefore, in the software development procedure of this portal, there is a need to capture the portal's business activities; and DEMO - a methodology that can describe the essential business processes in a coherent, consistent, comprehensive and concise way – would be promising for this purpose.

1.1 Research Task

Of all the above hurdles, the main question, if we want to have a successful Business Portal, is "how can we update the software development procedure (such as RAD procedure) in order to capture the business functions and also to improve the way of defining software requirements?"

Joseph Barjis [2] introduced the DEMO transaction concept as a way to construct business process modeling. In his conclusions, he stated that "requirements are specified in the form of transactions". It means that applying part of DEMO methodology (actor transaction diagram) can improve the software requirement definition process.

It is therefore interesting to explore how DEMO can contribute to a real software development project like our Business Portal. This leads to the following assignment

Apply DEMO methodology in the analysis phase of the Business Portal software development project in order to guide the design and implementation of this portal. Construct a framework combining DEMO models with RAD's analysis techniques in order to improve the requirement definition issue.

In order to solve the above assignment, the thesis should at least answer the following questions:

- 1. Apply DEMO to the business portal in order to determine what the operations of the "to be built" portal will look like?
 - a. Analyze the business process and business environment in which the entrepreneurs will start their own business, and the contribution of the "to be built" portal in order to improve this process.
 - b. Explain the communication between the portal and the user with a storyline, and clarify the inside operation of the portal to respond to a request from the user.
 - c. Build the Interaction Model which exhibits the construction of the enterprise system. Inside this model, the actors in the composition and the environment, and their mutual influences will be illuminated.
 - d. Build the Process Model² in which the sequences of actions are performed by the actors in the business portal. It also captures the changes in the coordination world, structured by the transaction pattern.

² This is the Process Model from DEMO methodology. In RAD methodology, we will have other Process Model which has completely different meaning

- 2. After capturing the business processes in DEMO models, the second question is how to use these models to support the software development process?
 - a. Construct a framework to add DEMO models to the analysis phase of current software development procedure (such as RAD in such a way that these DEMO models can contribute to the software development process.
- 3. As the result of applying this framework to a real case, the design and implementation of the Business Portal will be developed. In this process, the next question becomes how to determine the practical use of this framework.
 - a. Design and implement the prototype of the Business Portal, following the framework in the previous phase
 - i. In designing the prototype, develop an semantic way to capture all the business concepts of the Business Portal
 - b. Evaluate the practical use of this framework

In question number one, although DEMO has different models (Interaction Model, Process Model, Action Model, State Model and Interstriction Model); two models Interaction Model and Process Model are more relevant to software development [1]. Therefore, these are the models that will be mainly focused on this thesis. We will clarify that these DEMO models can capture all the business activities of this portal, and these activities will be transferred to the design and implementation in question three.

In the implementation part, it will take a lot of time to implement a complete portal with all its functions. Therefore, we will firstly choose the basic functions of the business portal to make the prototype and then depending on the time left, we can add more functions to the real portal later.

During the research, these questions will possibly be divided into more detailed tasks.

1.2 Thesis structure

Firstly, in **the background part**, we will summarize phases and techniques used in Systems Development Life Cycle (SDLC) as well as RAD methodology because RAD will be chosen as the methodology for our Business Portal. We will review the software development process in this part and that will become the foundation for improving the process by complementing with DEMO models. Then, DEMO methodology will be introduced. Our focus in DEMO methodology will be on the summary of DEMO models and the techniques used to develop these models. Finally, we will have a look at previous researches that combine DEMO with software development processes.

Secondly, an introduction of **the Business Portal project** will be specified. This is a project from a group of businessmen who want to build a business portal in order to support the aspirant entrepreneurs starting their own businesses. The scope, stakeholders, and goals of the project will be clarified in this part so that we can have an overview of the project.

In order to make sure that this software project will succeed, we need to have an advanced software development process (improved from RAD). In the next part, this process is shown in a **framework where we apply DEMO in the analysis phase of software development process.** This framework will answer question number two in the thesis's questions about the contribution made by the DEMO model to the software development process. In addition, the detailed steps of this framework will also be discussed in this part.

Fourthly, to verify the framework, we will **apply this framework in practice to build a prototype for the Business Portal.** This section will follow the steps in the framework to build DEMO models and RAD's technique in a real context - Business Portal. As the result of this step, the business activities of the portal will be captured in a complete set of requirements.

Due to the limited time, some of the above mentioned requirements will be chosen for **building a prototype for the Business Portal.** These chosen requirements will be analyzed more detail in order to develop its design and implementation.

Sixthly, the results of the previous phase will be continuously used in **design and implementation phase.** In this phase, we will develop a prototype in which the concepts of the Business Portal will be transferred into concrete software functions. Moreover, this phase will also introduce a semantic way to capture the business concepts in the Business Portal.

Finally, the result of the research will be reported in the **conclusion part** where we will summarize our achievements in this thesis and also propose various research directions for future work.

As the summary of the thesis structure, figure 1 gives an overview of the entire scope of the thesis and names the approach which we will use in each chapter



Figure 1: Thesis outline

2 Background

Like other software development projects, our Business Portal needs to have an appropriate methodology for its development. According to [4], there are different types of methodology which can be used for software development, including: Structured methodologies (waterfall, parallel), RAD methodologies (phased, prototyping and throwaway prototyping), and Agile methodology. Each methodology has its pros and cons and can be used depending on the situation of the software project. <u>Appendix A</u> shows the criteria to choose a suitable methodology.

In our project, we need to deal with two difficulties: unclear user requirements and limited time for finishing. Based on the comparison in <u>Appendix A</u>, "RAD methodology with prototyping" is the most suitable methodology for our project because it can well manage those two difficulties. In addition, one of the main goals from the client in our project is to provide a Business Portal prototype which will be demonstrated to their investors. Because the result of "RAD methodology with prototyping" is a prototype, this methodology is our choice for the methodology of the project.

Due to the reason that "RAD methodology with prototyping³" is a methodology for software development, it does not capture the organization's business processes which are important for the success of the whole project. It is necessary to find an additional way to capture the business processes and DEMO methodology - a methodology for business process modeling is used. By combining DEMO with RAD in the analysis phase, they can capture the business operation of this organization and improve the successful rate of the Business Portal.

In the following section, theoretical foundations of RAD, DEMO and related researches between them are introduced. Those foundations will be used in chapter four to build a new framework for software development procedure.

 $^{^{\}scriptscriptstyle 3}$ We will use RAD to refer to "RAD methodology with prototyping" in the later part of this thesis

2.1 RAD (Rapid Application Development)

RAD is a software development methodology whose aim is to decrease the delivery time of some parts of the systems into the hands of the users. Instead of following the sequence of phases (planning, analysis, design, implementation and system delivery) in the software structured design methodology, RAD adjusts these phases into a series of short cycles which is faster on delivery to the users.

In RAD prototyping methodology, the analysis, design and implementation phases are performed concurrently and repeatedly in a cycle until the system is completed [4]. Firstly, the analysis and design start with minimal functions of the system. After those limited functions are designed and implemented, they are showed and evaluated by the user in a prototype. In the next prototype, the feedback from the user and a few more features of the system will be taken into account. This process will be performed repeatedly until all the functions of the system are implemented.



Figure 2: RAD Prototyping methodology⁴

Source: Adapted from Alan Dennis and Barbara Heley Wixon [4]

⁴ This diagram is drawn based on activity diagram. In the rest of this thesis, diagrams about software development process and the new framework will also be drawn using activity diagram

In the following part, four main phases: planning, analysis, design and implementation of this method will be introduced. Because we will apply DEMO into the analysis phase of this methodology, this phase will be discussed in more detail than the other phases.

2.1.1 Planning

This phase will answer the question "why is it necessary to build an information system" [4]. Normally, a software project in an organization is initialized by a set of system requests from a department in this organization. Then, these requests lead to the feasibility analysis to check the ability to build the system including technical feasibility, economic feasibility and organizational feasibility.

Based on the requests and the feasibility analysis, the board of the project will decide whether to continue it or not. If the project is approved, this phase will develop a team, managers and plans to carry on the project.

2.1.2 Analysis

As we discussed in figure two, analysis phase is the following phase after the planning. It takes the project's scope and work plan from planning phase as its starting point. Based on this plan, the analysis's team members will have the general idea about the system which will be transferred into concrete analysis in the analysis phase.

The focus of the analysis phase is on "what the system will do from the users' perspective?". In this part, the project teams try to understand the current system as well as the requirements from the users in order to identify the opportunities to develop a concept for the new system. Figure 3 will show the common steps performing in this phase

 Requirements definition: This step defines the requirements for the "to be built" system which are collected from different stakeholders in the project. Normally, requirements can be divided into functional and non-functional requirements. A functional requirement defines "a function of a software system or its component" [24] while non-functional requirements mostly focus on some criteria used to evaluate the system. Although both kinds of requirements are important, the functional requirements are more concrete and will be elaborated in more detail in the following steps.

As you have already known from the introduction part, getting complete users' requirements is very difficult; and failure to do so is one of the main reasons for the high rate of unsuccessful software project. Therefore, we will improve this part by combing this step with DEMO methodology.



Source: Adapted from Alan Dennis and Barbara Heley Wixon [4]

- Use case: describes the system basic functions (functional requirements). Each use case includes a set of activities that respond to the user's actions. The use case is used to better understand the requirements as well as to connect with other models.
- RAD Process model⁵: shows the process and activities that are performed in a system. One of the techniques for process model is the Data Flow Diagram (DFD). DFD expresses the flow of information in a system. At the beginning, the system will be seen as a whole big process (context level) which the information flow comes in and goes out. Then, later, the big process will be decomposed into many related processes.

⁵ We have a different Process Model from DEMO methodology. Although they use the same name, the contents and purposes are completely different. In this thesis, if we discuss about Process Model without any specification, we discuss DEMO process model

- Data model: describes the logical structure of the data in the system. It illustrates information of people, places... and their relation which we need to capture in the system. The data model can be developed based on the use case. In addition, information from the process model can also help to complete the data model (showed by the data stores object).

According to [3], there is a change in the last two steps in the analysis phase if we choose the object oriented system approach (still based on RAD methodology phases) compare to traditional RAD approach. In object oriented approach, instead of RAD Process model and Data model, it will develop structure modeling (Class diagram) and behavioral modeling (Sequence diagram).

Besides the difference in the models, there is also a difference between the traditional approach and object oriented approach in the way "how a problem is decomposed" [3]. In the traditional approach, the main focus is either the process or the data which is difficult to pick one. In the object oriented approach, we try to balance it on objects that contain both data and processes.

In spite of the differences between two approaches, both of them are valid [3] for software development. Depending on the environment of the project, one approach can be chosen within the RAD's phases.

2.1.3 Design

This phase focuses on how the system will operate. Based on the requirements and other models from the analysis phase, different kinds of design will be developed including architecture design, interface design, database design and program design. A complete software design should provide enough information for the programmers to code the application.

2.1.4 Implementation

This is the phase where the actual system is built. In this part, the above designs will be transferred into the programs and as a part of the implementation phase, testing these programs is very important. When we finish the testing, the system will be installed (replacing the old one). There will be some training plans to teach the users how to use the system. This phase will end up with identifying some changes or improvement for the system in the next cycle.

2.2 DEMO (Design & Engineering Methodology for Organizations)

DEMO methodology is a modeling methodology developed by Prof Jan L.G.Dietz at TU Delft [7]. By applying DEMO to an organization, this methodology can capture the "essential structure of business processes"⁶ which will show the construction and operation of this organization.

In DEMO methodology, we distinguish three different human abilities: Performa, Informa and Forma. Within these abilities, the main focus of this theory in the organization (doing business) is the performa ability which "brings about new, original things" [7], for example: engaging into commitments (request, promise...), decisions, and judgments.

By focusing on the performa ability, this methodology states that an organization is a set of social individuals that perform two kinds of acts: production acts (P-acts) and coordination acts (C-acts). With P-acts, the subjects fulfill the mission of the organization such as delivery goods or services to the environment. With C-acts, subjects enter into and comply with commitments toward each other, such as request, promise, state, and accept.... In other words, C-acts are the communications between subjects in the essential level. Through these communications, P-acts which bring about new things will be performed.

COORDINATION HUMAN ABILITY PRODUCTION exposing commitment (as performer) ontological action evoking commitment (deciding, judging) (as addressee) performa expressing thought infological action (formulating) (reproducing, deducing, educing thought reasoning, computing, etc.) (interpreting) informa uttering information datalogical action (speaking, writing) (storing, transmitting, perceiving information copying, destroying, etc.) (listening, reading) forma

Figure 4: The three human capabilities

Source: Jan L.G. Dietz, "Enterprise ontology: Theory and Methodology" [7]

⁶ Jan L.G. Dietz, "The Deep Structure of Business Processes"

The about mentioned C-acts will appear in some generic patterns which are called transaction types. The transaction is one of the main concepts of DEMO methodology. It is a universal pattern of coordination acts. In each transaction, there are two kinds of actors: initiator and executor. In the beginning, these actors communicate with each other (one requests, and other promises or declines) to have an agreement about the result of the transaction. This phase is called order phase. Then, in the next phase (which is called execution phase), the executor will actually perform the agreement and create the production act (the result). Finally, in the result phase, these two actors communicate with each other again (one states, and one accepts or rejects) to agree about the result.

In order to express all above notions in an easily communicative way, DEMO methodology has a set of models including: Construction Model (CM), Process Model (PM), Action Model (AM) and State Model (SM). In more detail level, The Construction Model is divided into two models: Interaction Model (IAM) and Interstriction Model (ISM). Because the Interaction Model and the Process Model are two models that can be used to improve the software development process, they are the main focus of this thesis.

2.2.1 The Interaction Model (IAM)

In order to build DEMO models in an organization, this methodology starts with "all available documentation about the enterprise" [7]. The first step to build DEMO models is to apply the following three analyses and three syntheses to these documentations. As the result, we can build the Interaction Model (IAM).

- 1. The Performa-Informa-Forma Analysis: This step will divide all available knowledge into three sets: Performa, Informa and Forma items.
- 2. Coordination-Actors-Production Analysis: The Performa items in the previous step will be divided into C-act, P-act and actor roles.
- 3. The Transaction Pattern Synthesis: In this step, the transaction type and result type will be identified and we can create the Transaction Result Table from this step.
- 4. The Result Structure Analysis: This step finds out the relation between the identified transactions.
- 5. The Construction Synthesis: For every transaction type, the actors will be classified as initiating actor and executing actor.
- 6. The Construction Synthesis: We identify the transactions in some parts of the organization. These parts will become the environment for these transactions.

Following the above mentioned six steps, we can build the Interaction Model of the organization. An IAM is expressed in an Actor Transaction Diagram (ATD) and a Transaction Result Table (TRT) [7]. It consists of all transaction types and their actor roles in the organization. It also shows the mutual influencing through different transactions. According to [9], the IAM is the most important model if one wants to

redesign the business of an organization. Following is an example of an IAM model including a TRT and an ATD

The TRT summarizes all the identified transaction types and its result in the organization. This example is the IAM taken from case study of the business portal in the later chapter.

Transaction Type	Result
T01 entrepreneurship potential advice	R01: Advice A to become or not to become an entrepreneur is provided
T02 membership of the business portal	R02: Membership M has been started

Table 1: An example of TRT

Source: Adapted from Jan L.G. Dietz [7]

In the ATD, all identified transactions will be put into their boundary and the links between the transactions and its actors will be drawn



Figure 5: An example of ATD

Source: Adapted from Jan L.G. Dietz [7]

According to [7], the IAM is a good starting point for redefining and reengineering the organization. Because it shows only the very concise form of the organization construction, we can have a deep understanding about its operation without disturbing by the detail implementation.

In addition, through the IAM, we can have a clear idea about the competence, authorization and responsibility of the actors. Therefore, it can help to map out the organizational functions (relating to functional requirements in software development) to the actor roles. Combining with the Process Model in the later part, IAM can help to capture the Business processes of the organization.

2.2.2 Process Model (PM)

By applying transaction pattern to every transaction identified in the IAM, the Process Model shows the casual and conditional relationships between different steps of the related transactions



Transaction T01 Entrepreneurship potential advice & T02 Membership Registration

Figure 6: An example of Process Model

Source: Adapted from Jan L.G. Dietz [7]

The business processes of the organization are captured in the PM, and this can be used as the starting point to design the support system for the organization. According to [7], the PM is suitable for "assignment of organizational functions to actor roles". In other words, the PM can help to map out the organizational functions which can be used to develop the information system for the organization.

2.2.3 The role of DEMO in the software development process

In this part, we will summarize some previous researches which discussed DEMO methodology and its role in the software development process.

Because DEMO models can capture the construction of an organization, many researchers [14], and [20] used DEMO to model the business processes. Since DEMO focuses on the essential (performa) level, it can help to optimize the operation of the organization by adding or deleting transaction. These activities have "a major impact on the organization" [20] because it happens in a high (business) level.

Although business process modeling is not an obligatory phase in software development process, an optimized business process will be a good starting point for this process. As we know, an information system is often developed to support certain businesses activities. Therefore, if the processes of these activities are optimized and clearly understood, the requirements for the supporting information system will be easier to capture. As a result, we can increase the capability to develop a high quality information system. According to [2], business process modeling can be seen as a "useful tool for software design and increase the accuracy of the models designed".

Beside the contribution of DEMO to the business process modeling, many researchers have showed that DEMO can also be used to directly contribute to the software development process. Two of them [15] and [6] express the value of DEMO prior to information system modeling with UML.

As we know, UML⁷ (including use case, class diagram, activity diagram...) is becoming popular for modeling an information system. Combining DEMO with UML can provide "added value in business process modeling in advance of the specification of information system using UML" [15]. The contribution of DEMO to information system modeling can be summarized in three points

- Using DEMO, the scope of the information system can be well defined.
- DEMO can make sure that all the modeling concepts in the information system can be found in the modeling process. "Transactions and Actors identify all use cases that a certain essential actor needs in order to effectuate a transaction" [15]. This point can also be found in [6] that we will explain more detail in the next paragraphs.
- DEMO provides the context of the information system that increases the ability to define the models in the UML

⁷ UML - Unified Modeling Language is "a standardized general-purpose modeling language in the field of software engineering" [28].

In detail, when using DEMO for business process modeling, we can derive use cases which capture the functional requirements of an information system [6] and [5]. As stated in the introduction part, the requirement definition is one of the key elements for software development process. With DEMO, the business reality can be modeled completely, and that "guarantees the soundness of the derived use case model" [5]. In other words, DEMO can help to improve the requirement definition process of an information system by deriving its use cases. In the following part, we will introduce three steps to derive use cases from DEMO models [6].

- 1. A straightforward transformation from the Process Model to the use case diagram. In this step, each transaction will be mapped into component (may include more than one use case).
- 2. Consider the relationship between components and add all informational components which provide additional information for the business components.
- 3. Decide which business components will be 'automated' (mimicked by an informational component)

Through these three steps, Dietz [6] stated that the use cases can be derived straightforwardly. Because DEMO focuses on the essential (ontological level) of the organization, it is quite clear that the main important use cases can be identified. However, in our opinion, more use cases should be added when we analyze the organization into more detailed level (infological and datalogical level). This part will be discussed more deeply in chapter four when we develop <u>a framework</u> combining DEMO with the software development process.

3 Business Portal project

3.1 Introduction

According to the interview with the businessmen[17] when starting this project, in the Netherlands, there are at least 6 million creative people with the potential to develop their personal skills, to execute original ideas and to start running their own business. However, operating a business requires a lot of different skills and support which are still lacking in many young people.

In order to provide a long life support and increase the successful rate of starting businesses, we have designed the concept of the Business Portal. This portal will offer 24/7 interactive functions, services and products to any person who has a desire to become independent entrepreneurship instead of employment.

Although the basic idea about the Business Portal seems simple, this idea needs to be clarified into more concrete aspects. These aspects includes the main goals of this business portal, the aspirant entrepreneur's difficulties facing when he wants to turn his idea into real business and the support the business portal can provide. Therefore, doing an analysis on these main aspects will be a good starting point for our project.

Because the business knowledge about our business portal has not been put in a formal way yet, interview and literature research are the main methods used in this chapter. As a result, we will provide information about the project including its purpose, goals, the current situation which describes what happens now, and the desired situation which will show the possible support we can provide with our Business Portal.

3.2 **Business Portal's goals**

The Business Portal's aim is at providing a place for enterprising people where they can find all the support for starting their own business including: assessment of the potential to become an entrepreneur, creating and managing their business plans, providing a rapid independent evaluation on the contents of these business plans, and providing other supports during their business life.

A key element in this portal is to help the enterprising people analyze their own profile, develop their business plan, and execute their plan in an interactive way. A business plan is a "formal statement of a set of business goals, the reasons why they are believed attainable, and the plan for reaching those goals" [22]. In our Business Portal, the business plan provides information about ten related sources (market, product...). It enables them to value the risk and the return of their investment they will receive when executing the plan. In addition, it also helps verify assumptions and correct deviations from the plan.

As a portal, Business Portal also updates business information and guidance from different sources (such as chamber of commerce, banks...) to provide its user valuable information. Moreover, it should work as a place where entrepreneurs can communicate with each other, search and buy necessary resources in order to operate their business.

3.3 Current situation

In this part, we will describe the current process which normally a person needs to go through when this person wants to become a successful entrepreneur. Within this process, we will show the difficulties and different aspects he needs to focus when trying to achieve his goal.

The process starts when a person has an idea about a business. At this moment, he needs to decide whether to become an entrepreneur or to stay with his current situation. This person does not have any clue whether he is suitable for an entrepreneurship or not. Therefore, his difficulty in this step is that how can he decide between different alternatives such as entrepreneurship or employment and to choose the most suitable alternative.

The solution to this problem is to compare the aspects of these alternatives, to give appropriate weight to the various comparative aspects and as a result, to choose the most attractive alternative. The aspirant entrepreneur can choose some of the tools to perform the comparison, but all of them have some disadvantages:

- The best practice is to meet an expert and ask for advices. However, there are some disadvantages for this way. They are subjective, time-consuming and probably costly.
- The next tool is to find objective criteria on becoming an entrepreneur and based on these criteria, compare characteristics of different alternatives. This way of assessment is acceptable except the incompleteness of the criteria. Although assessment criteria are available through the internet, they are often fragmented. Therefore, it is hard to find a complete assessment.

Next when he decides to develop his idea and to become an entrepreneur, he needs to think in a practical way and the starting point is to write a business plan. In this business plan, he needs to take into account ten (10) critical concepts which will affect the success of the enterprise. They are:

- o Management team
- o Customer
- Customer problem
- o Market
- o Solution

- o Product
- Process to create product
- o Resource
- o Stakeholder
- o Context or environment

For the definition and the explanation of these concepts, see the Appendix B

The easiest way to produce a business plan is to develop it using some available templates which sometimes include a template for the financial spreadsheet. Nevertheless, this approach has some disadvantages. While these templates can be easily found through the internet, there is no standard business plan template. Therefore, it is difficult to choose a template for the business plan. In addition, there is no support between the business plan and the execution of this business plan later. It is also hard to update the business plan in a semantic way. Thus, the aspirant entrepreneur needs to deal with at least four difficulties

- The first difficulty that an aspirant entrepreneur needs to face is to handle all these ten above critical concepts. It means that he has to have a lot of knowledge to master these areas and put effort into applying it to his idea.
- The second issue is the interrelations between these areas, for example: resource has an interrelationship with other areas: the resources will be used to create products while these resources need to be found in the market and are provided by stakeholders. The coherence of these interrelations is one of the important criteria in evaluating a business plan. However, without experience, new entrepreneur faces difficulties to manage these relationships correctly.
- In some cases, he does not want to do some parts of these ten areas such as market research. He wants to hire somebody who will professionally do these parts. Therefore, he needs a market place where he can find the necessary parties who can help him in a certain job.
- Finally, evaluating his business plan is another issue. According to a survey in 250 venture capital companies across the United States [19], there are eight critical business plan's mistakes which can be avoided by first getting advice from experienced experts. In other words, it is hard for an aspirant entrepreneur to eliminate all the mistakes in his business plan; so the evaluation and advice from the business plan experts are necessary.

Finishing the business plan can give the aspirant entrepreneur a complete picture of his business idea, but the venture for his business life will just have started. It still has to be executed – which we mention as the "execution phase" or the "implementation phase". In this phase, the aspirant entrepreneur needs to generate different forms for different stakeholders in order to be able to start his business. Depending on the purpose of the communication and the frequency of the transaction, these forms must be grouped into stakeholder categories, such as:

Starting company's forms:

- o Drawing up Articles for the Association
- Registering the company with government bodies
- Fulfilling forms to apply for a bank account

o ...

Communication with a customer forms:

o Communication of enterprise capabilities and offerings

- The registration of a customer's request for quotation....
- o

Thus, this step requires the aspirant entrepreneur to focus on the following aspects

- He needs to complete the following different kinds of entrepreneurial processes: marketing, development, production, purchasing, human resources, financing etc... For example in marketing, the entrepreneur needs to develop his product, finds target customer at a certain customer group, communicates his customers, create products and deliver his products... However, these processes are different depending on the type of business. Therefore, it can be a very heavy task to the entrepreneur.
- He also needs to contact each stakeholder in order to complete all the above mentioned procedures. It will take time; and it sometimes will be hard to collect all the documents from different stakeholders. Besides, the entrepreneur needs to fill in again a lot of forms with the repeated information (name, address...). That can become a boring job without an appropriate support from a good information system.
- Under these circumstances, advices from business experts play an important role for the success of the business because every business operates in a dynamic environment. The continuously changing environment will have a large impact on the business. Therefore, the aspirant entrepreneur needs to adapt his business in order to meet all the changes in his business life. Thus, support from the experienced experts is necessary.

According to the experienced businessmen [17] in our portal, the entrepreneurship life can be divided into five phases: assessment, starting, breakeven, grow and exit. In every phase of his business life, there is a cycle of four steps: planning, executing, verifying and correcting. The entrepreneur needs to operate his business through this cycle in which not all the entrepreneur is realized

- The business environment is a dynamic environment, and the above mentioned ten domains change rapidly. Thus, the execution of a business is often different compared to the planning. In order to deal with the difference, the entrepreneur also needs advices from an expert to meet the entire targets in his plan.
- The second factor which makes the business operation more difficult is the different phases in the business life. In different phases, different focuses are necessary. For example, in the starting phase, a business cannot focus on a very large market in many countries while its resources are limited. So, the entrepreneur needs to have different strategy for these individual phases

Due to all these difficulties and aspects, there is a need to provide an information system which provides support to the entrepreneurial life. The Business Portal is built to fulfill this demand. In the following part, we will detail how the Business Portal can be used for this purpose.
3.4 Desired situation with the Business Portal

The aim of our project is to provide support for the entrepreneur during his business life, starting with the assessment phase when a person decides whether or not to become an entrepreneur, until the exit phase when this entrepreneur sells or transfers his business (exit).

In order to have a clear vision about the different focuses of an entrepreneur in his business life, the businessmen in our project [17] have divided the entrepreneurship life into five (5) phases. Within these different phases, the entrepreneurship needs to focus on different things. He also wants to evaluate the risk and reward ratio he can expect in each phase.

- Phase 1- Assess: This is the phase when a person decides whether he is suitable to become an entrepreneur or not. The focus of this phase is to discover what the risk and reward ratio of the idea to become an entrepreneur is, comparing to his current ratio. As a result of this comparison, he wants to make a rational decision on how to continue in the future.
- Phase 2 Start: The person has decided that it is worth to take a certain risk in order to become an entrepreneur. At this phase, he needs to develop his business plan and starts to execute this plan. Basically, his plan involves buying resources at a low price and selling them at a high price. In order to survive through this phase and to become successful, the entrepreneur will have to combine and manage different resources from stakeholders according to certain rules.
- Phase 3 Breakeven: After starting the business until the time when the revenue is higher than the cost, an entrepreneur makes a cumulative loss. In this period, his goal is to reduce the cumulative loss and become less dependent on outside financing sources. Breakeven is the phase between a starting phase of a business to the time when his cost is equivalent with his revenue or in other words, the business starts to make profit. The focus of this phase is at controlling and reducing the downside risk, reducing dependencies, controlling and increasing the upward potential.



Figure 7: Five phase of entrepreneurship life Source: Rutger Deurvoorst and Eldert van Schagen [17]

- Phase 4 - Grow: After having profit, this is the period when the business develops fast. The number of employees increases and the business becomes more profitable. The entrepreneur is reducing his risks by diversification. He also increases the reward potential by extending his products to other markets, and increasing the sales volume.

This phase is critical in reaching a substantial company value which is necessary to provide an appropriate reward to the entrepreneur. If certain conditions about sales volume and profit are not met, the company will be unable to avoid liquidity problems and will enter into bankruptcy proceedings. Failure to execute this phase will result a loss of investments and reputation of the entrepreneur.

Phase 5 - Exit: This is the time an entrepreneur wants to change into a new business or find other things to do. Therefore, he exits his current business at a good price which should be more than the risks taken from the previous phases. The goal of phase five is to realize a reward. The task of the entrepreneur during this phase is to find sufficient interested buyers and to reduce the related transaction costs. He wants to sell a part of the company to them in a high price and low transaction costs.

In more detail level, each of these five phases can be subdivided into four steps, called: Plan, Execution, Verify and Correct⁸. As an information system, our portal can support the planning step, compare between the planning and the execution, and provide advice to correct the plan. In the following part, we will identify the supports which the "to be built" portal can provide for the entrepreneur though his entrepreneurship life.



Figure 8: Four steps in each phase of entrepreneurship life Source: Rutger Deurvoorst and Eldert van Schagen [17]

⁸ These four steps are clearly separated from phase 2. Therefore, we will discuss them in detail in this phase. In other phase, we only discuss the different focuses.

3.4.1 Phase 1: Assess

The main focus of this part is to help the aspirant entrepreneur to choose between his current occupations (as a student, as an employee ...) and operating his own business. To make this decision, the portal needs to help him compare alternative lifestyles and choose the most suitable one for his situation.

3.4.1.1 Phase 1: assess your own entrepreneurial potential

When a visitor comes to the portal, he can use the portal to evaluate his characteristics to see whether he is suitable to become an entrepreneur

- **Produce the assessment question list**: This is a list of questions about the characteristic of the person who wants to become an entrepreneur. The purpose of this question list is to collect the information from the visitor and evaluate whether this person is suitable to become an entrepreneur or not.
- Evaluate his entrepreneurial potential with standards: After receiving the answers from the previous step, the information will be calculated and translated into a score point (10/10). If this person gets a high score, he will be advised to become an entrepreneur, otherwise, he needs to improve certain skills and can return to our portal later.
- Improve his entrepreneurial skills with our services: Depending on the visitor's score in the assessment, the portal will identify missing skills and advice him some books, exercises, services and different products which can upgrade his knowledge and his entrepreneurial skills. This will help to improve the skills of the entrepreneur and add value to the next assessment phase. It will also help to save time for the visitor in order to faster get enough skills to become an entrepreneur.
- Selling services and products to improve his entrepreneurial potential: In order to improve his rating, the portal advices different kinds of services and products. Some of them are free, but some need to be paid. Thus, the portal provides place which is called the web shop of the Portal where aspirant entrepreneur can purchase products, services, and tools.

3.4.2 Phase 2: Start your Business

Creating the business plan and other supports in order to start a new business is the main focus of this phase. Before using this service, the user needs to register and pay for the services. From now on, we call him aspirant entrepreneur.

3.4.2.1 Plan your business

This is the first step – the planning - of four steps in this phase. This step helps to create the business plan and provide assessment to this plan. The main result of this step is to help the aspirant entrepreneur prepare for his new business

- Create a business plan

- The aspirant entrepreneur comes into the business portal. After answering the question list about his business idea, the portal can generate a complete business plan (maximum 20 pages including the financial part of this plan)
- While getting a question, the portal can provide suggestion on how to answer this question.

- Get assessment for his business plan

- Applying a ratio analysis to the aspirant entrepreneur's input. The assessment will use some business plan rules for the analysis. Based on the answers we will give ratings or scores to the business plan.
- Besides calculating the score of the business plan, this function also provides advices to improve this plan including how to solve the conflict and suggest future steps to turn this plan into real business.

- Provide different forms for starting a business

- Starting a business requires the aspirant entrepreneur communicate with different stakeholders. When the aspirant entrepreneur wants to perform a certain task with an outside stakeholder, the portal will find the right category of stakeholders and individual members for the aspirant entrepreneur. It also finds out the resources which this stakeholder provides
- To perform the communication, the aspirant entrepreneur needs to transfer many kinds of forms to the stakeholder. With the business portal, the information from these answers will be used to enable transactions with stakeholders by generating forms to facilitate the transaction process

3.4.2.2 Execution of your business plan

After the entrepreneur starts his business, his real implementation information (executing business data) will be input to the portal through a question list. By comparing between the business plan information and execution information, the portal can provide advices about what the new entrepreneur should do next to meet his proposal goals in his business plan.

- Execute this business plan (implementation plan):

- Entrepreneurs access to the business portal, after answering the question list about his execution, the portal can update his execution plan
- o Besides, the portal also provides suggestion on how to answer a question

3.4.2.3 Verify the execution with the plan

- Get assessment for his implementation information (executing business data)
 - Comparing his business plan and his execution business data to see whether his execution business data is still according to the planning direction. This comparison will be done by applying a ratio analysis which will be input into the system as some rules, and based on these rules give

the suggestion to the user how can he align his executing business data in order to meet his business plan

3.4.2.4 Correct your business plan and the execution

- Purchase services and products to improve your start up phase

 Besides the services provided by the portal itself, aspirant entrepreneur can also buy products and services from other parties and our portal will play an intermediate role.

3.4.3 Phase 3, 4, 5: Breakeven, Grow and Exit

Although in the real entrepreneurial life, the strategies and focuses in phase 3, 4 and 5 are different, the main tasks in each phase are still the same like phase 2: planning, execution, verifying and correct. In other words, the functions which the entrepreneur requires from the portal are the same. Therefore, in the following part, we just map out the different focuses between these phases, and the additional supports from the portal for each phase.

3.4.3.1 Phase 3: Achieve financial breakeven

The main focus of this part is to increase the efficiency of the business in order to decrease cost and increase the revenue. As we know, at the early step of a business, the operation of the new organization does not optimize yet. Many changes often happen at this stage that increases the cost. Therefore, it is advised to focus on the core business of the organization in this step.

3.4.3.2 Phase 4: Growing your Business

The focus of this phase is increasing market and revenue. Our company now becomes mature and therefore, in this step, we can think about positioning our product in the market. Depending on the type of the company, it is also possible to open branches and agents of the company in this step. In short, the marketing part becomes more important in this phase.

3.4.3.3 Phase 5: Exit your business

In this phase, we plan to sell a whole or part of the company. Selling needs an additional preparation plan. This plan helps not only get high reward for the entrepreneur but also keep the company operating "going concern". In this phase the portal will be the instrument in saving the entrepreneur transaction costs which are related to exit transactions.

3.5 Conclusion

By analyzing the goals of the Business Portal and the current situation of the aspirant entrepreneur, we now have a clear vision of what the people want from our "to be built" portal. Besides, the five identified phases of the entrepreneurship life show that although the services and functions we provide to the users at different steps can be the same, the knowledge we provide in these steps need to be dissimilar with different focus and strategies.

Before the information in this chapter will be used to develop the system requirements in chapter 5, we need to make clear the chosen methodology for the software development process in our project. Therefore, in the following part, a review and update (if necessary) of current software development process will be performed.

4 A framework to apply DEMO in the analysis phase of software development procedure

4.1 Introduction

From the introductory chapter, we know that the failure rate of software projects is still high and according to Lorin J. May [14], one of the main reasons for this failure is the poor requirement definition. Although RAD is a good approach for our project which we have vague requirements, short time schedule and need to deliver a prototype (Appendix A), there is no guaranty that this approach can increase the successful rate of our project.

According to Joseph Barjis [2], DEMO is a promising candidate to capture the business process of an organization. Therefore, it can improve the requirement definition issue. Thus, in this part, we first review what the difficulties in defining software requirements are, then we will analyze RAD to find the step(s) which needs to be improved, and finally, we will design a framework in which we will add DEMO models to the analysis phase of RAD. Through this combination, the new framework can capture the business process of an organization and improve the software requirements definition. These are important factors for the success of a software project.

4.2 Difficulties in software requirement definition

Determining the correct software requirements is the key factor behind the success of every software development project. However, defining exactly what to build is still very difficult. There are some concrete reasons for this

- **Essential Difficulties:** According to Stuart R. Faulk [10], in every software development process, requirements definition phase brings with it many essential difficulties. Essential difficulties are "those inherent in the problem", including:
 - Comprehension: understanding the user's problems and knowing which modern designed tools and methods may help to solve the problems. Users do not know exactly what they want. That does not mean that they do not have any idea about their software. In contrast, they know it but do not know how to formulate their specific needs.
 "They do not begin with a precise and detailed understanding of what functions belong in the software, what the output must be for every possible input, how long each operation should take, how one decision will affect another, and so on." [10].

- O Communication: the different disciplines on the business side and the software development side make communication difficult. Both business needs and software requirements are difficult to effectively elaborate. As we know, information systems are used to support different kinds of business. In order to build a successful system, the analyst needs to have knowledge of the business processes, constraints, rules and the business environment. By contrast, people working on the business side do not want to deal with too many technical terms. It is both hard for the entrepreneurs and the analysts to formulate the problem and the solution in the same definitions as well as to capture all the above knowledge to communicate effectively with each other.
- Control: controlling is about managing the quality, cost and turnaround of the software development project within a complexity of requirements. According to [10], "the conceptual structures of software systems are complex and difficult to visualize". Therefore, it is hard to identify the complexity of each requirement and its interdependency. Thus, we do not know which requirements are easy to build and which are more difficult until we develop a particular piece of software for these requirements. As a result, it is hard to control the whole project (time, schedule and budget) on the basis of these requirements.

Besides the above mentioned essential difficulties, software development process also needs to deal with other difficulties due to the changing context of the business environment

- **Dynamic environment:** Together with the rapid change in the business environment, the information system supporting the business also needs to be updated continuously. Therefore, the software requirements (which are hard to collect) also need to be updated after initially having been agreed.

In addition, software requirement definition processes often operate in a multistakeholders environment of the business. Of course, different stakeholders have different perspectives and objectives in their software requirements. It is also difficult to exactly determine system's requirements and the requirements to which all the stakeholders agree.

- Inefficient process modeling: The purpose of an information system is to support one or many business processes. Thus, the development of such an information system (starting with the software requirements) must connect with the business processes. According to Joseph Barjis [2], in order to solve the poor conceptual modeling (requirements definition) problem, there is a need for good "modeling and analyzing business process", but that is something which is still lacking.
- Forgotten redesign and reengineering business processes: In our opinion, this is the important reason why it is hard to specify software

requirements. The result of any software development is a system which can increase the efficiency of the operation in an organization. If we assume that we can perfectly design all the users' requirements and successfully build an information system which is used to support an inefficient business process; the operation of this organization will not improve. Of course, this is not a system which the user really wants. In other words, without reviewing (and redesigning and reengineering if necessary) the operations of an organization before software development, it is very likely that we will incorrectly define what the users want.

4.3 Business process modeling in RAD analysis procedure

Through the above mentioned difficulties, business process modelling plays a very important role in the software requirement definition. However, it does not receive enough focus in the software development process. In the past, RAD analysis procedure introduced in the book "System analysis & Design" ⁹ [4] has no step for the business process modelling¹⁰. In recent editions of this book, Alan Dennis and Barbara [3] used the activity diagram¹¹ as the business process modelling tool for business process modelling purpose - Figure 9

Also from the difficulties, redesign and reengineering the organization is an important phase which can increase the efficiency of software requirement definition. The activity diagram in RAD is not a choice for this purpose compared to DEMO methodology. In DEMO, it separates between performa, informa and forma items and mainly focuses on the performa items. That makes the DEMO model abstract and it can be used for reengineering organization – "reengineering a business process is something that is done for every ontological process step" [7].

In addition, the activity diagram does not have the actor concept which clearly shows who is responsible for an activity. Without the actor role, it is difficult to express who the executor of this activity is. It is also impossible to show that there are some activities which are performed by the outside actors, but these activities will have impacts on the operation of our organization.

⁹ This is the RAD procedure we introduce in the Background chapter

¹⁰ One can argue that "use case" can be used for business process modeling, but from our opinion, it cannot capture all the business activities of an organization

¹¹ This is the diagram used to show figures about the software development process (Figure 9 and 10)



Figure 9: RAD analysis procedure – Object Oriented approach

Therefore, in the following part, the current framework will be improved by combining DEMO with other RAD's steps to build a new framework for software development process.

4.4 DEMO - RAD analysis framework

Based on these above mentioned RAD's elements, we will introduce a new framework in which DEMO models are added in order to improve the analysis phase of RAD procedure. The details of each step in the framework will be clarified in the latter parts¹²

Source: Adapted from Alan Dennis and Barbara Heley Wixon [4]

¹² Only the new step and modified step in this framework will be clarified in the following section. Details of traditional RAD steps can be read in [3]



4.5 Framework explanation

In this section, we will explain in details the above mentioned steps of the framework. Within each step, we will introduce its purpose, the techniques which can be used, the results and its added values in the software development process.

4.5.1 Requirements definition

Our framework starts with the requirement definition.

Purpose: This step helps to have a clear view of the "to be built" system, and how this system can support the organization. Besides, it also provides the list of concrete requirements which will be used in later steps.

Technique: They are the traditional techniques that are used in the RAD's requirements gathering process, including: interviewing, questionnaires, document analysis and observation (more information on these techniques can be found in [3] and [4]).

Results: The main aim of this step is to collect enough information to build the DEMO interaction model and the process mode. In addition, a list of requirements for the "to be built" system is defined. This list will be checked and updated later by comparing it with DEMO models and with users' reviews.

Added value: Through this step, the idea of the "to be built" system will be translated into more concrete list of requirements. Although the set of requirements in this step will often be updated in the future, the basic requirements from this step are valuable and will be used as the foundation to develop other models in the following steps.

4.5.2 Interaction Model (Transaction Result Table and Actor Transaction Diagram)

Purpose: In this step, all the transactions in the organization should be identified in the TRT and ATD. In addition, the interaction model (IAM) should also exhibit the actors in the composition, the environment and their mutual influences.

Technique: According to [7], all available documents are materials to develop the IAM. It means that besides the list of requirements from the previous step, other organization's documents should also be reviewed in order to have an inside about the organization.

Normally, creating the storyline about operations of this organization will be a good starting point for this step. Here is the suggested procedure to create the storyline

- Extract the information about the operation of this organization from the organization's available documents.
- Focus on the interactions between the stakeholders (both inside and outside our organization).

- Translate these interactions into a storyline which describes the main operation of this organization.
- Explain the storyline with the users and get feedback from them

After having the storyline, we will apply the following steps to the storyline (or other kinds of documents if the storyline has not been developed yet). As the result of these steps, the IAM can be fully developed [7]

- Apply the Performa-Informa-Forma Analysis to the above storyline (or business documents) in order to separate between the Performa, Informa and Forma items in the operation of this organization.
- The Performa items are the focus items of DEMO methodology. They are separated into C-acts, P-acts and actor roles.
- Put the template of the transaction pattern over the set of Performa items. In doing so, we can identify all transaction types.
- Formulate for every identified transaction type the resulting P-fact type. This P-fact will be placed in the transaction result table (TRT).
- For every transaction, we will identify the initiating actor(s) and only one executing actor. In this step, the actor(s) should be generated. That means we do not map an actor with a concrete department or person but keep this actor in a general term.
- Complete the actor transaction diagram (ATD) in its environment. In this step, the boundary of the studied area in this organization is drawn. With this boundary, now we can have the ATD

At the end, this diagram should be checked and updated according to the users and other stakeholders of the system to make sure that we capture the complete business process of the organization.

Results: On the one hand, TRT and ATD are the results of this step. On the other hand, the comprehensive knowledge about the operation of this organization will contribute to the successful rate of the system.

Added value: In the new framework, we use DEMO's IAM and PM instead of the Activity diagram in the original RAD procedure. There are some reasons for this

- As mentioned before, the ATD provides a complete way to construct business process modelling. According to Joseph Barjis [2], ATD provides a formal analysis for business process modelling.
- The IAM (and the later Process Diagram) can help to improve the operation of the organization by redesigning and reengineering the business. As stated by Dietz [8], "it shows in a very concise form some interesting things about the

construction and operation of the organization". In other words, before building an information system to support the operation of an organization, the IAM can help to improve the efficiency of this operation itself (if necessary). After this step, we can make sure that the information system "to be built" will support the "up to date" organization, not the "out of date" one.

- With the IAM development, the users and analysts will have a comprehensive knowledge of the business's operation. Therefore, the user can really show what he expects on the "to be built" system and the analyst will have a communication tool which can help him communicate more effectively with the users.
- Finally, because the ATD is abstract, it will be stable throughout the minor changes in the organization. For example: the ATD will not be changed if we send the user an email instead of normal mail. Therefore, we can use this diagram to deal with the dynamics in the business environment. As a result, although the software needs to be updated in the changing environment, its functions (and software requirements for these functions) can be mapped with the transactions which are quite stable. In short, it increases the ability to successfully build a system which is able to support our organization in a dynamic environment.

4.5.3 DEMO Process Model

As stated in the DEMO methodology section [7], every transaction is an instance of a particular transaction type, and there is regarding pattern for this transaction type. For example: the basic pattern of a transaction includes: request, promise, state and accept communication acts as well as a P-fact where new thing is delivered. In short, the PM shows the process steps which "are allowed to be taken" [7] in the business activities.

Purpose: The purpose of this phase is to divide every transaction in the ATD into detailed acts (or detailed steps) and map out the causal and conditional links between the detailed acts in these transactions.

Technique:

- Apply the transaction pattern from DEMO methodology [7] to every transaction in the ATD. The basic pattern includes: request, promise, execute, state, and accept steps. Besides, more steps like decline, quit, reject, and stop... can be added depending on the operation of this organization.
- Identify the causal and conditional links between these steps.
- Finalize the PM in which the related transactions can be grouped in a diagram so that their relationship will be shown.

Results: A complete Process Model is a result of this step. Through this model, the analysts can have the knowledge about the business process of this organization.

After this step, it is the right time to reengineer the organization (if necessary) to optimize its operation before developing its supporting information system.

Added value:

- The completeness of the transaction means that "once you have found a P-act/result or a C-act/result, you can be sure that you have found a complete transaction" [7]. When we define software requirements according to other techniques, there will be some cases where some requirements are omitted. With the completeness characteristic of the PM model, we can check whether we have missed some steps. Therefore we can clarify the missing part of the corresponding requirements.
- With the PM, we can express the dependency between different transactions; as a result, the requirements of the functions supporting these dependent transactions will also have a dependent relationship. It means that later, when we change one requirement in a transaction, we will need to review the other related requirements based on the relationship between the corresponding transactions.
- Besides its role in the software development process, PM also plays a part in capturing the Business Process of an organization. According to [7], the PM can show "the structure of the business process" which is lost when using "current process modeling". This is one of the reasons why we use DEMO models instead of Activity Diagram as original RAD procedure.

4.5.4 Update Requirements Definition (Mapping table)

Purpose: The purpose of this phase is to make sure that our list of requirements is completed. That means it can capture the main functions of the "to be built" system which enables us to support the business process derived from the above DEMO models.

Technique:

- Firstly, this step uses a mapping table to map out the steps in each transaction of the PM with the requirements which we identified in the requirements definition step. Here is the structure of the mapping table

Transactions	Steps	Conditions	Supported by "to be built" system	Requirements	Note
T0x ¹³	T0x–rq		Y	Ry ¹⁴	
	T0x–pr		Т		Performed
					tacitly
	T0x-ex		N		

¹³ x: The number of a certain transaction, such as T01, T02...

¹⁴ y: A certain requirement, such as V01, V02...

T0x-st	Y	??	Missed a
			requirement

Table 2: Checking requirements by mapping with PM detailed steps

There are six columns in the above table. In this section, we will explain the meaning of each column and the information which is fulfilled in this table.

- **Transactions:** This column will list the name of the transactions from the ATD of the organization.
- **Steps:** For each transaction, this column presents all its steps from the Process Model.
- Conditions¹⁵: The conditions are required in order to perform this step. Besides the basic sequence in each transaction (request, promise, execute, state, accept), there are some cases that a certain step needs to meet some conditions before it is executed. For example: the conditions can come from the business rules. It means that in some organizations, a certain step can only be performed if it meets these business rules.
- Supported by "to be built" system: Depending on whether the "to be built" system will support the corresponding step or not, this column will show three types of data: Y, N and T
 - **Y** (Yes): Supported by the "to be built" system. This means that there are corresponding function(s) in the "to be built" information system which supports this step. In other words, *there should be requirement(s)* in the corresponding requirement column in case this column gets the type Y.
 - N (No): Not supported by the "to be built" system. Sometimes a certain step or the whole transaction will be done by human being without support from software. Another case for "N" is that this step will be completed by an outside actor. With these kinds of steps, there is *no need to provide any requirements.*
 - T (Perform tacitly): Normally, there are many situations that we communicate tacitly, for example: when we provide advice to a visitor, we automatically assume that he understands it. Promise and accept steps are often performed tacitly. With these kinds of step, *there is no requirement*. However, we need to take these steps into account. In case there is too much miss-communication in these steps, we should improve them with a corresponding functions and this column will become Y.

¹⁵ If we have a complete DEMO models including Action Model, the condition can be extracted from Action Model

• **Requirement:** They are requirements chosen from the requirement definition step. These requirements are put in a row which is corresponding to the step in the same row.

This is the column where we really map the detailed steps from PM with the requirements. In every detailed step of the PM, we will check whether the "to be built" system provides the support for this step and what is this support in terms of concrete requirements.

- If the value of the "Supported by "to be built" system" cell is Y, then the corresponding "requirement" cell will be fulfilled with some requirements. If we want the system to support this step, but at this time, there is no corresponding requirement (or missing requirements), this column will be fulfilled with '??'. Each row marked with '??' in the mapping table needs to be reviewed in the later part.
- If the value of the "Supported by "to be built" system" cell is N or T, it means that there is no need for any requirement in this row. Therefore, the corresponding "requirement" cell will be empty.
- Note: This column is used to put any remark for the corresponding row
- After finishing the above mapping table, rows with '??' in the requirement column need to be reviewed and additional requirements can be added in the list of requirements.
- The additional requirements in this step are used to combine with the list of requirements which we got from the requirement definition phase in order to complete the set of requirements. This set of requirements will be used to develop the "to be built" information system.

Results: The mapping table is a result of this phase. On the basis of the mapping table, the software requirements will be updated. From this time, the requirements can support the main business processes of this organization.

Added value:

- With the mapping table between the transaction steps and the requirements, we can make sure that we have a complete list of requirements which can be used to support our business process.
- The mapping table can increase the requirements traceability. From this time, when we want to update a requirement, we can trace back which business function this requirement will support. As a result, the related requirements in this business function should be reviewed for updating.
- By looking at the condition column, we can map out the relationship between steps as well as the corresponding requirements for these steps. This relationship is necessary for estimating the cost and the complexity of building

these related requirements. That will help to solve the difficulty of controlling the time schedule and the cost in the software project

4.5.5 Use case

Purpose: This is the usual step from the RAD procedure. According to [5] and [6], if we have developed the ATD and PM, we could derive the use case from these models. Therefore, in this section, we will first derive use case based on DEMO and then, complete it with traditional RAD's technique.

Technique:

- As stated in [6], there are three steps for deriving use-case models based on the DEMO models
 - Transform every identified transaction into "business component". This component will include all transaction detailed steps as its activities. The initiator(s) and executor of this transaction become the actors for the activities. Because in use case diagram, there is no separation between the environmental and the elementary actors as in the ATD, all actors will be expressed with the same symbol.
 - Add the relationships (<include>, <extend>...) between the above business components and all informational components - "the components that serve to provide the information needed by the business components" [6].
 - In the final step, one decides which business components will be "automated, i.e. mimicked by an informational component". This means the components can operate by themselves. In other words, the corresponding actor(s) of this component will become a part of this component
- After the above three steps, more use cases should be added in order to have a complete use case model. The additional use cases can be developed using the traditional RAD technique. For example: Adding a use case to check the input of the users, or make these use cases into more detailed level.

Results: The result of this phase is to have a complete use case diagram which will be used in the later steps of software development process.

Added value:

 According to Boris Shishkov and Dietz [5], the three steps in the technique section can be used to directly map from DEMO model to the use-case model in such a way that all essential behavior will be captured. In addition, the combination between firstly deriving use case from DEMO models and then RAD technique will make sure that our use case is consistent. It not only captures the essential business activities but also provides enough details for developing other models in the later step. After the above mentioned steps in the framework, the class diagram and sequence diagram still need to be developed in order to finish the analysis phase in the SDLC. These diagrams can be developed based on RAD's technique [3]. Finishing these diagrams is the last step of the analysis phase and the knowledge of this phase will be used in the design and implementation phase.

4.6 Conclusion

By combining DEMO models and RAD's technique in the above mentioned framework, we can deal with the difficulties in defining software requirements and business process modeling. DEMO can help capture the business processes of the organization while RAD technique links these business processes to the software development concepts (requirements, use case).

Moreover, using this framework, the business processes can be optimized before we transfer them to a complete list of requirements and use case model. In addition, by focusing on the abstract level of DEMO models, the operation of this organization can be easily understood and managed to deal with the change in the dynamic environment. It also helps the business side and the analyst side increase the understanding and communication about the system by mapping between the business functions and the requirements for the "to be built" system.

Although in every step in the framework, we discussed its added value which is referred to the results of other researches, the contribution of the whole framework in practice needs to be validated. Thus, in the following part, we will apply it to the Business Portal project to verify the practical contribution of this framework.

5 Using the framework to build the Business Portal

Referring to the introduction, there is a need to build a portal in order to support the entrepreneurs managing their own businesses. In the previous part, we have developed a DEMO-RAD framework which can contribute to the development of this portal. To evaluate the operation of the new framework, we will apply it in practice to build the Business Portal in the following part.

Following the first step in the framework, the analyses in the <u>Business Portal section</u> will be transformed into a concrete list of software requirements. In the second step, the information in the requirements will be used to build the storyline which in turn, is the input for the IAM and the PM. Then, the list of requirements will be updated based on the business steps deriving from DEMO models. Finally, the contribution of each step in the framework will be summarized in the conclusion.

5.1 **Requirements Definition**

Based on the analysis of the Business Portal and many interviews with the businessmen in this project [17], the requirements for the "to be built" system will be defined more concretely in this section.

5.1.1 The actors in the business portal

The end result of our project is a software product which is used by different users. A user is "a stakeholder who will interact with a completed system either directly or indirectly" [21]. Each user can have different roles in our system. In a software development project, it is important to identify these roles and specify the functions related to them. Actor is the concept which can refer to the role. An actor "specifies a role played by a user or any other system that interacts with the subject" [13].

Therefore, in this section, we will specify the actors which have interaction with the portal and define the requirements for these groups of actors. For each actor, we will specify who these actors are, their characteristics and what they want from our business portal.

Visitors (V¹⁶): They are anyone who browses into the portal.

- Visitor's characteristics
 - o They do not need to register into the portal
 - Sometimes, visitors come to the portal unintentionally, they want to have a look in the portal and explore all the resources the portal offer.
 - These visitors will be the potential users of the portal.
 - They are at the first phase -i.e. "assess" of their entrepreneurship life

¹⁶ The abbreviation of the actor will be used to name the requirements for this actor. That helps to increase the traceability of the requirements

- What they want from the business portal
 - They can access limited resources in the portal including: some free information (articles, news...). Besides, they also want to get the overview idea how the portal works before they use it.
 - Visitors want to know whether they are suitable to become an entrepreneur. That is the assessment function about "Evaluate your entrepreneurial potential with standard"
 - This actor can register in the portal in order to get more support from our portal

Aspirant entrepreneurs (AE): They are registered visitors, and have some ideas for starting their own business.

- Aspirant entrepreneurs' characteristics
 - The main target group customers of this business portal are the youth from the university. They are young and high educated. They also have skills in using computers
 - They are often lacking business experience and often do not have a lot of money.
 - They have many ideas about staring a business
 - This actor needs to register in the portal before he can use their provided functions
 - They are at the second phase "Start" of their entrepreneurship life
- What they want from the business portal
 - They come to the business portal to get support in order to make their idea into real business
 - Before using a function to create his business plan, this actor needs to pay a fee for using services.
 - They want to create their business plan where they can input information about their idea, financial information, and product's information. As a result, they want to have a complete business plan.
 - After that, they can get evaluation for their business plan
 - They also want to get advices on how to start their business including forms to interact with different stakeholders
 - Due to privacy aspects, this actor wants that only he can access his own business. That means he can not access other people's business plan as well as the resources for the administrator.

Note: When this aspirant entrepreneur inputs the acceptance from the governance for registering his business, in our portal, he becomes an **entrepreneur**

Entrepreneurs (E): They are the entrepreneurs who have the real business, not just an idea like the aspirant entrepreneurs

- Entrepreneurs' characteristics
 - They have finished a business plan and started a real business
 - They often have more business activities with other stakeholders compare to the Aspirant Entrepreneur

- They are at the end of the second phase "Start" and lasting until the end of their entrepreneurship life (breakeven, grow, exit)
- What they want from the business portal
 - They can input the data from their real business information into the portal and get evaluation for this information which we call "executing business data".
 - They want to get support in order to make the execution of their business meet all the goals in the business plan
 - They want to have advices about strategies in different phases of their entrepreneurial life
 - This actor has full rights (access, delete, change) on his business plan and executing business data but can not access other people's plans as well as the resources for the administrator.
 - They want to manage stakeholder's rights to access into his business plan and executing business data

Business plan experts (EP): They are the people who decide the order of the question lists and the rules how to evaluate the business plan and the executing business data

- Experts' characteristics
 - They have knowledge about business environment, business plan and business strategy
 - Before updating the portal, this actor needs to understand the structure and the operation of the portal
 - This actor needs to get the right from the Site Manager before accessing into the portal as an expert
- What they want from the business portal
 - They can transfer business knowledge to question lists, business plan checking rules and advice in order to guide the AE and E
 - They can access and update the question lists but not the answers from the users.

Site Managers (M): They are the main responsible people for the operation of the portal

- Site Manager's characteristics
 - They understand the logic and functions of the portal and should have knowledge about its design and implementation. They manage the dynamics of questions and rules.
- What they want from the business portal
 - They can manage users and users' rights as well as update the news and announcements
 - They can access all the resources in the portal but not the answers information and personal documents from the AE and E.

Stakeholders (S): They are the outside actors and resource providers (such as: bank, government, investors...) who want to provide resources to the entrepreneurs in our portal.

- Stakeholders' characteristics:
 - There are varieties of stakeholders
 - The entrepreneurs in our portal want to have different kinds of transaction with these stakeholders via our portal.
- What they want from the business portal
 - They want to sell their resources to the entrepreneur (a contract needs to be signed before they can introduce their resource to the new entrepreneur within the portal)

In the next part, what actors want from the business portal will be translated into a list of requirements.

5.1.2 Requirements for the Business Portal

5.1.2.1 Software requirements specification's decisions

Before writing software requirements specification (SRS), there are some decisions in order to make the SRS consistent and increase its added value in the software development process of the project. According to [21], these decisions are: how much detail of the requirements, do we allow duplicated requirements in different blocks (such as "payment" is a requirement which is needed in creating business plan block and buying service block) and how to increase the tractability of these requirements. These decisions will be discussed in this section.

There are many arguments about the level of detail in specifying the requirements. According to [21], there is no correct answer to the question "how detailed their requirements need to be". In our project, we choose less detail level of requirements because of some reasons:

- Firstly, the starting point of our project is a business idea. In other words, we develop our system without the "current" system. It is difficult for the customers (they are the businessmen in the project) thinking about the requirements in very detailed level. Besides, less detailed requirements can help the customers and the analysts easily capture the business processes of the portal without bothering too much detail.
- Secondly, the customers in our project are extensively involved in the software development process. It means that later on in this process, we can still discuss with them and detail certain requirements if necessary.
- Finally, we have decided to develop the prototype of the business portal by ourselves (not outsource it). Developing by ourselves has an advantage about communication and comprehension of the requirements. In our project, the analysts will follow the project throughout different phases of the software development process (design, implementation and testing). That means the members in our project can easily discuss with each other about these requirements in detail during these phases.

By choosing less detailed level of requirements, there are some simple rules which we will use in the following part for writing requirements

- A requirement should be expressed in one sentence
- We should not use "and" in a requirement sentence because this sentence can be separated into two requirements.

Duplicating a specific requirement in different places is not rare in the SRS document. On one hand, that helps to group related requirements into one place and increase the association between the requirements in this block. On the other hand, it is difficult to manage and update the duplicated requirements. In our project, we

specify the requirements based on the actors. In order to increase the completeness of the requirements for each actor, it is sometimes allowed repeating a certain requirement in different actors.

To solve the difficulty in managing and updating requirements, we will use some techniques to increase the requirement traceability of our SRS document

- The abbreviation of the actor will be used to name the requirements for this actor, for example: the requirements for Visitor actor will be started with "V"
- Use parent and child requirements. If necessary, a requirement will be detailed into many child requirements. The parent requirement can be reached by implementing its children
- The mapping between the requirements and the business functions also increases the traceability of SRS document. It will be done in the Mapping DEMO models and requirements table

In addition, from the software development's perspective, requirements can be divided as functional requirements and nonfunctional requirements. The functional requirements will be grouped by the actors while the non-functional requirements will be grouped based on the behavior properties of the system. The functional requirements which directly support the business processes are the ones that can be improved by using our framework. They are the main focus of this thesis while the non-functional requirements to develop our portal can be found in <u>Appendix C</u>.

5.1.2.2 Functional requirements

Functional requirements describe the behaviors (functions or services) of the system that support user goals, tasks or activities. Here is the list of requirements for the Business Portal which are grouped by the actor. These requirements will be written in the system's perspective that the "to be built" system provides some functions or services to the actors.

5.1.2.2.1 Visitor (V)

V1 Assess visitor's Entrepreneurship potential

- V.1.1. Provide a list of questions about his personal characteristics
- V.1.2. Receive the visitors answers
- V.1.3. Assess visitor's entrepreneurial potential
- V.1.4. Generate a place for the user to save his answer (archive function). Only registered users can save his answers
- V.1.5. Provide register place for the users to become a member in the portal.

V2 Update public announcement from the portal

- V.2.1. Update news or announcements about the business activities to the visitors. News and announcements will be divided into categories
- V.2.2. Provide contact information from the portal sides to the visitors

V3 Help desk

V.3.1. A place where the visitor can directly contact with the people in the business portal. Before using this service, payment is required

V4 Log in into the portal environment

- V.4.1. Access to a place where the visitors can log in to the portal environment
- V.4.2. Check right (authority) of the log in visitors in order to make sure that the resources can be accessed by the right persons.

5.1.2.2.2 Aspirant Entrepreneur (AE)

AE1 Payment function

- AE.1.1. Send a request for payment when the AE uses some certain services
- AE.1.2. Provide payment information and guidance how the users can do his payments.
- AE.1.3. A place where a user can input his payment information

AE2 Create a business plan

- AE.2.1. Provide the question list about his business idea
- AE.2.2. Guide the AE how to answering a question
- AE.2.3. Receive the AE's answers
- AE.2.4. Generate a complete business plan based on the answers of the AE
- AE.2.5. Save AE's answers after certain steps

AE3 Get assessment for the business plan

- AE.3.1. Check the whole business plan based on the checking rules in the system
- AE.3.2. If a checking rule needs to get information from a third party, the portal will collect this information before doing checking.
- AE.3.3. If there is a violation in a rule, it provides advices for the user how to improve his business plan.

AE4 Provide different forms for starting a business

- AE.4.1. Depending on the type of the AE's business, provide the checklist with different steps the AE needs to pass to start his business
- AE.4.2. Generate different types of reports for different stakeholders based on the AE's answers

AE5 Marketplace

- AE.5.1. A place where the AE can request a certain kind of resource: expert, investment, labor etc.
- AE.5.2. Search the actors who have these resources and introduce them to the entrepreneur

AE6 Web store

AE.6.1. Manage a web store place where AE can manage his documents

AE.6.2. Provide administrator rights(CRUD) for a AE with his own (not other people's) web store place

AE7 Forum

- AE.7.1. A meeting place for entrepreneur or aspirant entrepreneur to communicate with each other.
- AE.7.2. Post, delete and modify his thread and comments in the forum

5.1.2.2.3 Entrepreneur (E)

E1 Create an execution business data

After the new entrepreneur starts his business, an execution business data of his business will be input to the portal through a question list, then by comparing between the planning information and executing information; the portal can provide the advices of what the new entrepreneur should do next in order to meet his planning goals.

- E.1.1. Provide the question list about his business execution data for a certain period of time.
- E.1.2. Get the answers (real business information) from the user
- E.1.3. Generate or update his execution business data
- E.1.4. Guide the entrepreneur how to answer a question
- E.1.5. Save his execution business data answers after certain steps

E2 Get advice for his execution business data

- E.2.1. Check the execution business data using the checking rules and the data from the business plan
- E.2.2. If there is a violation in a rule, provide advices on how the user can improve his business
- E.2.3. Depending on the phase of the business, provide a checklist with different steps in which the entrepreneur needs to do in order to operate his business
- 5.1.2.2.4 Business plan experts (EP)

EP1 Create and manage the question list

- EP.1.1. Provide a place where an expert can input a question, type of the answer for this question, suggesting answers and explanation of this question
- EP.1.2. Arrange the order of these questions

EP2 Create and manage checking rules

- EP.2.1. A place where an expert can input checking rules, advises for the user. These rules will be used to evaluate the business plans and the execution business data
- EP.2.2. In case of changing the question list, provide a place where an expert can set up how to migrate user's information to the new question list system.

5.1.2.2.5 Site Manager (M)

M1 Manage users and their rights

M.1.1. Provide a place where an M can manage the user and their right with the resources of the portal

M2 Manage announcement to all the user

- M.2.1. Create, update, delete the categories and announcement to the users
- 5.1.2.2.6 Stakeholders (S)

S1 Resource provider

- S.1.1. Provide a place where resource providers can introduce their resources to the portal
- S.1.2. Provide a place where the portal can introduce their resources to the entrepreneur

S2 Access into the entrepreneur report

After their resources are used by an entrepreneur, this stakeholder can ask the entrepreneur the payment and right to access into some parts in the entrepreneur's information

S.2.1. Provide a place where the stakeholders can access to a certain report in an entrepreneur's plan where they have the authority from the entrepreneur

In this part, although we specified the requirements of the business portal, it is not sure whether these requirements can or cannot completely support the business processes of the business portal. Therefore, in the following part, DEMO models are developed to capture the business operations of the portal. By comparing with the business processes in DEMO models, the requirements will be updated if necessary.

5.2 Interaction Model

5.2.1 The story line

In order to develop DEMO models of our Business Portal, we will use an explanation case and the story line. Both of them will express the operation of this Business Portal

5.2.1.1 Explanation case

Joe is a student at EEMCS faculty of TU Delft University. Although his major is software engineering, he spends a lot of time for camera and photos. Once time, he had noticed that one of his pictures had a problem. When he took a picture of a man, he missed this man's head. Then, he was thinking about programming a piece of software which can help people recover this kind of pictures.

After two months working, Joe has finished the program. At the same time, he started thinking why he does not make his own business with this program? In order to start his business, he needs a business plan, invested money and more supports for his work. By searching on the internet, Joe found Business Portal and decided to choose this portal as the starting point for his own business.

Following is the operation of the Business Portal that Joe will use for his business. At the beginning, he comes to the portal as a visitor. He can become a member of the portal before he creates his business plan. After that, he starts his own business and communicates with other actors through the supporting functions in the portal.

5.2.1.2 Business portal's story line

One can come to the Business Portal intentionally or unintentionally. For the intentional visitors, they are the ones who have a business idea and want to transform this idea into real business.

Article 2111¹⁷ : Visitor assesses his entrepreneurial skills

First of all, every visitor can ask the Business Portal an advice whether they are suitable to become a business man by choosing to do an entrepreneurship potential test. This visitor needs to input some personal information for example: his name, birthday, sex, address, and education level. Depending on how old the visitor is, the Business portal provides a suitable test with different questions about the visitor's characteristics. A form for fulfilling visitor's information is provided. After he finishes his answers, he can click a button to send it to the portal. After receiving his answers, the portal will compare the answers with the standards and will decide the score (with scale 10) for this visitor. If he gets high score (>5), he is advised to become an

¹⁷ The name of the article is chosen from the Businessmen in the project

entrepreneur. Otherwise, the portal will tell him what he needs to improve in order to have enough quality for an entrepreneur or he needs to give up his business idea.

When fulfilling the answers for the question list, the visitor can choose to save his answers (in order to comeback and finish it later). Only registered member of the portal can save his answers and only he can reuse his personal information.

Article 2112: Visitor registers to become a Business Portal's membership

One can become a member of the Business Portal by filling his personal information (some personal information can be re-used if this visitor already provided in the entrepreneurship potential test) through the register page of the portal. In that form he has to mention personal data including: surname and first name, birth date, sex, telephone number, and postal address (street, house number, zip code, and residence) and his email address. The system then checks whether the information provided is complete. If not, a request is sent back to him in order to complete the data. If this form is completed, the system will then send a confirming email to his email address including an active link for his application.

After this person reads his email and clicks on the link to activate his account, the system will record him as a member of the site, and then his information is added to the member register. This is the database used to manage the member information. If the system does not receive the active link from this person, it will refuse him as its member. From the time a visitor's account is activated, he becomes an aspirant entrepreneur (AE) in the portal.

Article 2113: Aspirant Entrepreneur pays and creates a business plan

As a member of the Business Portal, AE can request to create and manage his business plan in the portal. After receiving his request, the system will calculate the fee (for instant 5 Euro per month) that a member has to pay before creating his business plan.

The system then will send an invoice (with a reference number) to him for the payment. Payments have to be performed by bank transfers, credit card or PayPal and the reference number needs to be mentioned. As soon as the payment is received, a notifying email is sent to the AE in order to inform him that he can continue to create and manage his business plan.

In order to create the business plan (after meeting all requirements about membership and payment), The AE needs to provide information including: his business idea, financial planby answering a list of questions provided by the Business Portal. A form for fulfilling AE's business plan answers is provided and after he finishes his answers, he can choose a button to save (send) it to the portal. These questions will be divided into the following areas: Market information, Customers, Products, Process, Resource, Stakeholders and Financial information.

Article 2114: Aspirant Entrepreneur can require knowledge from the portal (help functions provide information depending on the current content of the AE)

Before answering any question, the portal will provide the AE an explanation of what this question is about and guidance how to answer it. Guidance can be showed by: the options for the answer, an example of the answer, or the relation between this answer and other parts of the business plan

Each answer from the AE will be automatically sent to the portal for basic information checking right after the AE answers it, for example: after the AE answers about his future business name, the portal will request the information from the www.kvk.nl database to check the availability of this name. This basic checking is done by some defined rules created by business experts. In addition, if these rules need information from the third parties (like the kvk in the above example); the portal will access information from these third parties in order to check the AE's answers.

Article 2115: Aspirant Entrepreneur requests verification for his business plan After finishing the answer part, the AE can ask the portal to get assessment in his business plan. The business plan will be based on the checking rules provided by business experts in order to check the completeness of the whole plan. If there is a violation in a rule, the portal will provide advices how the AE can fix it.

Article 2116: Aspirant Entrepreneur can print out forms

Also based on the AE's answers, the business portal can generate different types of report for the stakeholders including

- Articles association
- Registering the company with government bodies
- Realize a bank account

Article 2117: Portal keeps track of changing status of Aspirant Entrepreneur

In order to inform the Business Portal that an AE becomes the real entrepreneur (E), this AE needs to mark a checkbox of changing state into entrepreneur. Then the business portal provides a place to input his real business information (company information) including tax number, bank account ... and upload his registered (with the governments) documents. After finishing this step, the AE can confirm his changing status into a real entrepreneur (E).

Article 2118: Entrepreneur manages his executing business data

As a real entrepreneur, an executing business data part (with real business data) can be created in the business portal. Like the business plan, an executing business data can be done by answering a list of questions. A form for fulfilling business information is provided and after he finishes his answers, he can choose a button to save it in his executing business data part.

Article 2119: Entrepreneur requests Portal a verification or comparison of his executing business data again the corresponding business plan

After finishing the answer part, the entrepreneur can ask the portal to get assessment in his executing business data part. This time, the checking rules are applied to compare the implementation and the business plan (which is done before). If there is a violation in a rule, the portal will provide advices how the user can fix it. In addition, depending on the phase of the business (five phases), the checklist with different steps the E needs to do in order to operate his business is provided

Article 2120: Aspirant Entrepreneur or Entrepreneur requests free information or buys services in the Market place

A Market place is another function of the Business portal for both AE and E. In this function, the Business portal places a role as an intermediate to match the E's (or AE's) needs with the stakeholders' supply. The suppliers (of these products: labor, funding, goods...) need to register (and sign a contract) with the business portal before providing their goods or services. The subscription fees for them are fixed depending on the chosen period and their types of products. In addition, besides this subscription fees, both entrepreneur and stakeholder pay fixed fees when a matchmaking is realized.

Once Business portal receives resource requests from the entrepreneur (type of resources, prices, quantity ..., it provides a list of available resources (all of them meeting the entrepreneur's requests) to the E for selecting. Once the E has accepted one of the offers, he pays the reservation fee. He has to pay also the cost of the selected resources. Then, Business Portal contacts with the resources providers for real order the chosen resources. If the resource is available and the provider accepts this order, he needs to pay the matching-fee, and will be paid the cost of the resource. Once this is done, the service is considered finished. If the provider does not accept the order or he does not have available resource, then a refund will be sent back to the entrepreneur together with the list of other providers for the same resource.

5.2.2 The Performa-Informa-Forma Analysis

The first step of the DEMO analysis is describing the activities in the ontology level. In order to do so, we first distinguish the Performa items, Informa items and Forma items [7] for the above storyline. We apply the following rules to analysis of the Business Portal description:

- Red for Performa items, green for Informa items, and blue for Forma items
- An actor role between the brackets "[" and "]" and colored orange
- A C-act/ result between the brackets "(" and ")"
- A P-act/ result between the brackets "<" and ">".

This distinction will help us to identify the transactions of the systems. It will also help us to determine the initiator(s) and the executor of each transaction. These transactions are displayed in a transaction result table (TRT), which includes the types of the object world facts resulting from these transactions. The network of business transaction is expressed in the Actor transaction diagram (ATD) and more detailed information of the business portal will be revealed in the explanation part.

One can come to the Business Portal intentionally or unintentionally. For the intentional visitors, they are the ones who have a business idea and want to transform this idea into real business.

Article 2111: Visitor assesses his entrepreneurial skills

First of all, every [visitor] can ask the Business Portal an advice whether they are suitable to become a business man by (choosing to do) an entrepreneurship potential test. This visitor needs to input some personal information for example: his name, birthday, sex, address, and education level. Depending on how old the visitor is, the Business portal (provides a suitable test) with different questions about the visitor's characteristics. A form for fulfilling visitor's information is provided. After receiving the answers, the portal will compare his answers with the standards and will decide the score (with scale 10) for this visitor. If he gets a high score (>5), he is <advised to become an entrepreneur>. Otherwise, the portal will tell him what he needs to improve in order to have enough quality for an entrepreneur or he needs to give up his business idea.

When fulfilling the answers for the question list, the visitor can choose to save his answers (in order to comeback and finish it later). Only registered member of the portal can save his answers and only he can reuse his personal information.

Article 2112: Visitor registers to become a Business Portal's membership

[One] can become a member of the Business Portal by filling his personal information (some personal information can be re-used if this visitor already provided in the entrepreneurship potential test) through the register page of the portal. In that form he has to mention personal data including: surname and first name, birth date, sex, telephone number, and postal address (street, house number, zip code, and residence) and his email address. The system then checks whether the information provided is complete. If not, a request is sent back to him by email in order to complete the data. Until this form is completed, the system will then (send a confirming email) to his email address including an active link for his application.

After this person reads to his email and (clicks on the link to activate his account), [the system] will record him as <a member of the site>, then his information is added to the member register. This is the database used to manage the member information. If the system does not receive the active link from this person, it will (refuse him as its member). From the time a visitor's account is activated, he becomes an aspirant entrepreneur (AE) in the portal.

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As a member of the Business Portal, AE can request to create and manage his business plan in the portal. After receiving his request, the system will calculate the payment (for instant 5 euro per month) that a member has to pay before creating his business plan.

The system then will (send an invoice) (with a reference number) to the AE for the payment. Payments have to be performed by bank transfers, credit card or Paypal and the reference number needs to be mentioned. As soon as (the payment is received), a notifying email is sent to the AE in order to inform him that he can continue to create and manage his business plan.

In order to create the business plan (after meeting all requirements about membership and payment), The AE needs to provide information including: his business idea, financial planby answering a list of questions provided by the Business Portal. A form for fulfilling AE's business plan answers is provided and after he finishes his answers, he can choose a button to save (or send) it to the portal. These questions will be divided into the following areas: Market information, Customers, Products, Process, Resource, Stakeholders and Financial information.

Article 2114: Aspirant Entrepreneur can require knowledge from the portal (help functions provide information depending on the current content of the AE) Before answering any question, the portal will provide the AE explanation of what this question is about and guidance how to answer it. Guidance can be showed by: the options for the answer, an example of the answer, or the relation between this answer and other parts of the business plan

Each answer from the AE will be automatically sent to the portal for basic information checking right after the AE answers it, for example: after the AE answers about his future business name, the portal will request the information from the www.kvk.nl database to check the availability of this name. This basic checking is done by some defined rules created by business experts. In addition, if these rules need information from the third parties (like the kvk in the above example); the portal will access information from these third parties in order to check the AE's answers.

Article 2115: Aspirant Entrepreneur requests verification for his business plan After finishing the answer part, the AE can ask the portal to get <assessment in his business plan>. The business plan will be based on the checking rules provided by business experts in order to check the completeness of the whole plan. If there is a violation in a rule, the portal will provide advices how the AE can fix it.

Article 2116: Aspirant Entrepreneur can print out forms

Also based on the AE's answers, the business portal can generate different types of report for the stakeholders including

- Articles association
- Registering the company with government bodies
- Realize a bank account

Article 2117: Portal keeps track of changing status of Aspirant Entrepreneur In order to inform the Business Portal that an AE becomes the real entrepreneur (E), this AE needs to mark a checkbox of changing state into entrepreneur. Then the business portal provides a place to input his real business information (company information) including tax number, bank account ... and upload his registered (with the governments) documents. After finishing this step, the AE can confirm his changing status into a real entrepreneur (E).

Article 2118: Entrepreneur manages his executing business data

As a real entrepreneur, an executing business data part (with real business data) can be created in the business portal. Like the business plan, an executing business data can be done by answering a list of questions. A form for fulfilling business information is provided and after he finishes his answers, he can choose a button to save it in his executing business data part.

Article 2119: Entrepreneur requests Portal a verification or comparison of his executing business data again the corresponding business plan

After finishing the answer part, the entrepreneur can ask the portal to get assessment in his executing business data part. This time, the checking rules are applied to compare the implementation and the business plan (which is done before). If there is a violation in a rule, the portal will provide advices how the user can fix it. In addition, depending on the phase of the business (five phases), the checklist with different steps the E needs to do in order to operate his business is provided

Article 2120: Aspirant Entrepreneur or Entrepreneur requests free information or buys services in the Market place

A Market place is another function of the Business portal for both AE and E. In this function, the Business portal places a role as [an intermediate] in order to match the E's (or AE's) needs with the stakeholders' supply. [The suppliers] (of these products: labor, funding, goods...) need to register (and sign a contract) with the business portal before providing their goods or services. The <subscription fees> for them are fixed depending on the chosen period and their types of products. In addition, besides this subscription fees, both entrepreneur and stakeholder cpay fixed fees> when a <match-making is realized>.

[Once Business portal] receives resource requests from the entrepreneur (type of resources, prices, quantity ...), it provides a list of available resources (all of them meet the entrepreneur's requests) to the E for selecting. Once the E has accepted one of the offers, he pays the reservation fee. He has to pay also the cost of the selected resources. Then, Business Portal contacts with the [resources providers] for real order of the chosen resources. If the resource is available and the provider <accepts this order>, he needs to pay the matching-fee, and will be paid the cost of the resource. Once this is done, the service is considered finished. If the provider does not accept the order or he does not have available resource, then a refund will be sent back to the entrepreneur together with the list of other providers for the same resource.

5.2.3 Transaction result table (TRT)

Based on the above Perfoma-Informa-Forma analysis, the following transactions can be identified in the below TRT

Transaction Name	Result		
T01 entrepreneurship potential advice	R01: Advice A to become or not to become an entrepreneur is provided		
T02 membership of the business portal	R02: Membership M has been started		
T03 creating business plan	R03: Business plan BP has been created		
T04 business plan and executing business data payment	R04: The fee for creating business plan and executing business data in year Y has been paid		
T05 business plan assessment	R5: Business plan BP has been assessed		
T06 checking outside source	R6: The source of information S has been provided by a third party		
T07 creating executing business data (implementation information)	R07: Executing business data EP has been created		
T08 executing business data (implementation information) assessment	R8: Executing business data EP has been assessed		
T09 annual question list and checking rules control	R09: Question list and checking rules control for period P has been done		
T10 order resource	R10: Resource R has been ordered		
T11 reservation fee	R11: Reservation fee of resource R is arranged		
T12 order payment	R12: The payment of order O is arranged		
T13 provider subscription	R13: Subscription S has been arranged		
T14 subscription payment	R14: The fee for year Y by provider P is paid		
T15 Resource compensate	R15: Provider P is compensated for the resource R		
T16 Matching fee	R16: Matching fee of resource R is arranged		
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T17 Resource payment	R17: The payment of resource R is arranged		
T18 match-making	R18: match M is made		

Table 3: Business Ontology TRT

5.2.4 Detail actor transaction diagram ATD

All the transactions in the TRT table will be expressed in the detail ATD which visualizes the initiator(s) and executor of each transaction. It also shows the boundary and the relationship between these transactions; the explanation for this diagram will be showed in the later section.



Figure 11: ATD of the Business Portal

Source: Adapted from Jan L.G. Dietz [7]

5.2.5 Explanation of detail ATD

5.2.5.1 Note for the detail ATD

In the ATD, there are two kinds of actor role, the environmental actor role (starts with CAxx) and elementary actor role (starts with Axx). The environmental actor role is outside of the system while the elementary is inside and presents one atomic amount of authority and responsibility. In the practical way, the elementary actor of a transaction (Txx) who plays the role of the executor will be put the same number (Axx) with this transaction. For example: the executor of transaction T02 is A02-Register.

In the environmental actors of the business portal, there are two types of member: aspirant entrepreneur and entrepreneur. Thus, we divided them into 2 actors: CA021 Member (Aspirant Entrepreneur AE) and CA022 Member (Entrepreneur E). As stated in the storyline, an aspirant entrepreneur will become an entrepreneur if he gets the acceptance from the government for registering his business.

5.2.5.2 Explanation of detailed ATD

Each transaction in the above diagram can explain one or many interaction(s) between the organization and its environment. In this part, we will provide more explanation for these transactions to get the complete picture about the organization.

In DEMO methodology, the ATD captures not only the organizational parts which are supported by "to be built" business portal but also all the operations of the whole organization. It means that in the above transactions, some of them can be carried out by normal communication between human beings. The others can be operated by an information system. The separation between which transaction will be supported by software ("to be built" business portal) and which one will be done by normal communication will be showed in the <u>Mapping DEMO models and requirements table</u>

Firstly, T01 and T02 in the ATD diagram mean that a visitor (initiator) can request to have entrepreneurship advice and to become a member of the business portal. These requests will be operated by the executors (Entrepreneurship potential adviser and Registrar). After the executors check their business rules, they will promise (or decline) with the requests. Then, they will execute the transactions. That means one or many other activities are actually performed by the executors in order to finish the execution. The results of the execute step will be stated to the initiator and if the initiator accepts these results, the transactions are finished.

Besides the basic transaction pattern of T01 and T02, a transaction sometimes is enclosed to other transactions as we will see in the payment transaction. T04 Membership payment is the enclosed transaction of T03 and T07. These are the business plan transaction and the executing business data transaction. It means that the payment needs to be paid before the first time the member creates either the business plan - T03 or the executing business data - T07. Thus, there are two initiators for transaction T04.

Thirdly, for every created business plan, the aspirant entrepreneur can ask for the assessment of this business plan and T05 is the transaction to perform this activity. To perform the assessment, it is sometimes necessary to ask the information from a third party outside our portal – T06, so T06 is an enclosed transaction of T05. In this case, the operation of transaction T05 needs to wait for T06. After T06 finishes, T05 has enough information and can continue its execution.

In enclosed transaction structure, a transaction will be initiated by other transactions. Another way to initiate a transaction is a self activation transaction. T09 – Annual question list and checking rule control - is an example. It means that this transaction will be activated by itself after a period of time. In addition, when the checking rule is changed, the business plan and the executing business data need to be re-assessed. Therefore A09 is also the initiator of T05 and T08. For instance: Assume that one checking rule of business plan is "the interest of the business needs to be larger than the bank interest (at this time is 2%)". Then, whenever the interest of the bank changes (5%), T09 is active and as the result of T09 performance, T05 is initiated. The business plan needs to be re-assessed and advises will be given to the owner of this business plan.

Fifthly, as a member, user of the portal can request certain resources – T10. The executor of T10 is A10 – resource orderer who will ask this member to pay the reservation fee for the requested resources. Although the "member" is the one who books the resources, the actor paying for these resources can be a different one, such as his company. Therefore, we choose different actor for the resource payer – CA08. After finishing all the payment, the resource orderer will forward the order to the match making in order to find the provider for this order.

These resources are provided by the resource provider – CA04. Before he can introduce his resource in our portal, he needs to do subscription – T13 and payment –T14. When there is an order which is appropriate to the resource provider, the match maker will ask the provider to provide these resources – T15, if he agrees with the order, he needs to pay the matching fee –T16 – before receiving the payment for the resource – T17. At that time, the match making transaction T18 is finished.

The combination between the TRT and ATD constitutes the Interaction Model of the organization. Each transaction in the Interaction Model includes different steps which will be express visually in the Process Model.

5.3 Process Model

In the previous part, the IAM provided the overall picture about the operation of our organization through the transaction concept. According to [7], the detailed steps of each transaction appear in some generic pattern and the basic pattern includes request, promise, state, and accept step. In this part, the above mentioned

transactions will be developed into detailed steps which show the root of the business processes of the business portal.



Transaction T01 Entrepreneurship potential advice & T02 Membership Registration

Figure 12: Process Model - T01 and T02 Source: Adapted from Jan L.G. Dietz [7]



Transaction T03 Business Plan & T04 Business Plan payment Transaction T05 Business Plan assessment & T06 Outside Source Checking

Figure 13: Process Model - T03, T04, T05 and T06

Source: Adapted from Jan L.G. Dietz [7]





Figure 14: Process Model - T07 and T08 Source: Adapted from Jan L.G. Dietz [7]



Transaction T09 Updating question list and checking rule

Figure 15: Process Model - T09

Source: Adapted from Jan L.G. Dietz [7]



Transaction T13 Provider subscription & T14 subscription payment

Figure 16: Process Model - T13 and T14

Source: Adapted from Jan L.G. Dietz [7]



Transaction T10 Order resource & T11 Reservation payment T12 Order payment & a part of T18 Resource Match maker







Source: Adapted from Jan L.G. Dietz [7]

5.3.1 Explanation of the Process Model

With the steps in the above PM, the structure of the business process in the Business Portal has been showed. For each step, we know what the previous and its following step are, who is responsible to perform this step, and if this step needs to wait for a certain condition before performing. Comparing with the activity diagram in RAD, the sequence steps in the activity diagram can be derived from the sequence steps in the Process Model. In other words, if necessary, we can develop the activity diagram based on the Process Model.

In the following section, we will explain the Process Model in more detailed.

Transaction T01, T02 and T08 are the examples for the basic pattern of transaction. A visitor requests some services from our portal. After checking that the number of requests is smaller than the number of request which the portal can handle, our portal will promise with this visitor and start to execute it. Then the portal states the result back to him and if he accepts it, we finish the transaction.

Besides the basic transaction pattern, we have some transactions which are enclosed to others such as T04 is enclosed to T03 and T07, T06 is enclosed to T05, and T14 is enclosed to T13. With these transactions, in the promised step of the main transaction, the executor performs two actions: the first one is the execute step, and the second one is a request to activate the enclosed transaction. Then, from this time, the enclosed transaction will be performed. The execute step of the main transaction needs to wait until the enclosed transaction is finished (the dashed arrow). After completing the enclosed transaction, the main transaction can be performed and completed.

In our portal, updating the question list and checking rules transaction – T04 will be done every quarter of the year. Therefore, this is a self activation transaction. In a self activation transaction, it will be activated periodically and it will be showed in the Process Model by a cycle arrow in the request step of T09. Therefore, in the request step of T09, two acts are performed, one is the promise of T09 and the other is the request for the following T09.

Because T10, T11, T12, T15, T16, T17, and T18, have the interrelation, it makes this part of PM is the most complex one in our PM. When the resource orderer performs the promise to a T10rq, he will perform several activities: he asks the reservation payment and order payment for this request. He also activates T18 request for resource match making transaction, but this request is only performed after finishing the payment in T11 and T12.

When the match maker receives T18 request, he will search an appropriate resource provider for the order - T15rq and this resource provider needs to pay for the matching fee - T16rq. Besides, the resource provider will ask the payment for his provided resource. The transaction T18 is only executed after finishing T15, T16 and T17. With the completion of T18, the order resource transaction T10 is performed and the result will be stated to the member.

With every detailed step in the PM, one or many activities can be performed in the implementation level. For example, inside the request to become a member of our portal, we need firstly to provide a channel for him to input his request, then, we need to provide him a form to fulfill his information, we also check the completeness of his fulfill information and correct it if necessary before we promise to him. In other words, there will be one or many corresponding requirements for every detailed step and that will be clarified in the following mapping table.

5.4 Mapping DEMO models and requirements table

In the previous part, we developed the IAM and PM of DEMO models. The transactions and steps from these models can help to capture the business process of the organization. In this part, these transaction steps will be used combining with the software requirements to make sure that each step receives the suitable support by our "to be built" system.

This table is built based on the technique which has been described in the "<u>Update</u> requirements definition" section. The main idea is that with every step in the process model, we will specify whether it receives the support from the business portal. If the answer is Yes (**Y**), there should be some corresponding requirements for this step. Otherwise, we are missing some requirement(s), and they need to be updated in the next section.

Transactions	Steps	Conditions	Supported by "to be built" system	Requirements ¹⁸	Note
	T01–rq	#rq<	Y	V.1.1, V1.2	
T01		maximum			
entrepreneurs		#rq			
hip potential	T01–pr		Т		Performed tacitly
advice	T01-ex		Y	V.1.3	
	T01-st		Y	??	Missed ¹⁹ a requirement - a
					place to show advises
	T01–ac		N		
	T02–rq		Y	V.1.5	
T02	T02–pr		Т		
membership of the	T02-ex		Y	M.1.1	Although we accept automatically almost all
business portal					application for membership, the Site Manager can use M.1.1 to execute (or refuse)

¹⁹ Missed - : Missed a requirement

					a certain application
	T02-st		Y	??	Missed – Function to send
					active email to the user
	T02-ac		Y	??	Missed – Function to
					activate user when he clicks
					on the active link
	T01-ra		Y	AF 2.1 AF 2.2	
T03 Creating	T01_pr		T.		Performed tacitly
business plan	T01-0V	T04-ac	· · · · · · · · · · · · · · · · · · ·		
	TUTECX	(navment)	•		
	T01_et	(payment)	v		
	T01-50		I	AL.4.2	
	TOT-ac		N		
	TOA				
T 04	101–rq		Ŷ	AE.1.1	
104					
Membership					
payment	T01–pr		Ν		
	T01-ex		Ν		
	T01-st		Y	AE1.3	
	T01-ac		Y	??	Missed – Function to inform
					the user that we accept his
					payment and he can
					continue with his paid
					services
	T01-ra		Y	??	Missed - A place for AE put
T05 Business			-		his request for assessing his
plan					BP
assessment	T01–pr		т		Performed tacitly
accocciment	T01-ex	T06-ac	У	ΔF 3 1	
		(Checking	•	//L.0.1	
		outside if			
		necessary)			
	T01_et	necessary)	v		
	T01-51			AE.3.2	
	101-ac		<u>N</u>		
	T01 rg		V	22	Missed A place to cond the
TOC Checking	roi–rq		T	"	wisseu - A place to send the
					request for checking outside
outside	T 04				
source	101–pr		<u> </u>		Performed tacitly
	T01-ex		N		
	T01–st		Y	??	Missed - A place to receive
					checking results

	T01-ac		N		
	•				
	T01–rq		Y	E.1.1, E.1.2	
T07 creating	T01–pr		Т		Performed tacitly
executing	T01-ex	T04-ac	Y	E.1.3	
business data		(payment)			
	T01-st		Y	??	Missed - A place for the user
					to print out his
					implementation information
	T01–ac		N		
	T	I	r	-	
T08 executing	T01–rq		Y	E.2.1	
business data	T01–pr		Т		Performed tacitly
assessment	T01-ex		Y	E.2.1	
	T01-st		Y	E.2.2, E.2.3	
	T01–ac		N		
	T	I	r		
T09 Question	T01–rq		Y	EP.1.1	
list and	T01–pr		Т		Performed tacitly
checking rule	T01-ex		Y	EP.1.1, EP.1.2	
control	T01-st		Т		
	T01–ac		Т		
	1	1			
	T10–rq		Y	AE.5.1, S.1.1	
T10 Order	T01–pr		Т		Performed tacitly
resource	T01-ex	T18-st	Y	AE.5.1	
	T01–st		Y	??	Missed - A place to show the
					result of his resource
	T 04				ordering
	101–ac		N		
	T 44		V		
T 44	T11-rq		Y N	AE.1.1	
III Reconvetion	T11-pr		N		
Reservation	T11-ex		N		
payment	111–St		ř	AE1.3	Missed Eurotian to inform
	111-ac		Ť	<i>!!</i>	Missed – Function to inform
					the user that we accept his
					continuo with his paid
					services
		1			
	T12_ro		Y	AF 1 1	
T12 Order	T12_pr		N	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
payment	T12-ex		N		
Paymon	T12-07		V	ΔF1 3	
	T12-30		v	22	Missed – Function to inform
	112-00				

					the user that we accept his
					payment and he can
					continue with his paid
					services
	T13–rq		Ν		At this time, the provider
T13 Provider	T13–pr		N		needs to sign a contract in
subscription	T13-ex		N		order to provide his services
	T13-st		N		in our portal
	T13-ac		N		This transaction will be done
					in the traditional way
	1		ſ		
	T13–rq		N		At this time, after the
T14	T13–pr		N		contract, he also needs to
Subscription	T13-ex		Ν		рау
payment	T13-st		Ν		This transaction will be done
	T13-ac		Ν		in the traditional way (bill and
					bank transfer)
	I		ľ	1	
	T15–rq		N		This transaction will be done
T15 Resource	T15–pr		N		by phone
compensate	T15-ex		N		
	T15-st		N		
	T15–ac		N		
	T16–rq		N		This transaction will be done
T16 Matching	T16–pr		N		in the traditional way (bill and
fee	T16-ex		N		bank transfer)
	T16-st		N		
	T16-ac		N		
	T17–rq		N		This transaction will be done
T17 Resource	T17–pr		N		in the traditional way (bill and
payer	T17-ex		N		bank transfer)
	T17-st		N		
	T17–ac		N		
	T18–rq	T11-ac,	Т		Performed tacitly after
T18 match		T12-ac			receiving payment
making	T18–pr		Т		Performed tacitly (T11-ac,
					T12-ac)
	T18-ex		Y	AE.5.2	
	T18-st		Y	??	Missed a requirement - After
					the match maker finish the
					resource compensate
					transaction (by human

		being), match maker needs to input to the system that the provider will agree to provide a certain type of resource
T18–ac	Т	Performed tacitly

Table 4: Mapping DEMO models and requirements table

5.4.1 Explanation of the mapping table

The mapping table not only shows the business processes of the organization but also clearly defines roles of the information system in each step. By following this table, we will know that each business step will receive the support from the information system. In addition, the missing requirements can be also identified.

There are many functional requirements which do not appear in the above table, such as: requirements about Help Desk, requirements about Forum... as well as all the non-functional requirements. It does not mean that these disappeared requirements are not important. In contrast, they are important. Although they do not directly support the transaction steps (transaction steps are in the Performa level), these requirements can support the information level, data level of the business. They can also take into account some special requirements from the users (such as M2 – Manage announcement to all the users).

Because the main focus of the "to be built" portal in this project is to implement the functions where the business portal communicates with the entrepreneur, almost all transactions with the provider (T13, T14, T15, T16 and T17) will be done without the support of the information system. Therefore, there is no current requirement corresponding with these transactions. In the future, if these transactions are decided to get support from the information system, more functions and requirements need to be added.

By identifying the missing requirements, we will have an opportunity to update the requirements list before we come into further phases.

5.4.2 Updating the functional requirements

After the previous step, the list of requirements needs to be updated to make sure that all the transaction steps, which need to get support from the "to be built" software, will receive these supports and there are some corresponding requirements for these steps. It means that, if we have "??" in a column, this column needs to be checked with the user to analyze whether we are missing a requirement or not. In the following part, the additional requirements for our "to be built" portal will be described.

V1 Access visitor's Entrepreneurship potential

V.1.6. Show the advices for the user's entrepreneurship potential

- V.1.7. Provide a function to send active email to the user
- V.1.8. A function to activate user when he clicks on the active link

AE1 Payment function

AE.1.4. Inform the user that the portal accepts his payment and he can continue with his paid services

AE3 Get assessment for business plan

- AE.3.4. A place for AE putting his request for assessing his business plan
- AE.3.5. A function to send the request for checking outside source
- AE.3.6. Receive outside source checking results and using it in the checking rules

E1 Create an executing business data

E.1.6. A place for the user to print out his executing business data

AE5 Marketplace

- AE.5.3. Show the result of his resource ordering
- AE.5.4. Provide a function to inform the user that we accept his payment and he can continue with his paid services

M3 Manage resources order

- M.3.1. A place to check the order from the entrepreneur
- M.3.2. After the match maker finish the resource compensate transaction (by human being), match maker needs to input to the system that the provider will agree to provide a certain type of resource.

5.5 Conclusion

In this part, we have followed the new framework to successfully develop the requirements list, IAM and PM. After comparing DEMO models and the requirements list, we can update the missing requirements for our Business Portal. These steps help to capture the business process of the business portal as well as improve the requirements definition. In other words, this framework has proved its efficient way of working.

Besides the added value of each step which we have discussed in the previous parts, this framework provides additional help in our project.

Firstly, with the storyline, ATD and PM, they increase the communication capability of the project. At the beginning, when we discussed certain parts of the business portal, we needed to spend much effort to explain its context. After developing these models, we can refer to certain transaction and certain step before the discussion. In our case, there are many small projects that are operated inside the business portal project, the ATD helps to position what project is focusing on what part of the portal.

Secondly, before developing the framework, there was no document about the business processes of the portal. The PM helps to capture this important aspect. Through the PM, the order of steps and who is the responsible one to perform a certain activity are clear. Therefore, it can also be used for human resource planning or management purpose. Although in our case, we do not redesign and reengineering the organization (we have not had an organization yet), the IAM and PM can help to do it in other cases.

Finally, the mapping table is the tool to connect the business (Performa) level with the implementation level. It helps to update the missing requirements. We can make sure that we have the complete requirements for the "to be built" portal which can support the business process of the organization. Moreover, this table also shows the activities performed tacitly. Although these steps do not need supporting function(s) for them at this time, they can become a part of our information system in the future.

In the previous part, we have not yet developed the use case diagram of the portal although it is a step introduced in the framework. The reason is that use case diagram and use case description need to be developed in very detailed level. It will take a lot of time to construct all the use cases of the business portal. Therefore, this part will be postponed to the next chapter where we will specify which functions will be chosen to design and implement in the prototype.

6 Building the prototype for the business portal

In the previous chapter, we have already captured the business operation of the organization and the requirements for its information system. To verify the completeness of the defined requirements as well as to prove the concept of the Business Portal, a prototype of the Business Portal will be developed. From this time, RAD will be used as the methodology for our work.

Due to the limitation of time, we will not build all the above mentioned requirements, but mainly focus on the essential functions of the Business Portal which are described in detail in the Prototype's scope part. Besides, the analyses performed by applying the framework in the previous part, Use case²⁰, class diagram, and sequence diagram will be used to analyze the chosen requirements in this section.

6.1 Prototype's scope

Here is the list of the main functional requirements²¹ for the prototype. These requirements include child requirements which we describe in the "<u>functional</u> <u>requirements</u>" and "<u>updating requirements</u>" section.

- 1. V1 Access visitor's Entrepreneurship potential
- 2. V2 Provide information to the visitors
- 3. V4 Log in into the portal environment
- 4. AE1 Get payment
- 5. AE2 Create a business plan provide question list and input form
- 6. AE3 Get assessment for his business plan
- 7. AE4 Provide different forms for starting a business
- 8. M1 Manage users and their rights

Besides the above requirements, we also specify the optional requirements; the functions related to the optional requirements will be taken into account in the design phase but they are optional in the implementation phase. We will develop them if we still have time after finishing all eight above requirements.

- 1. E1 Create a executing business data²²
- 2. M2 Manage announcement to all the user

These requirements mainly focus on the interaction between our portal with the Visitor, the Aspirant Entrepreneur and the Entrepreneur. We can summarize this interaction in the following ATD diagram.

 $^{^{\}rm 20}$ Use case will be developed as the technique in the framework by combining DEMO and RAD

²¹ Main requirements are chosen based on the reference of owner of the Business Portal

²² The level of detail information in the executing business data will be the same with the "business plan".



Figure 19: ATD for the Prototype

Source: Adapted from Jan L.G. Dietz [7]

6.2 Use case

Use case is a very popular tool in software development. It shows more detailed level of the main elements in requirement definition. It "responds to a request that originates from outside of that system" [29]. Because in the requirement definition part, we choose to write the requirements in less detailed level, it is important now to specify these requirements in depth.

In our framework, use cases will be developed based on DEMO models: IAM and PM. Three steps deriving use cases from DEMO models which were introduced in the "<u>use case</u>" section of framework part, will be used here to develop the use case diagram. The diagram from the third step of the procedure where we derive use case from DEMO model will be showed first. Then, a part of the complete use case will be introduced. The complete use cases diagram, use case definition and different developing steps can be found in <u>Appendix D</u>



Figure 20: Deriving use case from DEMO models – step 3 Source: Adapted from Jan L.G. Dietz [6] Besides the essential components which we can describe based on the DEMO models, there are more activities (in the information and data level) that Business Portal needs to perform. Therefore, we need to add more use case to the above use case diagram before we develop the use case definitions. The result of this step is a complete use case diagram. Following a part of the use case diagram which describes the business plan.





6.3 Class diagram

Class diagram is a static diagram which "describes the structure of a system by showing the system's classes, their attributes, and the relationships between the classes." [23] At this step, class diagram will be used for the conceptual modeling purpose. In the later steps, the class diagram will be organized corresponding to the database and files.



Category			News and Announcement
-Title -Description -Picture			-Title -Description -Picture
+Find news and Announcement()	1	1 0*	+Assess() +Search()

Figure 22: Class diagram of the prototype

Source: Adapted from Alan Dennis and Barbara Heley Wixon [3]

6.4 Sequence diagram

While the class diagram shows the structure of the elements in the organization, the sequence diagram shows their behavior. The sequence diagram describes the objects in a use case and the exchanged messages between them. Since in our prototype, the information exchange between objects is simple, we will not develop the sequence diagram for every use case but only for some main use cases, for example: following is the sequence diagram to create the business plan.



Figure 23: Sequence diagram of the prototype – Create Business Plan

Source: Adapted from Alan Dennis and Barbara Heley Wixon [3]

In this chapter, we specified the scope of the prototype with the list of requirements. These requirements will be defined more detailed in the use cases, class diagram and sequence diagram. In the next chapter, we will start to design and implement a system to meet these requirements.

7 Design and Implementation of the prototype

In this chapter, the conceptual level from the analysis part will be transferred into the concrete design and implementation. Although we still follow the steps in RAD methodology, we will not mention all these steps in this chapter. Our focus is the steps which need more discussion or are specific for our project.

7.1 Design Phase

7.1.1 Introduction

In the design phase, the first and most important choice is to decide the strategies used to build the system. There are three main strategies: building the system from scratch, purchasing a package or outsourcing the system. By comparing these strategies based on some propose criteria in <u>Appendix E²³</u>, the decision is to build the system from scratch by ourselves.

Besides the decision how to build the system, there are some other aspects which will be taken into account in this section. The first aspect is how to capture the business concepts and translate them into concrete pieces of information in our system. We need to find a way to design the question list and checking rules in order to collect and validate the information from the entrepreneur. Secondly, because the Business Portal is developed as a website, the navigation between different functions is important. Finally, we need to specify some guidance for designing its user interface.

7.1.2 Question list and checking rule design

Since there are many business concepts in our business portal, we need to find a formal way to capture them and their relation. This way should reduce the ambiguity between the businessmen (or business expert) and the analysts in order to be able to transfer these business concepts into concrete things which can be implemented. Therefore, the focus of this part is about transforming the business knowledge into the questions and checking rules in the business portal.

Because the chosen method will be used to transfer the knowledge from the business expert to the analyst, it should meet the following criteria

- It can capture the business concepts and the relation between them
- It will be easy to learn and understand
- It will be formal enough to reduce ambiguities and flexible enough to let us describe abstract concepts

²³ The part in Appendix E and question list and checking rule design have got the contribution from the IA design group (Illias Begetis, Miguel Kuster, Ashwin Ramsaran, Shaief Abdoelgafoer, and Nguyen Hoang Thuan)

A semantic network - "a network, which represents semantic relations between the concepts" [27] is a good candidate for our purpose. A semantic network consists of many nodes and edges. A node is used to represent a concept while an edge represents semantic relations between the concepts. Besides, each edge can have a label which names the relation in this edge.

Before we develop the semantic network for the concepts in our prototype, an example for the semantic network will help reader have an overview about it.



Figure 24: An example of semantic network

Source: Adapted from Wiki [27]

- The "is a" label refers to sub-kind relations. It is read as: A concept X "is a" concept Y. For example: Car is a Vehicle.
- The "part of" label refers to aggregation of concepts. An X is "part of" of Y when Y is an aggregation of Xs. For example: a Wheel is part of a Car.
- The "has" relation refers to properties that a concept can have. An X "has" a Y means that the concept Y characterizes X. For example: a Car has a License Number.
- The "instance of" relation refers to an instance of a concept that may be important to include in the semantic diagram. I.e. Ford Focus is a Car
- Other labels can be used in the semantic network

Since the business work is more complex with many concepts, we will have a huge semantic network with many concepts. The glossary which defines the concepts of the business portal can be found in <u>Appendix B</u>. In addition, we also specify some conventions to help easy follow the diagram

- Normal node is put in white color, for example: year, time unit
- The blue nodes represent concepts that are more important in every business, for example: plan, business...
- Gray nodes represent concepts that determine the blue nodes.
- Nodes on brown are explained further in supporting diagrams.



Figure 25: Semantic network for the Business concept

After having the definition for the concepts and the relation between them in the semantic network, these concepts are used to build the questions and the checking rules in our business portal. As we know, the major concepts (blue nodes) have more important information and thus we want to collect from the user. In many cases, these main concepts can be specified by their related (or child) concepts. Therefore, when adding a concept to the semantic network, there are two types of node: note is defined by itself and note is defined by its child concepts. With the following procedure, we will specify how to define the question list and the checking rules for the concepts in the prototype.

- For every concept
 - This concept will be added to the semantic network to verify its relation with other concepts.
 - The definition of this concept will be put in the glossary
 - A question will be designed to collect information for this concept
 - o Checking rules applying for this concept will be designed
- If this concept can be specified by its relation or child concepts
 - o Definition for related and child concepts will be put in the glossary
 - Questions will be designed to collect information for related and child concepts
 - Checking rules applying for some of these concepts (if necessary) will be designed
 - If the main concepts can be fully derived with its children, replace the question for the main concept with a function to generate this main concept from its related and child concepts

With this procedure, the questions, collecting information and checking rules of the prototype can be built. Additionally, in case of parent and children concepts, we can make sure that the detailed information can be used to rebuild the information in the main concepts. By applying this procedure into the semantic network, we developed the question list and checking rules for entrepreneur potential function and business plan function in <u>Appendix F</u>

7.1.3 The website structure of prototype

In the following part, the structure of the website will be introduced. This structure starts with the home page where we show three main functions of the prototype: information center, payment center and creative center (there is one more center for the administrator. However, it is in the backend of the portal, so we do not show it here). These main functions will be more detailed in the below diagram.

Each center includes one or some requirements which will be built in this center. The functions correspond to these requirements will be divided into sub steps. For example: the "entrepreneurship potential" function will be detailed to provide question list, receive answer....

The payment center has the pink color. Since there are some activities need to be paid before executing these activities, a part of the payment (with the pink color) will be put before these activities. That means the payment checking will be performed before these activities. For example, before creating the business plan, the entrepreneur needs to pay.



Figure 26: Prototype's website structure

7.1.4 Interface design

This part will introduce the guidance for designing the user interface, the real design interface will be developed in the implementation phase, and a screenshot of the user interface is introduced in <u>Appendix G</u>

According to [12], the usability of an interface is specified by five quality components:

- Learn ability: It is the "easy to use" ability of the interface for the users to accomplish the basic tasks at the first time they access the interface
- Efficiency: From the second time the users comeback to our website, how fast they can access the tasks they want to perform
- Memorability: When the users do not use the application for sometimes, it should be easy for them to reestablish their performance in the user interface
- Errors: This is the way to handle the errors from the users.
- Satisfaction: This is the pleasure of the users after using the interface

In order to achieve these five above components, in our interface, we will follow the following guidance. This guidance will be grouped into the related design area

General guidance:

- The layout of the interface should be coherent through different pages in the website
- It should be easy to navigate between three main centers
- The users can follow a route to achieve the basic tasks provided in our website (register, log in, create entrepreneur potential test, create business plan...)
- The content in the portal should be grouped into categories

Homepage

- There should be a clear separation between three centers in the website: information center, payment center and creative center.
- The homepage should include an introduction briefly explains what the site is about and what support the users can expect from our sites
- The site owner and the contact information can be accessed from the home page.
- The user can directly log in to his environment from the home page

Input form

- Because we need to collect many different information from the user, the vertical flow (where the label is put in the same line with the text box) is suggested
- The combo box should be used instead of text box to limit the input error from the user
- The default value is suggested for every possible field
- The help information and error information for a field should be placed near this field
- If there is long help information, it should be put into a new window
- Different color should be chosen to show different meanings
 - o Red: Error
 - Yellow: Help and advices

7.2 Implementation Phase

7.2.1 Platform and programming language

In the design part, we decided to develop the prototype by ourselves (<u>Appendix D</u>). Thus, choosing the platform to implement the prototype is important. Since some members in the team are familiar with PHP while others prefer Ruby, they are two platforms proposed to develop our Business Portal. In the following table, we will make a short comparison for these two programming languages (The one starts with "+" has more advantage than the other one.)

Comparison aspect	PHP/ Symfony framework	Ruby / Ruby on Rails
Programming language	PHP - like C++	+ Ruby - Human readable language
Framework	Symfony	Ruby on Rails
Developer availability	+ Widely popular	Developing
Automatically creating MVC and database	+ Supported	+ Supported
MVC (Model - View - Controller) separation	+ Supported	+ Supported
Plug ins - found for our project	+ CMS management + User management (Not for symfony 1.2)	+ CMS management + User management
Easy to study	Normally	+ Easy to comprehend in a short time
Development time	Normally	+ Faster time without too much coding
Portable ²⁴	Need complex install	+ Can run as a package in a certain folder
Hosting	+ Cheap and popular	- Quite difficult and Expensive

Table 5: Compare platform - PHP vs Ruby

Because one of the main purposes of the prototype is to express the concept of the Business Portal and to deliver this prototype to the investors, the development time and portable are two important criteria. Ruby on Rails has advantages on both of these criteria while it is equivalent with PHP in other criteria. Therefore, it is chosen as our development platform.

²⁴ "Portable" means that the user can easily run the application from a package without installation

7.2.2 Testing

According to [11], Ruby on Rails provides three kinds of test. They are: unit tests, functional tests and integration tests. Unit tests are used to validate the model while functional tests are used to test the controller methods. Integration tests allow us to test the application from the user perspective.

Since our focus is to prove the Business Portal concepts, the testing should focus on the creative center where we implement the entrepreneur profile and business plan functions. Therefore, in this part, we will verify the providing advice to the entrepreneur profile and business plan functions. We will use the functional test (calling the assessment method from the controller) to test the assessment of entrepreneurial profile function.

Firstly, we will generate a test case:

phonenumber: 0681519638 education: Master experienceyear: 10 cerificate: parentsentrepreneur: true parentexperienceyear: 10 teammember: 9

File: BusinessPortal/(02)test/fixtures/entrepreneurostentials.vml

Then, by applying our designed checking rules for the entrepreneur potential, this aspirant entrepreneur violates three business rules. Firstly, he is younger than 55. Secondly, he has his working experience but less than 30 (he lost 2 points for this criteria). Finally, the number of his parent's experience year is 10, so he does not get point in this aspect. Therefore, we expect he can get 6 points as his total score.

The following test case is written in which we assert the score of this entrepreneur is equal to 6. Then, as the result of running this test case, it is passed. In other words, the result of our calculation is meeting our expectation.

```
## File: BusinessPortalV02\test\functional\entrepreneurpotentials_controller_test.rb
```

```
class EntrepreneurpotentialsControllerTest < ActionController::TestCase
fixtures :entrepreneurpotentials, :users, :roles, :roles_users
def test_score
get :edit, :id => 1
    entrepreneurpotential = assigns(:entrepreneurpotential)
    score = entrepreneurpotential.score
    assert_equal 6, score
end
end
```

Other test cases and sample data can be found in the "test" folder of the application

7.2.3 Documentation

In this part, first we will shortly introduce Ruby on Rails architecture, then, review this architecture in our implementation. Finally, the complete documentation of the application will be generated and placed in the "document" folder.

7.2.3.1 Ruby on Rails: Model – View – Controller Architecture





Source: Agile Web Development with Rails [16]

The structure of a Ruby on Rails application will be based on the above three types of components: controller, view and model. When a user accesses a URL, linking to a Ruby on Rails application, the request will be sent to a corresponding controller (the decision to choose a correct controller is performed by the router). This controller can call different actions. Then the result of these actions will be sent to the view where they are shown to the users. In addition, if the data processing and business rules relating to the request are complex, they are grouped into the model. Following is more explanation for these three components.

- The controller supervises the whole application. It handles the requests and replies the result to the users. Firstly, it receives events from the outside world. Then, it communicates with the model, and displays an appropriate result to the user through the view.
- The view is responsible for showing the result to the users. Generally, the data in the model will be passed to the view so that we can have the dynamic user interface. In addition, view also to be used to collect the information from the users through some controls like: text fields, list boxes, text areas...
- The model is used to maintain the state of the application. It handles the data processing in the application. Besides, it is also the place to implement all the business rules of the organization.

7.2.3.2 The Business Portal application structure

In the Business Portal application, the model, view and controller will be implemented in the "app" folder. Following is the short summary the folder structure of the application



Figure 28: The file and folder structure of the Business Portal application

Source: Adapted from Agile Web Development with Rails [16]

In order to explain the structure of the Business Portal in more detailed, we will take the business plan function as an example. The purpose of this explanation is to provide the guidance to update this function (add more questions and checking rules... to the business plan). Assume that we want to add information about the phone number of the entrepreneur to the business plan.

Firstly, we will prepare a place in the database to store this new value. The "migrate" folder is the place to put the scripts for managing the evolution of the database. A new script file (or a migrate file) is created by the following command.

ruby script/generate migration add_columns_plan

Within the created file, the scripts are written by Data Definition Language (DDL) statements that define the schema of the database. In our example, the phone number filed is added by the "add_column" command.

```
## File: db\migrate\ 20090401204500_add_columns_plan.rb
class AddColumnsPlan< ActiveRecord::Migration
    def self.up
        add_column :plans, :phonenumber, :string
    end
    def self.down
    end
        remove_column :plans, :phonenumber
    end</pre>
```

end

There are two methods in the above code: up and down. These methods will be used to manage the evolution of the database. It means that after we run the "up" method to add a new field to the "plans" table, we can undo our activities by running the "down" method. Rails uses this mechanism to handle the version of the database. Then, in order to apply the change ("up" method) in the above script to the database, we use the following command.

rake db:migrate

After having this field in the "plans" table of the database, the relation between the database and Rails application will be introduced. In Rails application, it uses the Object relational mapping (ORM) to map the relational databases tables to object oriented classes. An ORM maps "database tables to classes, database table rows to objects, and database table columns to object attributes" [11]. By the support of the Active Record in Rails, we can access to the above added field in the model of the plan.

Since the field is used to store the phone number, "phonenumber" field should only accept integer number. With the Active Record's support, we do not need to write the validation method but only use the one provided by the Active Record (validates_numericality_of). In addition, if the information in the added field will affect some methods in the controller, these methods need to be updated. Following is the list of the current methods in the "plan" model.



Figure 29: The "plan" model's methods²⁵

Source: Adapted from Ruby on Rails application

²⁵ Complete documentation of the prototype will be defined in the "doc\app" folder, and the structure of the document will look like Figure 29
We have already prepared a place to store the phone number in the database, and validate the input information for this field in the model. In order to show this field to the end user, the role of the view and the model will be discussed in the next section.

From the controller section, we know that all requests from the user will come to the controller. For example: if there is a request to edit the business plan, this request will come to "edit" method in the "plan" controller. This method will then search for the correct plan with the plan's id. By default, after this step, the controller will call the corresponding view whose has the same name with the method. In our example, it is the "edit" view. The information of the "plan" object will be available in the "edit" view for editing purpose. Because the phone number was added to the plan model, it is also available in the view.

```
## File: BusinessPortalV02\app\controller\ plans_controller.rb
class PlansController < ApplicationController
    def edit
    @plan = @user.plans.find(params[:id])
    end
end</pre>
```

In the view folder, each controller has its own subdirectory (in our case is the "plans" folder). Within the subdirectory, different view files are generated. The names of these view files are the same name with the actions in the controller.

In these view files, Ruby code and html code can be used together. The code between <% ... %> is the Ruby code (Embedded Ruby) while html code is written with traditional tag. Finally, all the code will be translated into html and returned to the browser.

Since our editing action will let the user change the data from the plan, there will be a form in the "edit" view. This form is generated by the "form_for" command. Within this form, different controls can be generated. To add the phone number field, we add the label for it and use Ruby code (f.text_field) to generate the text field control for receiving inputs from the user. More properties of the text field can be specified here such as: title, position, width...

```
## File: BusinessPortalV02\app\views\plans\ edit.html.erb
<% form_for([@user, @plan]) do |f| %>
<label for="entrepreneur_phonenumber">Your phone number </label><%= f.text_field
:entrepreneur_phonenumber, :title => 'Your phone mumber' %>
<% = f.submit 'Save Business Plan' %>
<% end %>
```

Another aspect of the user interface is the layout of the controller. Although we can define many properties of the controller in the view, it is usual to use a style sheet to define the layout of the view. The style sheet will be grouped in the "public\stylesheets" folder.

In short, to modify a function in our Business Portal, such as "business plan function", we firstly modify the database corresponding to this function, then update the model of this function where we implement the validation, and other model's methods. The corresponding

view needs to be updated to express to the users what the change of this function is. Finally, the controller will be used to manage the request, to find out the correct model and to map the result to the corresponding view.

The detailed documentation of the Business Portal can be found in the "doc\app" folder by accessing the "index.html" file.

7.2.4 Installation

Normally, we need to build a web server to run a web application. However, there is an instant package for Ruby on Rails which can be used to provide web server environment in Window platform. Following is the steps to access the prototype using this package.

- Download instant Ruby on Rails environment for window: InstantRails-2.0-win.zip from http://rubyforge.org/frs/?group_id=904
- Decompress the file (No blank in the directory name)
- Receive the Business Portal program BusinessPortalV02.rar, often attached in email (The version number can be different)
- Decompress the file in the rails_apps inside the environment folder (step 2) InstantRails-2.0-win\rails_apps
- Run InstantRails.exe in the environment folder InstantRails-2.0-win\InstantRails.exe
- Run Manage Rails Applications



Figure 30: Instant Rails – Manage Rails Applications

Source: Instant Rails application

T Rails Applications	×
Rails Applications book_shelf book_shelfOriginal BusinessPortalV01 buzmock buzmock2 chapter1	Web Server Configure Startup Mode Start with Mongrel
comatose	Open a Rails Console
Check one or more Rails application perform that action on the selected	ns and then click a button above to applications.
To create a new Rails app, click th window where you can run the 'rails	e button below to open a console s' command.
Unless you configure the startup mo in development mode on port 3000.	ode, the default is to start a Rails app
Create New Rails App	Refresh List Close
Figure 31: Instant Rails –	Starting the Business Portal

Source: Instant Rails Application

- Check the Business Portal program (the version may be different (V01, V02...))
- Click "Start with Mongrel"
- Open a browser (firefox or Internet explorer)
- Point to: http://localhost:3000/
- To access the functions of admin, use "admin" as user name and "businessportal" as password
- To access normal functions, use "businessman1" and "businessman2" as user name and "businessman1" and "businessman2" as password

8 Conclusion and future work

The aim of this chapter is to present the achievements of the whole thesis project. We will start with what we has been achieved during the last few months. Then we will provide recommendation and ideas for future research.

8.1 Conclusion

In the introduction to this thesis we stated that the goal of this study is to develop the concept of the Business Portal which provides support for the aspirant entrepreneur starting his own business. To make sure that we can achieve this goal, we also want to improve the current software development process. We will discuss whether these two goals have been met in this section.

We firstly analyzed the current situation of the Business Portal. Since at this time, we have no "current" system, we started the analysis with the goals of the Business Portal. We then specified the difficulties an aspirant entrepreneur has to face when he wants to start his business. Also in this part, we identified the five phases of entrepreneur life cycle where any entrepreneur has to focus on during different parts of his business life.

Having what the users expect from our "to be built" Business Portal, we decided the methodology which is used in order to develop the system. By comparing different software development processes, RAD with prototyping was chosen as the methodology for developing the portal. However, the high rate of software failure in the past, due to poor requirement definitions, forces us to review this process. We discovered what the difficulties when defining the requirements are. They includes dynamic environment, inefficient process modeling, forgotten redesign and reengineering business processes, miscommunication, the complex relation between requirements and the difficulty of understanding user's problem.

DEMO methodology, which has proved itself in business process modeling, reengineering the organization and dealing with dynamic business environments, is a good solution to solve our difficulties. Therefore, we have developed a new framework for the analysis phase of the software development process where we combined the IAM and the PM model with the traditional RAD technique. In every phase of the new framework, we discussed its purpose, the techniques we would use, its results and its theoretical added values.

The new framework will be applied into the Business Portal. There are two matters that have to be resolved in this stage. Firstly, we want to validate our new framework in practice. Secondly, this is also the analysis phase in the software development process of the Business Portal. We analyzed the functional and nonfunctional requirements of the business portal. From the analysis, DEMO models have been developed starting with a story line about the operations of the portal.

Based on the story line, IAM and PM were constructed to capture the business process of the organization and to increase the comprehensiveness of the portal. In addition, these models can help to reengineer the organization and deal with the dynamic business environment because they mainly focus on the "performa" activities of the organization.

To make sure that we have included all the portal requirements, a mapping table between PM steps and requirements has been built. After this step, the missing requirements were added to complete the requirement list. Up to this point, the new framework had shown its added value for our project; and the concept of the Business Portal was fully understood.

Building all the requirements will demand a lot of time and effort. Thus, in order to prove the concept of the business portal, we decided to develop the prototype with eight (8) main requirements. They include "assess entrepreneur potential", "build and validate the business plan" which are much related with the business concepts. In the design part, we used a semantic network to reveal the business concepts and transferred these concepts to the question list and "checking rules" in the prototype. In addition, the structure of the website was developed on the basis of three main centers: information center, creative center and payment center.

Ruby on Rail was chosen as the platform for developing the prototype. With Ruby on Rails, the class diagram in the design will be transferred to the class in Ruby, while the guidance on the interface is used to design the prototype's interface. Although in the design, we defined three centers, in the prototype, we did not implement the payment center. The reason for that was that, with payment, we need to have a real Paypal (or Visa) merchant account, and some legal aspects need to be taken into account. However, we do not have an organization for these legal aspects so far. Thus, this function will be developed in the future.

The prototype was shown to the members in the group (some of them come from the business sector). Although some parts in the user interface need to be improved, the final feedback is positive. We also did some testing and used a function in Ruby to generate the documents for classes and methods in the prototype. Besides, we also developed guidance how to install and run the prototype in the personal computer.

In brief, we have got the answers to our proposed research questions where we built a framework to improve the analysis phase of the software development process and applied it to develop the prototype of the Business Portal. Although the prototype only implemented a part of the Business Portal, it showed that we can fully develop the whole idea of the Business portal.

8.2 Future work

There are many possibilities to extend our work. Firstly, because we developed the Business Portal where we do not have a real organization, it is very important to capture its business processes. Therefore, we chose the IAM and PM in DEMO model to combine with RAD technique. Besides IAM and PM, DEMO still has other models like AM and SM. According to [7], AM can specify the "business rules" of the organization while the SM shows the "data dictionary" of an enterprise. Thus, combining these models into the framework and evaluating this combination could be an extension for our work.

Secondly, we have validated our framework based on the design of the business portal. Since the business portal originates from an idea, we have only applied this framework for the "to be built" system. In our opinion, it can be used to analyze the "current" system in an organization.

Thirdly, we are mainly focusing on the requirements related to the business plan concept in the prototype. It could be useful to develop other functions, especially the functions related to resource providers. In addition, we have developed the static question list and checking rules in the prototype because we have limited number of requirements and checking rules at this time. However, in the future, with the extending of the question list, it would be necessary to develop a process handling the question list and checking rules design, and dynamically combine the new question list and checking rules into our portal.

So far, Ruby on Rails has proved that it is a good platform for developing the prototype. It is easy to learn and can reduce the development time. There are also many additional plug-ins (which is called gems) to reduce the development effort. Beside all these positive aspects, user interface is the part which we need to focus in the future. Since Ruby on Rails generates the interface based on its "view" code, we do not have an interacted design tool to modify the interface. At this moment, we firstly develop the view, and then run the application to get the html files. These html files will be modified by a graphical user interface builder like Dreamweaver and the result of this modification will be used to adjust the "view" code. This process makes the user interface design becomes a heavy task. Therefore, different approaches or supporting tools should be used in the future for designing the user interface of our portal.

Appendix

Appendix A: Criteria for selecting a methodology for software development

By comparing these criteria with our project (unclear user requirements, short time schedule and needs to provide a prototype at the end), RAD methodology with prototyping is chosen as our methodology

Ability to develop systems	Structured RAD Methodolog methodologies		ogies	Agile Methodolo gies		
	Waterfall	Parallel	Phased	Prototyping	Throwaway Prototyping	ХР
With unclear user Requirements	Poor	Poor	Good	Excellent	Excellent	Excellent
With unfamiliar Technology	Poor	Poor	Good	Poor	Excellent	Poor
That are complex	Good	Good	Good	Poor	Excellent	Poor
That are reliable	Good	Good	Good	Poor	Excellent	Good
With a short time schedule	Poor	Good	Excellent	Excellent	Good	Excellent
With schedule visibility	Poor	Poor	Excellent	Excellent	Good	Good

Table 6: Criteria for selecting a methodology

Source: Adapted from Alan Dennis and Barbara Heley Wixon [4]

Appendix B: Glossary for the Business Portal - Business Glossary

Business

A business (also called a firm or an enterprise) is a legally recognized organization designed to provide goods and/or services to consumers.

Trademark

A trademark or trade mark, identified by the symbols [™] and [®], is a distinctive sign or indicator used by an individual, business organization or other legal entity to identify that the products and/or services to consumers with which the trademark appears originate from a unique source of origin, and to distinguish its products or services from those of other entities. A trademark is a type of intellectual property, and typically a name, word, phrase, logo, symbol, design, image, or a combination of these elements.

Registration Date

Registration date is the date when the business is registered in the registry of the local authority.

Plan

Plan Value

Plan Value is defined as the total net present value (NPV) of a time series of cash flows. It is a standard method for using the time value of money to appraise long-term projects. Used for capital budgeting, and widely throughout economics, it measures the excess or shortfall of cash flows, in present value terms, once financing charges are met.

Planning Horizon

The planning horizon is the amount of time an organization will look into the future when preparing a strategic plan.

Time Unit

Time unit is the time measurement unit used to divide the planning horizon into smaller segments. The most common units in business planning are year and quarter.

Time Unit Sequence

The planning horizon period divided in equal periods of the time unit.

Cash In

Cash in is the amount of cash being received by a business during a defined period of time.

Cash In Source

This is the source of the money being received by a business. It is the money income by sales of the business product.

Cash Out

Cash out is the amount of cash being paid by a business during a defined period of time.

Uncertainty

Uncertainty is the lack of certainty; a state of having limited knowledge where it is impossible to exactly describe existing state or future outcome, more than one possible outcome.

Balance Sheet

A balance sheet is a summary of a person's or organization's balances. Assets, liabilities and ownership equity are listed as of a specific date, such as the end of its financial year. A balance sheet is often described as a snapshot of a company's financial condition because it applies to a single point in time.

Assets

Assets are everything of value that is owned by a person or company. The 2 major asset classes are tangible assets and intangible assets.

Liabilities

A liability is defined as an obligation of a person or an organization arising from past transactions or events, the settlement of which may result in the transfer or use of assets, provision of services or other yielding of economic benefits in the future. Individual or group must adopt corporate charter and file it with the state.

Product

A product is anything that can be offered to a market that might satisfy a want or need.

Service

A service is the diametrically opposed non-material counter piece of a physical good. A service provision comprises a sequence of activities that does not result in ownership of the outcome and creates predetermined benefits by effectuating a change of service consumers, a change in their physical possessions or a change in their (in) tangible assets.

Tangible Product

A tangible product is a physical object whose consumption increases the utility of the consumer.

Experience

Experience as a general concept comprises knowledge of or skill in or observation of something or some event gained through involvement in or exposure to that thing or event.

Quality

Quality can mean a high degree or grade of excellence or worth; a degree of excellence or the lack of it; an essential and distinguishing attribute of something or someone; a characteristic property that defines the apparent individual nature of something.

Cost

Cost is the value of money that has been used up to produce something, and hence is not available for use anymore. In business, the cost may be one of acquisition, in which case the amount of money expended to acquire it is counted as cost.

Average Product Price

Price is the result of an exchange or transaction that takes place between two parties and refers to what must be given up by one party (i.e., buyer) in order to obtain something offered by another party (i.e., seller).

Profit Margin

Profit margin refers to a measure of profitability. It is calculated as net income divided by revenues, or net profits divided by sales. It measures how much out of every dollar of sales a company actually keeps in earnings. A higher profit margin indicates a more profitable company that has better control over its costs compared to its competitors.

Brand name

Brand name refers to the descriptive verbal attributes and concrete symbols such as a name, logo, slogan, and design scheme that convey the essence of a company, product or service.

Product Lifecycle

Product lifecycle is the course of a product's sales and profits over time. The five stages of each product lifecycle are product development, introduction, growth, maturity and decline. Product lifecycle deals with the life of a product in the market with respect to business or commercial costs and sales measures.

Production Time

Production time is the time required for the execution of the process which creates the core product of the business.

Usage Time

Usage time is the time that the product is used to create value to the customer.

Market Share

Market share is the percentage or proportion of the total available market or market segment that is being serviced by the product of a company.

Projected Sales Volume

The presumptive number of product sales which is forecasted on beforehand based on historic data and facts or assumptions.

Process

A process is a collection of interrelated tasks, which accomplish a particular goal. A process begins with a customer's need and ends with a customer's need fulfillment.

Primary Process

Primary processes are processes that constitute the core business and create the primary value stream. Typical operational processes are Purchasing, Manufacturing, Marketing, and Sales.

Secondary Process

Secondary processes are the processes that govern the operation of a system and support the primary processes. Examples include Accounting, Recruitment and Technical support.

Marketing

Marketing is the activity, set of institutions, and processes for creating, communicating, delivering, and exchanging offerings that have value for customers, clients, partners, and society at large.

Targeting

Targeting is the process of determining the market segment to which a particular good or service is marketed. It is mainly defined by age, gender, geography, socioeconomic grouping, or any other combination of demographics.

Positioning

Positioning means the process by which marketers try to create an image or identity in the minds of their target market for its product, brand, or organization. It is the 'relative competitive comparison' their product occupies in a given market as perceived by the target market.

Segmenting

Segmenting is the process of dividing the market into segments based on customer characteristics and needs.

Resource

Resource is a person, asset, material, or capital which can be used to accomplish a business goal; produce goods and/or services.

Knowledge

Knowledge can be defined as confidentially held, or better, 'closely-held' information in the form of unpatented inventions, formulae, designs, drawings, procedures and methods, together with accumulated skills and experience in the hands of a licensor firm's professional personnel which could assist a transferee/licensee of the object product in its manufacture and use and bring to it a competitive advantage.

Cash

Cash is currency and coins on hand, bank balances, and negotiable money orders and checks.

Initial Value

Initial value of a resource is the value at the beginning of its lifetime.

Fixed Cost

Fixed cost of a resource is the part of its total cost that is independent of the quantity or amount of resource.

Stakeholder

A stakeholder is a person or an organization with an interest in the business. Each stakeholder affects or can be affected by the business's actions. Stakeholders are part of a group or category that have similar characteristic, i.e. group of shareholders has different rights and obligations than employees or directors. Each stakeholder has a contract with the business.

Categories of identified stakeholders are:

- Employees
- Communities
- Shareholders

- Creditors
- Investors
- Government

A broader mapping of a company's stakeholders may also include:

- Suppliers
- Labor unions
- Government regulatory agencies
- Industry trade groups
- Professional associations
- NGOs and other advocacy groups
- Prospective employees
- Prospective customers
- Local communities
- National communities
- Public at Large (Global Community).

Entrepreneur

An entrepreneur is a person who has possession of an enterprise, or venture, and assumes significant accountability for the inherent risks and the outcome. It is an ambitious leader who combines land, labor, and capital to create and market new goods or services. Entrepreneur is a term applied to the type of personality who is willing to take upon herself or himself a new venture or enterprise and accepts full responsibility for the outcome.

Employee

An employee contributes labor and expertise to a business. Employees perform the discrete activity of economic production. Of the three factors of production, employees usually provide the labor.

Supplier

A supplier is anyone who provides goods or services to a company.

Solution

Solution is defined as the answer to a problem, a way of answering a problem, actions or process to solve a problem or means to solve a problem.

Problem

A problem is an obstacle which makes it difficult to achieve a desired goal, objective or purpose. It refers to a situation, condition, or issue that is yet unresolved. In a broad sense, a problem exists when an individual becomes aware of a significant difference between what actually is and what is desired.

Customer

A customer, also client, buyer or purchaser is the buyer or user of the paid products of an individual or organization, mostly called the supplier or seller. This is typically through purchasing or renting goods or services.

Purchase Volume

Purchase volume is the same as the sales volume as long as no competition is introduced and is defined as the number of products purchased by customers and sold by the business.

Projected Sales Purchase

The presumptive number of product purchases by a customer or groups of customers which is forecasted on beforehand based on historic data and facts or assumptions.

Competitor

Seller of a product or service whose product or service can be used to fill or satisfy a consumer need (real or imagined) in a market where other sellers offer products that will also fill or satisfy the same need.

Context

Context is he environment in which a business operates. An environment can be defined as anything which surrounds a system. It affects the decisions, strategies, processes and performance of the business. The micro environment consists of different types of stakeholders - customers, employees, suppliers, board of directors and creditors. The macro environment consists of factors which are beyond the control of the business - Social, Technological, Economical and Political.

Weather

The weather is a set of all the phenomena occurring in a given atmosphere at a given time. Weather phenomena lie in the hydrosphere and troposphere. Weather refers to current activity, as opposed to the term climate, which refers to the average atmospheric conditions over longer periods of time.

Taxation

A tax may be defined as a "pecuniary burden laid upon individuals or property to support the government; a payment exacted by legislative authority. A tax is a financial charge or other levy imposed on an individual or a legal entity by a state or a functional equivalent of a state. Taxes are also imposed by many sub-national entities. Taxes consist of direct tax or indirect tax.

Legislation

Legislation is law which has been promulgated (or "enacted") by a legislature or other governing body. The term may refer to a single law, or the collective body of enacted law. Legislation can have many purposes: to regulate, to authorize, to provide (funds), to sanction, to grant, to declare or to restrict.

Economy

An economy is the realized social system of production, exchange, distribution, and consumption of goods and services of a country or other area. A given economy is the end result of a process that involves its technological evolution, civilization's history and social organization, as well as its geography, resource endowment, and ecology, among other factors. These factors give context, content, and set the conditions and parameters in which an economy functions.

Inflation

Inflation is a rise in the general level of prices of goods and services in an economy over a period of time.

Interest Rate

Interest rate is the price paid for the use of savings over a given period of time expressed in a percentage of the amount of savings.

Market

Market refers to the group of consumers or organizations that is interested in the product, has the resources to purchase the product, and is permitted by law and other regulations to acquire the product. The market definition begins with the total population and progressively narrows.

Market Segment

A segment is a subgroup of people or organizations sharing one or more characteristics that cause them to have similar product and/or service needs. If each segment is fairly homogeneous in its needs and attitudes, it is likely to respond similarly to a given marketing strategy.

Growth Rate

Growth Rate is the annual increase in product sales or population within a given market. The market growth rate is a factor to be considered when evaluating the performance of a particular product in a particular market.

Segmentation Method

Segmentation method is the method used for classifying a market into distinct subsets (segments) that behave in similar ways or have similar needs. The segmentation process in itself consists of segment identification and segment characterization.

Segmentation Criterion

The segmentation criterion is a criterion that is used in order to identify a segment and characterize the members of the segment under a common factor.

Marketing Strategy

A marketing strategy is a process that can allow an organization to concentrate its limited resources on the greatest opportunities to increase sales and achieve a sustainable competitive advantage. A marketing strategy should be centered on the key concept that customer satisfaction is the main goal.

Advertising

Advertising is a form of communication that typically attempts to persuade potential customers to purchase or to consume more of a particular brand of product or service.

Pricing

Pricing is the manual or automatic process of applying prices to purchase and sales orders, based on factors such as: a fixed amount, quantity break, promotion or sales campaign, specific vendor quote, price prevailing on entry, shipment or invoice date, combination of multiple orders or lines, and many others.

Product Differentiation

Product differentiation is the process of distinguishing the differences of a product or offering from others, to make it more attractive to a particular target market. This involves differentiating it from competitors' products as well as one's own product offerings.

Appendix C: Non functional requirements

Non functional requirements refer to behavioral properties that the system must have, such as performance and usability. Comparing to the functional requirements which define what a system is supposed to do, non-functional requirements define how a system is supposed to be.

Operational (O)

These requirements express the physical and technical environments in which the system will operate

- O.1. The Business Portal should operate on the internet environment in which it can operate with different web browsers
- O.2. Open source will be used in order to develop this system
- O.3. Ruby and Java scripts are chosen as programming languages here
- O.4. User can get information from the portal through SMS system
- O.5. With the information provided by third party, web services should be used to collect information.

Performance (P)

They show the speed, capacity and reliability of the systems

- P.1. The system should operate 24/24 365days/year
- P.2. The system should be easy to use for the user
- P.3. The questions provide to the users should be in the form of closed questions (multiple choice, number, check list...)
- P.4. Users should be able to go back to the process and alter the entered information
- P.5. The layout of the system should be consistent
- P.6. User can choose languages (English and Dutch)
- P.7. The system should be back up every day in order to provide the recovery point in case of problem
- P.8. The system should be easy to maintenance and update

Security (SE)

These requirements are about who has authorized access a certain resource of the system under what circumstances

- SE.1. The system provides a place to log in into its environment
- SE.2. After the business plan owners generate reports, he can store these reports in the portal and can give right to access these reports to his investors
- SE.3. Keep secure for the payment information from the user
- SE.4. Each type of users can only accesses the resources they have the authority. They CANNOT access other resources
 - SE.4.1. Visitor can not create business plan, executing business data, and use the web store, the forum, functions for experts and administrators
 - SE.4.2. AE and E can not use the functions experts and administrators

- SE.4.3. Expert can only use the expert functions with the manage the question lists and the rules
- SE.4.4. Administrator can manage all the resources except the user's private information and answer about their plans

Culture and Political(C)

They are cultural, political factors and legal requirements that affect the system

C.1. The portal has to meet European laws regarding privacy and retaining data.

Appendix D: Use-Case

Three steps deriving use case from DEMO models



Figure 32: Deriving use case from DEMO models – step 1 Source: Adapted from Jan L.G. Dietz [6]



Figure 33: Deriving use case from DEMO models – step 2 Source: Adapted from Jan L.G. Dietz [6]



Figure 34: Deriving use case from DEMO models – step 3

Source: Adapted from Jan L.G. Dietz [6]

Use case diagram



Figure 35: Prototype's Use case diagram

Source: Adapted from Alan Dennis and Barbara Heley Wixon [3]





Use case Definition

Use case Name: Br	owse Portal		ID Number: 1
Description: This describes how a visitor can get information and		have an overview about	
the general functions of the portal			
Trigger: Visitor com	es to the main page of	the Business Portal	
Туре	External: Y	Temporal:	
Majo	or inputs	Ma	ijor Outputs
Description	Source	Description	Destination
Browse request	Visitor		
News and	Visitor	Detail news and	Visitor
Announcements		announcements	
search request			
Portal's contact	Visitor	Portal's contact	Visitor
request		information	
Detail news and	News and		
announcements	announcements		
	database		
Portal's contact	contact information		
information	database		
	Major Steps Performe	d	Information for Steps
1. Receive the requ	lest from the visitors	4	Browse request (Input)
and provides the ma	ain page of the portal		Now & Appoundment
2 Saarah nawa ana	d announcemente		
2. Search news and	announcements		Dotail nows and
	1	•	
			Detail news and
			announcements
			matching request (Q)
3. Search portal cor	ntact information		Portal's contact request
	/ ←		Portal's contact
			information
			Portal contact information
			matching request (O)

Use case Name: Assess Entrepreneurship potential	ID Number: 2	
Description: This describes how the visitor can receive the assessment for his		
entrepreneurship		

Trigger: Visitors wa	nt to check his ability	whether he is suitable t	o become an entrepreneur
or not	Extornal: V	Tomporal	
Major	Inputs(I)	Majo	r Outputs(O)
Description	Source	Description	Destination
Assessment	Visitor	Advices to become	Visitor
request		an entrepreneur or not	
Characteristic information	Visitor	Visitor's information	Visitor DB
Question lists	Question list DB	Visitor's answers	Visitor's answer DB
Visitor's answers	Visitor's answer DB		
	Major Steps Performe	ed	Information for Steps
1. Receive the requ	lest from the visitors	•	Assessment request
2. Provide suitable	question list to the visi	itors	Question list DB (I)
3. Receive Visitors'	answers		Characteristic information
	\langle		(I)
			Visitor's an s wer DB (O)
4. Compare visitors	answer with the stand	dard,	
provide advices	1		Visitor's answer DB (I)
			Question list DB(+)
	\backslash		
			Advices to become an
			entrepreneur or not (O)

Use case Name: Buy good or services from market place			ID Number: 3	
Description: This describes how a visitor (or Aspirant Entrepreneur or Entrepreneur) can				
find a suitable resou	find a suitable resource and buy it			
Trigger:				
Туре	External: Y	Temporal:		
Major	inputs	Ma	ajor Outputs	
Description	Source	Description	Destination	
Search request	Visitor	Resource	Visitor	
		matching search		
		request		
Resource	Visitor	Resource	Visitor	
information		information		
request				
Resource	Resource	Resource request	Stakeholder (resource	
information	Database		provider)	
Order information	Visitor	Resource order	Order information database	
to chosen resource		information		
Visitor (or E or AE)	Visitor or (Member	Payment	Payment information	
information	database)	information	database	
Resource Payment	Visitor	Confirmed order	Visitor, Order information	
information		information	database	
Accepted order	Stakeholders			
information	(resource provider)			
Major Steps Performed Information for Steps				
1. Search resources matching visitor request		Search request (Input)		
			Resources matching	
			search request (O)	
2. Provide information	on about a certain reso	ource	Resource information	
			request (I)	
			 Resource information (O) 	
3. Receive order info	ormation for certain res	sources	Order information (I)	
			Visitor information	
Order information		Order information database		
			(O)	
4. Use payment use-case to receive payment		+ Payment information (I)		
			Payment information (O)	
Paid order information				
5. Commin the order	willi		Accepted (or relused)	
	(stakenoider)		provider (I)	
			Confirmed (or refused)	
			order information(O)	

6. In case of order refused, refund payment to the visitor and introduce other providers	•	Payment information (O) Search request (I)
		Reseurces matching search request (O)

Use case Name: Register to Business Portal		ID Number: 4	
Description: This describes how visitor can register to become			a member (Aspirant
Entrepreneur in the Business Portal)			
Trigger: Visitor click	on the register link		
Туре	External: Y	Temporal:	
Major	inputs	М	ajor Outputs
Description	Source	Description	Destination
Register request	Visitor	Visitor's	Visitor database
		information	
Personal	Visitor	Active link	Visitor
information			
User's agreement	User's agreement		
	database		
User's agreement	Visitor		
acceptation			
	Major Steps Performe	d	Information for Steps
1. Possive the request from the visitors			Register request (Input)
2. Collect user personal information		Personal information (I)	
		Visitor's information (0)	
3. Get user acceptation for the agreement			User's agreement (I)
		Visitor's answer DB (O)	
		User's agreement	
			acceptation
4. Send activate email and receive user confirmation		Active link (O)	

Use case Name: Co	mplete business plan	ID Number: 5	
Description: This describes how the AE can complete a business plan			
Trigger: AE requests to create his business plan			
Туре	External: Y	Temporal:	
Major	inputs	Ma	jor Outputs
Description	Source	Description	Destination
Create BP request	AE	BP information	BP database

Question list and	Question list	Explanation	Question list database
input forms	database	information	
BP information	AE		
Validating rule	Rule database		
٩	Major Steps Performe	d	Information for Steps
1. Receive the request from the AE			Create BP request (Input)
2. Use 2 use-cases: answer closed questions and complete forms to collect BP information			Question list database (I) BP information(I) BP information (O)
3. Validate user input and recollect information◄			Validating rule BP information (O)
4. Provide assistance to the AE		Explanation information	

Use case Name: Answer close question and Complete forms			ID Number: 6
Description: This describes how the AE can answer the questions list to complete his BP			
Trigger: AE requests to create his business plan			
Туре	External: Y	Temporal:	
Major	inputs	Ma	ajor Outputs
Description	Source	Description	Destination
Question list	Complete BP use -	BP information	BP database
request	case		
Questions	Question list	Explanation	Question list database
	database	information	
Validating rule and	Rule database		
recommendation			
BP information	AE		
Outside information	Stakeholder		
	(Information		
	provider)		
N	lajor Steps Performed	ł	Information for Steps
1. Receive the request from the complete BP use-case		Assessment request (Input)	

2. Provide a question list to the AE	Question list DB (I)
3. Receive AE' answers	BP information (I) AE's business plan DB (O)
4. Validate input answers and provide Recommendation to answer them correctly Request third party	Validating rule and recommendation AE's business plan DB (O)
4A. If necessary, contact third party to collect information for validating AE's answers	Outside information (I) Recommendation

Use case Name: Generate report			ID Number: 7		
Description: Describe how AE can receive reports					
Trigger: AE requests to create certain type of report					
Туре	External: Y	Temporal:			
Major	inputs	Ma	ijor Outputs		
Description	Source	Description	Destination		
Generating report	AE	List of possible	AE		
request		reports			
Report form	Report database	Detail report	AE		
BP information	BP database				
AE information	AE database				
Major Steps Performed Information for Steps					
1 Receive the reque	est from the AF		Generating report request		
			(Input)		
			(
2. Provide different f	orms for the AE	←	Report forms (I)		
			List of possible reports (O)		
Chosen report	t –				
3. Getting chosen report and fulfill information			BP information		
			AE information		
			Detail report		

Use case Name: Analyze Input

ID Number: 8

Description: Analyze the user input in order to assess the business plan				
Trigger: AE has completed the forms and requested an assessr			nent	
Туре	External: Y	Temporal:		
Major	inputs	Ma	ajor Output	
Description	Source	Description	Destination	
Assess Plan	AE	Assessment	AE	
Request		Report		
BP information	BP database			
AE information	AE database			
Assess Rules	Knowledge Base			
database	(KB)			
	Major Steps Performe	d	Information for Steps	
1. Receive the request from the AE		•	Assess Plan request (Input)	
2. Read business pla	an information	•		
			BP information (I)	
BP information	n			
3. Assess business plan			BP information (I)	
(AE information (I)	
			Assessment Rules (I)	
			Assessment Report (O)	

Use case Name: Create Decision Outcome			ID Number: 9		
Description: Create a presentable format for the user based on assessment report					
Trigger: An assessm	ent has been complet	ted			
Туре	External: Y	Temporal:			
Major	inputs	Ma	Major Outputs		
Description	Source	Description	Destination		
Assessment Report	Business Plan	Assessment File	AE		
	Assessor				
Presentation	AE				
Formats					
Major Steps Performed Information for Steps					
1. Receive Assessme	ent Report		Assessment report (Input)		
Assessment F	Report				
2. Read presentation formats			Presentation Formats (I)		
BP information					

3. Generate Report File	
	Assessment Report File (O)
4. Notify and Present Report to EA	

Use case Name: Cre	es	ID Number: 10			
Description: An expe	Description: An expert creates assessment rules based on his experience				
Trigger: An error or o	omission has been for	und in assessment out	put		
Туре	External: Y	Temporal:			
Major	inputs	Ma	ajor Outputs		
Description	Source	Description	Destination		
Assessment Rule	Business Plan	Assess Rules	Business Plan Assesor		
	Expert	database			
Major Steps Performed			Information for Steps		
1. Create rule	←		Assessment Rule (Input)		
2. Check rule syntax	<		Rule Language Grammar		
		Rules (I)			
3. Add Rule to the database					
			Assess Rules database (O)		

Use case Name: Def	tion	ID Number: 11			
Description: The info	Description: The information needed for a rule are recognized and the question list database				
is updated					
Trigger: An assessm	ent rule has changed				
Туре	External: Y	Temporal:			
Major	inputs	Ma	jor Outputs		
Description	Source	Description	Destination		
Assess Rules	Business Plan	Question List	Question List DB		
database	Assessor				
Ν	Aajor Steps Performed	d	Information for Steps		
1. Read altered rule	←		Assessment Rule DB		
			(Input)		
2. Check Required Ir	nformation				
3. Create question					

4. Create question form	Question List DB (O)

Use case Name: Def	ID Number: 12		
Description: Advices	for the EA have been	n defined	
Trigger: A new advic	e has come up. An e	xisting needs to be mo	dified or updated
Туре	External: Y	Temporal:	
Major	inputs	Ма	ijor Outputs
Description	Source	Description	Destination
Expert Advice	Business Plan	AE Advice	Advice DB
	Expert		
			•
ſ	Major Steps Performe	d	Information for Steps
1. Create advice	•	l	Expert Advice (I)
2. Check Advice Syntax			Advice Grammar Rules (I)
3. Save Advice			Advice DB (O)

Use case Name: Pr	ovide Advice for Sta	rting Up the Business	ID Number: 13	
Description: Advices	r business			
Trigger: A BP has been assessed and advice has been requested				
Туре	Type External: Y Temporal:			
Major	· inputs	Ma	ajor Outputs	
Description	Source	Description	Destination	
AE Advice	Advice DB	Advice File	AE	
	Major Steps Performed			
1. Read business in	formation		BP Information (I)	
2. Retrieve appropriate advices			Advice DB (I)	
3. Present Advices to AE			Advice File (O)	

Appendix E: Compare strategies to build the system

To compare three main strategies: building the system from scratch, purchasing a package and outsourcing the system, some criteria will be chosen in the following part

- 1. Portable: The result of the development is a prototype which will be introduced to other people. Thus, portable or easy to install is a requirement
- 2. Development time: As the project has a limitation of time, the development time need to be short
- 3. Question sequence may vary depending on the user input.
 - a. Ability to assign the next question for each answer
- 4. GUI must be consistent during the interaction with the user.
 - a. Ability to customize the GUI of the questionnaire
 - b. Ability to apply an external CSS file to the GUI
 - c. Ability to include the generated questionnaire in a third web page
- No redirection to third web sites should be done to the user during browsing

 Ability to include the generated questionnaire in a third web page
- 6. All information transmitted to the portal's servers by the user should be secure in terms of confidentiality and integrity. No information should be readable and editable by third parties.
 - a. Ability to secure the user dialog via the tool
 - b. Ability to include the generated questionnaire in a third web page
- 7. The security countermeasures should be noticeable by the end user.
 - a. Ability to secure the user dialog via the tool
 - b. Ability to include the generated questionnaire in a third web page
- 8. The tool should be easy to use
 - a. Minimum interaction with mark-up languages
 - b. Minimum interaction with scripting languages
 - c. GUI for the question list developer
- 9. The tool should be cheap
 - a. Tool price
 - b. Pricing policy (Per usage, per questionnaire etc)
- 10. User support
 - a. Help feature
 - b. Helpdesk support
 - c. On line communities

From all above criteria, portable, development time, cost and user support are four main important criteria to choose the strategy

Strategies comparison

The generated table with the checklist is the following table. The rows are the above criteria and each column applies for every prospective tool. With in each cell the grading scale is presented; the possible values that each grade may take.

As the result of the comparison, build from scratch is a good approach for our prototype.

		Package			Outsource	Build from
	Criterion	FeedBack	IT	Lime		scratch
		Dialog	FastClose	Survey		
1.	Portable	N	N	N	Depend	Depend
2.	Short development time	Y	Y	Y	N	Depend
3.	Question sequence may vary					
	depending on the user input.					
	a. Ability to assign the next question	N	N	Y	Y	Y
4	for each answer					
4.	interaction with the user					
	a Ability to customize the GUI of the	Y	N	Y	Y	Y
	questionnaire	•				•
	b. Ability to apply an external CSS	Y	N	Y	Y	Y
	file to the GUI					
	c. Ability to include the generated	N	N	Y	Y	Y
_	questionnaire in a third web page					
5.	No redirection to third web sites					
	completion					
	a. Ability to include the generated	N	N	Y	Depend	Depend
	questionnaire in a third web page			-		
6.	All information input by the user					
	should be secure in terms of					
	confidentiality and integrity. No					
	information should be readable and					
	a Ability to secure the user dialog	N	N	V	V	V
	via the tool	IN	IN	I	I	I
	b. Ability to include the generated	Ν	Ν	Y	Y	Y
	questionnaire in a third web page					
7.	The security countermeasures should					
	be noticeable by the end user.					
	a. Ability to secure the user dialog	N	N	Y	Y	Y
	b Ability to include the generated	N	N		V	V
	guestionnaire in a third web page				1	I
8.	The tool should be easy to use					
	a. Minimum interaction with mark-up	2	5	2		
	languages					
	b. Minimum interaction with scripting	2	5	2		
	languages					
	c. GUI for the question list developer	Y	Y	Y		
9.	The tool should be cheap					
	a. Tool price			€0.00	N	Y
	b. Pricing policy (Per usage, per			N/A	N	Y
40	questionnaire etc)					
10	. User support	V	V	NI		V
		Ý	Ý		Y Democrat	Ý
	D. Helpaesk support	Y	Y	IN V	Depend	Y
	c. On line communities	N	N	Y	N	Y

Table 7: Compare strategies to build our prototype

Appendix F: Question list and checking rules

Semantic network for V1 Access visitor's Entrepreneurship potential



Figure 36: Semantic network for personal information

Question list for Potential entrepreneur

1.Personal details	What is your <u>family name</u> ? What is your <u>first name</u> ? What is your <u>gender</u> ? What is your <u>date of birth</u> ?
2.Address	What is your <u>address</u> ? What is your <u>postal code</u> ? What is the name of your <u>town</u> ? What is the <u>country</u> location?
3.Personal contact	What is your <u>email</u> dress? What is your <u>mobile phone</u> number?
4. Education/ Professional training	Choose maximum graduate level of your education from list
5. Work experience	How many years of work experience do you have?
6. Qualifications/ Certificates	Please archive your certificates
7. Entrepreneurship	Is or was one of your <u>parents entrepreneur</u> ? If yes for how many <u>years</u> are they entrepreneur? How many persons are in your management team <u>(# persons in</u>

<u>team</u>)

Checking rules for Potential entrepreneur

1.	IF age > 55		THEN get 1 point
2.	IF education level is h	nigh	THEN get 2 points
	IF education level is r	nedium	THEN get 1 point
3.	IF working year expendence	rience > 30	THEN get 3 points
	IF working year expendence	rience > 20	THEN get 2 points
	IF working year expension	rience > 10	THEN get 1 point
4.	. IF parent is entrepreneur		THEN get 1 point
5.	 IF parent year of experience as entr IF person in management team > 6 		epreneur > 45 THEN get 1 point
6.			THEN get 2 points
	IF person in manager	ment team > 3	THEN get 1 point
7.	IF Total point >= 5	THEN Give a	dvice "Can become successful entrepreneur"
	IF Total point <5	THEN Give a	dvice "Need to improve personal skills"
Quest	ion list for Business	9 Plan	

1. The Business	
	In what year the business registered (business starting date)
	What is the name of the business?
	How many owners does the business have? (# owners)
	What is the market sector?
	In which geography is the business operating(geographical focus) What do you offer (type of product)
	How many employees does the business employ today ?(# employees)
	What is the total of the balance sheet (€) today?
2. The plan	
	What is the financial currency of the business?
	Which is the starting date of your plan
	What time period are you using to plan your sales?
	How many (years) periods do you include in your planning horizon?
	The product cost is what percentage of the product price?
	For each period enter your projected net cash flow
	What are the probabilities of these net cash flows?

Checking rules for Business Plan

1. IF Plan value==0 OR Plan value==<0 THEN Business plan:=not executable

If the plan value is equal to or smaller than zero then the plan should not be executed and the entrepreneur should reconsider his plan. He has to either increase the projected net cash flow during planning horizon or (and) increase the probability of the projected cash flow. The sales volume and/or the product sales price are too low or/and the product cost is too high.

- 2. IF Plan value>0 THEN Business plan:=executable
- 3. IF AVG(Growth Rate of projected sales volume)<10% THEN Recruit another salesman

$$GrothRate = \frac{1}{n} \sum_{n=1}^{n} \frac{CashFlow(n)}{CashFlow(n-1)}$$

If the growth rate, as defined in the previous equation, is smaller than 10% percent then the efficiency of the business is not acceptable and the sales volume should be increased.

4. IF
$$\frac{PlanedValue}{\sum \Pr{ojectedNetCashFlow}} < 50\%$$

THEN Risk of failure is too high AND
Your investors will require a return on their investment of 60%

If the above ratio is smaller than 50% then the risk is too high to be taken by the investors. They usually require a ratio greater than 60%. The financing of the start up might faces difficulties and rejection from potential founders.
Appendix G: The User Interface of the prototype

Portal The best solution for entrepreneur			Current user: businessman1 <u>Manage Account</u> <u>I</u>		
Home	Information Center	Creative Center	Above	Contact	
ly Business	; Portal				Quick link
					businessman1

personal skills, to execute original ideas and to start and run their own business. However, starting a business is not an easy job for anybody, especially for young people who don't have enough experiences. In order to provide a long life support to these people, and increase the success rate of business starting, we have designed the concept of the Business Portal. This portal will offer long life 24/7 interactive functions, services and products to any person who has the desire to become independent and freedom in his entrepreneurship instead of employment.

Goal

The Business Portal's aim is to provide a place for enterprising people where they can find all the support for starting their own business, including creating and managing their business plans, providing a rapid independent evaluation on the contents of these business plan as well as providing other supports for all their business life. A key element in this portal is the interactive business plan. The business plan provides stakeholders with an accurate assessment of 10 sources of value (market, product...), enabling them to value the risk/return relationships and to execute the plan, verify assumptions and correct deviations from the plan. As a portal, Business Portal also updates business information and guidance from different sources (such as chamber of commerce, banks...); and works as a place where entrepreneurs can search or buy necessary resources in order to operate their husiness

Assessment My Plans Register Real Data



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Figure 37: User Interface - Home Page

Home Infor	mation Center Above Contact	
ere you can find the	e lastest news and information for your Business	Quick link
CATEGORY: ABO	DUT US	businessman1 Build Personal Profile
+10	Introduction Business Portal is an ICT project whose main purpose is to develop a <u>More</u>	<u>Mariage Busiliess Plans</u> <u>Business Forms</u> <u>Register Real Data</u>
+11 N/A	Supporting phases for Business With these different phases, the Life entrepreneurship needs to focus on d <u>More</u>	
- CATEGORY: ECO	ONOMIC	
- CATEGORY: EIN	relation to the stock More	
+1000	Stocks climb as economic data Stocks rise following surprise increases in new again top forecasts home sales, demand for <u>More</u>	
	W Previous 1 2 Next w	
	× Previous 1 2 Next »	~
Onder	Business Portal by Ltd Ondernemersportal & TU Delft Copyright © Ltd Ondernemersportal & TU Delft Themers Current user: businessr	nan1 Manage Account Log c
Onder Portal	Business Portal by Ltd Ondernemersportal & TU Delft Copyright © Ltd Ondernemersportal & TU Delft Corrent user: business Current user: business The best solution for entrepreneur The creative Center Above Contact	nan1 Manage Account Log c
Onder Portal Home Infor	Business Portal by Ltd Ondernemersportal & TU Delft Copyright © Ltd Ondernemersportal & TU Delft Copyright © Ltd Ondernemersportal & TU Delft Current user: business The best solution for entrepreneur The best solution for entrepreneur mation Center Creative Center Above Contact	nan1 Manage Account Log c
Onder Portal Home Infor reating your own Br You are on your w In order to have a should recognize to	Business Portal by Ltd Ondernemersportal & TU Delft Copyright © Ltd Ondernemersportal & TU Delft Current user: business The best solution for entrepreneur The best solution for entrepreneur The best solution for entrepreneur The best solution for entrepreneur The best solution for entrepreneur in his business life, you that entrepreneurship life can be divided into 5 phases:	nan1 Manage Account Log of Quick link businessman1 Build Personal Profile Manage Business Plans
Home Infor You are on your with norder to have a should recognize to	Business Portal by Ltd Ondernemersportal & TU Delft Copyright © Ltd Ondernemersportal & TU Delft Copyright © Ltd Ondernemersportal & TU Delft Current user: business Current user: business The best solution for entrepreneur mation Center Creative Center Above Contact Usiness vay to start your own business. a clear vision about the different focuses of an entrepreneur in his business life, you that entrepreneurship life can be divided into 5 phases:	nan1 Manage Account Log co Quick link businessman1 Build Personal Profile Manage Business Plans Business Forms Register Real Data
Onder Portal Home Infor reating your own Bu You are on your w In order to have a should recognize to	Business Portal by Ltd Ondernemersportal & TU Delft Copyright © Ltd Ondernemersportal & TU Delft The best solution for entrepreneur The best solution for entrepreneur in his business life, you that entrepreneurship life can be divided into 5 phases: Example Solution So	non1 Manage Account Log c Quick link businessman1 Build Personal Profile Manage Business Plans Business Forms Register Real Data
Onder Portal Home Infor reating your own But You are on your with order to have a should recognize to should recognize to the should recognite to the should recognize to the should recognite tot	Business Portal by Ltd Ondernemersportal & TU Delft Copyright © Ltd Ondernemersportal & TU Delft Copyright © Ltd Ondernemersportal & TU Delft Current user: business The best solution for entrepreneur The best solution for entrepreneur mation Center Creative Center Above Contact usiness way to start your own business. a clear vision about the different focuses of an entrepreneur in his business life, you that entrepreneurship life can be divided into 5 phases:	nan1 Manage Account Log of Quick link businessman1 Build Personal Profile Manage Business Plans Business Forms Register Real Data
Onder Onder Portal Home Infor reating your own But You are on your with order to have a should recognize to should recognize to the should recognite t	Business Portal by Ltd Ondernemersportal & TU Delft Copyright © Ltd Ondernemersportal & TU Delft Immediation Current user: business The best solution for entrepreneur Immation Center Creative Center Above Contact Usiness vay to start your own business. a clear vision about the different focuses of an entrepreneur in his business life, you that entrepreneurship life can be divided into 5 phases: Immation Center Immation Center Immation Center Creative Center Above Contact Usiness vay to start your own business. a clear vision about the different focuses of an entrepreneur in his business life, you that entrepreneurship life can be divided into 5 phases: Immation Center	nan1 Manage Account Log of Quick link businessman1 Build Personal Profile Manage Business Plans Business Forms Register Real Data
Onder Portal Home Infor Home Infor reating your own Br You are on your will norder to have a should recognize to should recognize to the sho	Business Portal by Ltd Ondernemersportal & TU Delft Copyright © Ltd Ondernemersportal & TU Delft Immedia Current user: business The best solution for entrepreneur Contact Immation Center Creative Center Above Contact Immation Center Greative Center Above Contact Immation Center Greative Center Above Dati	nan1 Manage Account Log of Quick link businessman1 Ruid Personal Profile Manage Business Plans Rusiness Forms Register Real Data

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Figure 38: User Interface - Information Center and Creative Center

	Portal The	best solution for entre	preneur	Currei	nt user: busines	sman1 <u>Manage Account</u> <u>Log out</u>
Home	Information Center	Creative Center	Above	Contact		
Edit Assesse	ment Entrepreneurship poter					Quick link
ersonal d	ata					have been set of the
What is your family name ?		BusinessMan1				Manage Business Plans
What is your first name 2		Thuan				Business Forms
ubstic vour	gondor 2	O Man O Woman				Register Real Data
What is your gender ? O Man • What is your date of birth ? 1900 •		1900 March	- 29 -			HERE IS THE PLACE FOR
\ddress		V4				HELPS & ADVIGES
Vhat is your	address ?	Delft				Four score: 7
What is your postal code ?		ddedededed				- Rule 3: Your experience is
		Delft				smaller than than 30, you get 2 points (Maximum is 3) for
Country		Canada 💌				this criteria. - Rule 5: One of your parent is
ersonal c	ontact					entrepreneur, you get 1 point
mail addres	s	hoangthuan1610@ya	hoo.com			However, Total their year of experience is smaller than 45
Your phone number						you do not get point for this
ducation	/professional training					criteria(Maximum is 1). – You need a more member
laximum edu	ucation level	Doctor 💌				for your business, you get 1
Entrepren	eurship					 criteria.
How many working experience year do you 29		00 More		BASED ON YOUR PERSONAL PROFILE, YOU COULD BE VERY		
las one of y	our parents been entreprene	ur? 🔽				SUCESSFUL !
yes for hov ntrepreneu ow many pe am(# pers	v many years are they r ? ersons are in your manageme cons in team)	1 ent 4				<u>Create Business Plan</u>

Figure 39: User Interface - Assessment Entrepreneur potential

General Business Plan data_		
Business Plan registered year:	2009 - April - 24 -	
Business Plan Name	Business Software	
How many owners does the business have What is the market sector?	1 .	HERE IS THE PLACE FOR
In which geography is the business operating? What do you offer(type of product)? How many employees does the business employ today ? Financial information of the	The Netherlands	HELPS & ADVICES Explaination: Rule 3: The plan value/total net cash flow: is 50.0% <=50%. The risk of your business is too high
What is the financial currency of the business? Business plan description:	VND 🔽	
Company's Address	TU DELFT	
Company Postcode	2624HT	
City	Delft	
Company Phone number	0681512242	
Email address	hoangthuan1610@gmail.com	
Website		
Business Plan's Financial info	ormation	
What is the starting date of your plan: What time periods are you using to plan your sales: How many periods do you include in your planning horizon: Period Net Cash Flow and Pr	2009 April 16 Year V 4 More	
Period:Period 1PeriodNet Cash flow:100-100Probalities:5010	2 Period 3 Period 4 200 150 15 70	
Save Business Plan Have Busine	ass Plan Assessed Back to Creative Center Print Report	

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Figure 40: User Interface - Business Plan

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