# Master thesis

---

**Demand-based learning in higher education from an organizational perspective**

An assignment at KPMG

Name: Kevin Buijserd
Student number: 0071390
Date: 20/08/2009


# Demand-based learning in higher education from an organizational perspective


## *Author*

*Kevin Buijserd*
Programme: Information Technology & Management
Student Number: 0071390
E-mail: k.buijserd@student.utwente.nl

## *Graduation committee*

*Romana Aziz*
Department: Information Systems & Change Management
E-mail: r.aziz@utwente.nl

*Elfi Furtmueller*
Department: Information Systems & Change Management
E-mail: e.ettinger@utwente.nl

*Edward Veen*
Department: IT Advisory
E-mail: veen.edward@kpmg.nl

# Management summary

This research aims to create an assessment model which helps higher educational institutions in implementing demand-based learning. The main question in this research is: According to which assessment model can KPMG advise educational institutions at implementing demand-based learning? To answer this question, three sub-questions are posed in the first section of the research. Through answering each of these questions, the assessment model at the end of this thesis could be formed. Different sources were used to answer each sub-question. A start was also made with the validation of the model, by conducting case studies at three different educational institutions.

To develop the assessment model, the research starts out with defining what demand-based learning is. This is the result to the first sub-question. Different types of presentations and documents are used together with a formal literature review to come up with a definition: *Demand-based learning aims to offer flexibility to students which in turn should enhance students' perceived quality of the educational institution.* The research showed that the flexibility to make adjustments to the individual's curriculum is what most educational institutions value as important in demand-based learning. Flexibility in study pace was also seen as important, while flexibility in study location received little attention.

The answer to the second sub-question is an impact study on demand-based learning and flexibility in organizations. Organizations were found to be limited in the level of flexibility they can offer. This level of flexibility is constrained by cost effectiveness of the organization, elements of education and quality and regulations and market demand. Case studies later showed that while the offered level of flexibility is subject to constraints, the required level of flexibility by students was also smaller than expected. For educational institutions the desired level of flexibility offered to students is indirectly established within the organization's vision on demand-based learning. This vision is made explicit within an educational model, which shows how different programs are built up and what types of freedom lie with the student. Demand-based learning also requires alignment of standards, rules and policies to improve interchangeability of students between different faculties within an organization. Applications and infrastructure play an important role in this for they are the main facilitators of student support processes in modern education. Case studies also showed that the introduction of educational and organizational standards can ease the introduction of support applications. The educational model determines how students can flow through an educational institution. This flow of students sets requirements for different support processes in the organization. These process requirements may also impose new application requirements. Demand-based learning can also have considerable effects on organizational culture, where roles change and different departments are forced to work together towards a common goal.

The different dimensions described above have been combined to form the assessment framework. This is the result of sub-question 3. The framework starts out with the four dimensions of the 'Klaverblad' model which are: Organization, processes & services, people & culture and technology & infrastructure. The results of the impact study were structured over these four dimensions and supplemented with general management best practices. The result of this is the assessment framework. This framework can be used to assess the extent to which the organization has provided input to each of the elements in the four areas of the 'Klaverblad' model. It is believed that this model can provide a more structured preparation

approach to an implementation process, as opposed to handling the different issues as they come up over time in the project.

The three case studies showed that most of these dimensions were indeed important for organizations that implemented demand-based learning. They also showed wide differences between the educational models that are used. Emphasis on different elements in the assessment model differed on an organizational basis, depending on the as-is situation at the time of implementation. Case studies showed the quality of the assessment model as satisfactory. However considering the limited amount of work that has yet been carried out in this area the model cannot be viewed as a paradigm. Future research should further increase the validity of the model.

# Table of contents

# List of figures

# List of acronyms

| | |
|---|---|
| DBL | Demand-Based Learning |
| IEM | Industrial Engineering & Management |
| IT&M | Information Technology & Management |
| KNMG | Koninklijke Nederlandsche Maatschappij tot bevordering der Geneeskunst |
| NIVRA | Nederlands Instituut Van RegisterAccountants |
| SOA | Service-Oriented Architecture |

# Preface

This thesis is the final project in the Information Technology and Management track of Industrial Engineering and Management at the University of Twente. To write my thesis I approached KPMG in November of 2008. After completing my final courses I started at KPMG in March 2009. At this time I was looking to do an assignment in the area of information management. KPMG approached me with a similar type of assignment in the field of education. As a student I have always been on the receiving end of education and this assignment allowed me to take a closer look at the organization of education. To make this research a success a high level of written information was used and different KPMG experts were interviewed. Several higher educational institutions were also approached for an interview and a workshop was held for several stakeholders from different schools.

Several people have contributed to the success of this project. This project would probably not have been as successful without their involvement and support. First of all I would like to thank Edward Veen. Edward has been my main supervisor at KPMG during the project. His experience in the field of education has contributed widely to the contents of this report. He also helped me find my way around the organization and its people, which was not always easy. Romana Aziz also contributed to this project as supervisor at the University of Twente. She critically looked after the way in which my research was organized and this greatly improved its overall presentation. My second supervisor, Elfi Furtmueller also provided a lot of feedback on my work and her positive comments were very motivating. I would also like to thank Jacob de Boer who allowed me to participate in the workshop sessions. These sessions were very helpful and they also gave me the feeling that I could contribute to some of KPMG's activities.

I would also like to thank Ronald Koorn, Matthijs Elfers, Erik Rutkens and Ramon Hendriks. As KPMG colleagues they all invested a portion of their valuable time in helping me with this project and I am thankful for that. The interviewees at the different schools who took their time to let me interview them, thank you. Finally I would also like to thank everyone at ITA De Meern for making my time there interesting and enjoyable. One of the goals of writing my thesis at KPMG was to get a good feel for what the job of an IT Consultant entitles. To this end several colleagues took their time to contribute to this and provided me with a clear image of what it is to be an advisor working for KPMG.

Finally I hope those reading this thesis can use the information therein to their advantage.

# Part I: Introduction

Part I describes the context of the research. In this part an introduction to the organization and topic of the research will be given. Part I also describes the research approach which was used to answer the main- and sub-questions posed.

**Contents:**

# 1. Research approach

This chapter introduces the reader to the topic of this thesis. Furthermore it elaborates on the research approach that was used throughout this thesis. It shows which research questions were posed and which techniques were use to answer these questions in the chapters ahead. It also explains how these techniques work and why they were chosen.

## 1.1 Initial reason for this research

KPMG advises educational institutions on their organizational development and information management. In the past years several developments have had changing effects in higher education. Most importantly; changes in regulation, demand, and society and new technological possibilities (Burbules & Callister 2000). These developments are pushing educational institutions to respond and adapt. One of the results is that these institutions are moving from traditional ways of teaching towards new teaching models. Technology is an important enabler in this development. A distinction is made between automation and facilitation. Higher educational institutions do already automate through the use of support applications such as Blackboard, Moodle and Teletop. New teaching models aim to deliver the 'anytime, anyplace, anywhere' perspective on learning. The role of technology in this perspective is very different than in the traditional perspective.

Different educational institutions in The Netherlands are at different stages in implementing new teaching models. One observation by KPMG is that educational institutions are in fact able to form a vision on the future and where they want to be within a certain time span. However, when it comes to implementing such a vision, difficulties arise. Causes of this can range from differences between professionals and management, immaturity in the information landscape or skipping certain steps in development (de Boer, 2008).

KPMG wishes to develop a framework that can support higher educational institutions in modernizing their educational models. Through this framework educational institutions should be better capable at translating their vision to a design plan and into an implementation framework.

This tool should assess different dimensions that are relevant in educational models, for example processes, information flows, and the roles of students and professors. Educational standards and flexibility will also be discussed as they are found to important later on. By comparing the results of such a tool with the vision an institution has on demand-based learning, further steps for implementing this vision can be determined.

## 1.2 Terminology

This research is about the introduction of 'vraagsturing' in educational institutions. The rest of this report will refer to the concept of 'vraagsturing' in education as demand-based learning (DBL). The concept focuses on delivery of services, in this case knowledge transfer, in response to a varying customer demand, in this case by the student. Demand-based learning resembles a 'pull' principle, which is contrary to a 'push' principle, where an organization offers services according to a preset portfolio, regardless of what the market desires. Push and pull principles can also be observed in manufacturing. Here push manufacturing refers to

producing on stock, while pull manufacturing refers to producing to customer order (Hopp & Spearman, 2000).

'Vraagsturing' has also been seen in the field of health care (van Heffen & Kerkhoff, 1997). Here the concept is about empowerment of patients, who attain more freedom in their choices as to where, when and how they get treated. Within education the concept has similar meaning. Demand-based learning is concerned with empowering students by offering them more freedom regarding their education. While demand-based learning remains a wooly concept at this point, exploring aspects and implications of demand-based learning has been part of this research.

Elements of demand-based learning are more and more put on the agenda's of major Dutch educational institutions. According to Frijns and van de Hurk (2007) demand-based learning often implies restructuring processes, changing roles and needs and changes in IT. This marks the complexity of demand-based learning for organizations.

## 1.3 Questions

Several sub-questions were setup to answer the main question. Answering the main question will in turn help to accomplish the research goal. A short discussion of these questions is given below.

### 1.3.1 Research goal

*To draw up an assessment model on the basis of literature, practice material and KPMG expert opinions, which can be used by KPMG to advise educational institutions at implementing a demand-based learning model.*

### 1.3.2 Questions

**Main question**

According to which assessment model can KPMG advise educational institutions at implementing demand-based learning?

**Sub-question**

In order to answer the main question the following sub-questions are important;

1. How is demand-based learning defined in literature and practice?
2. What does demand-based learning imply for the organization, actors, processes and logistical elements?
3. Which elements should be considered in a DBL implementation project?

Sub-question 1 is relevant because a general scan on literature showed that demand-based learning has not been widely documented so far. One hypothesis for this is that educational topics are often documented in similar type journals while literature on organizational change usually comes from organization and management journals. Demand-based learning concerns elements from both fields and is therefore not one of the mainstream areas of research.

Sub-question 2 is relatively broad. The reason for this is that while this thesis will also explore these areas independently, it is also interested in interaction effects between these different organizational areas.

The answers to sub-question 3 are the basic elements for the assessment tool which will be developed.

## 1.4 Structure

The structure of the report mostly follows the research questions. The outline of the report is schematically shown in figure 1. Chapter 4, 5 and 6 contain the answer to respective sub-questions 1, 2 and 3.

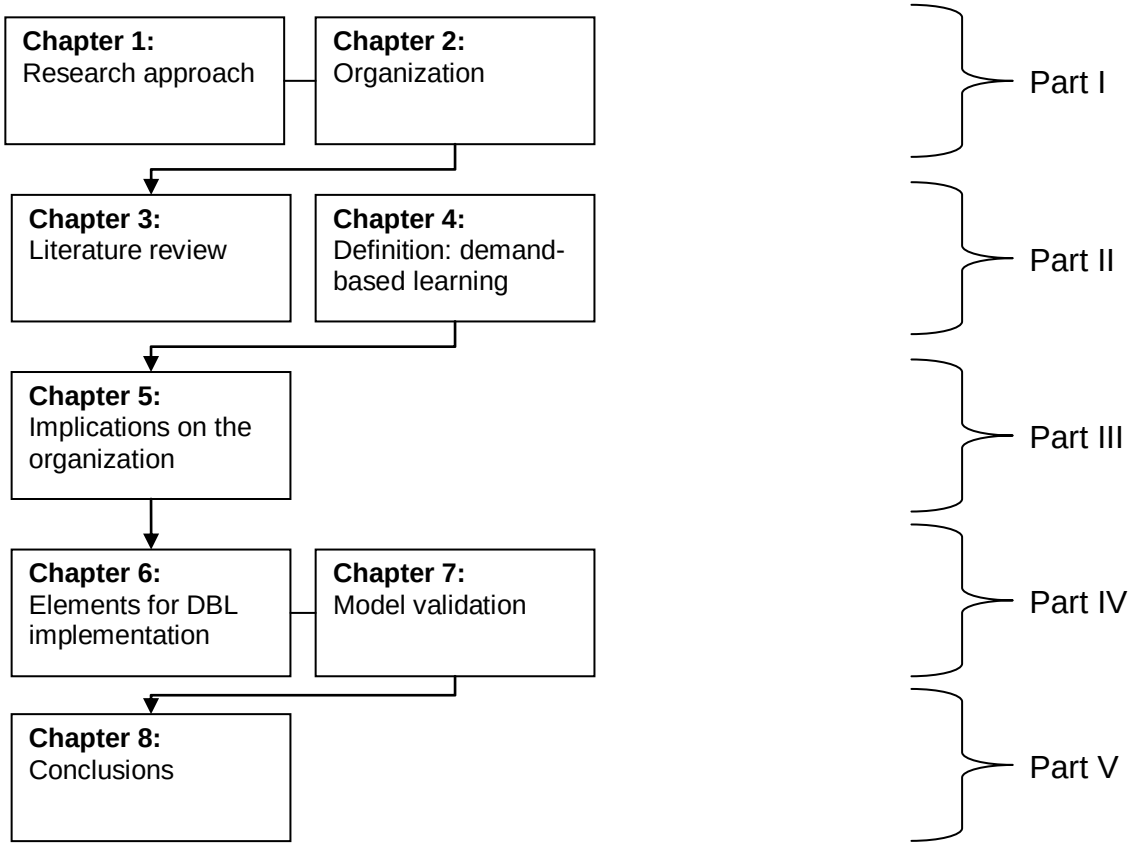


*Figure 1: Outline of the report*

The results of the literature review are a concept matrix and a concept map. These two things try to summarize different concepts and their meanings as described in literature. The definition on DBL is given in chapter 4 by using elements from both the literature review and different types of practical material that were used in the respective chapter. The definition from chapter 4 is carried over to chapter 5 and is used to see how DBL impacts educational institutions. This results in a set of general effects on the organization, which are used in chapter 6 to form different sections in the assessment model. Case studies are used to start model validation in chapter 7. Chapter 8 evaluates the research approach using Hevner's (2004) criteria for design science. This chapter also contain conclusions, limitations and future research.

## 1.5 Scope

Three subtypes of Dutch educational institutions exist. The first subtype consists of MBO institutions, which are aimed at teaching professions. The second and third subtypes are

HBO/ROC institutions and universities. One difference between MBO and HBO/ROC and universities is competence-based versus demand-based learning. Competencies are general professional areas of interest.

A second difference between the first and the second and third subtypes is the role of research. While MBO institutions are not involved in research, HBO/ROC institutions and universities are. Because of these differences this research mainly aims at HBO/ROC institutions and universities. However results can partially be generalized to MBO institutions.

This research does not aim to prescribe how demand-based learning should look. This remains a choice made by organizations themselves. The assessment model which will be developed however aims to guide organizations in making these choices in a more considerate way.

## 1.6 Research Methodology

To answer each of the research questions several different approaches were used. These approaches will be discussed below. A short overview of methodologies used for answering each sub-question is presented in table 2.

| Research question | Methodology |
|---|---|
| 1. **How is demand-based learning defined?** | - Formal literature review on education-related concepts<br>- KPMG inside material<br>- Practical material |
| 2. **What does demand-based learning imply for the organization, actors, processes and logistical elements?** | - KPMG inside material<br>- Practical material<br>- KPMG expert interviews |
| 3. **Which elements need to be considered in a DBL implementation project?** | - KPMG inside material<br>- Practical material<br>- General IEM literature<br>- Interviews with local experts for validation |

*Table 2: Research approaches*

The first sub-question was answered by conducting a literature review, which is presented in chapter 3. Together with practice material and KPMG inside material the concept of demand-based learning is defined in chapter 4. Combined with results from KPMG expert interviews and results from earlier sections, chapter 5 describes the implications of demand-based learning on educational organizations. This yielded a general set of themes which related to demand-based learning and their impacts on the organization. This is not a covering set but a gathering of most relevant themes. At this point my supervisor at KPMG and I looked at a model in which we could hang these themes. We chose the 'Klaverblad' model by KPMG Consulting, because this model in our eyes resembled the four most important areas in an organization; organization, processes & services, people & culture and infrastructure & technology. The relationship between the Klaverblad model and chapter 5 is that the set of

implications described in chapter 5 can be placed under the different dimensions of the Klaverblad model. After doing this several non-described areas in the Klaverblad model remained. These 'empty fields' were filled in using general Industrial Engineering & Management (IEM) literature. Together with findings from chapter 5 these formed a holistic assessment model for implementing demand-based learning. Local expert interviews were conducted to determine the model's validity. At the end of the report limitations, recommendations for further research and conclusions are presented.

### 1.6.1 Formal literature review

The formal literature review process (Webster & Watson, 2002) was used to explore the literature on education and education related organizational developments. The formal literature review process aims to eliminate three undesirable elements of research selection:

- Random sampling (selecting first articles found)
- Biased sampling (selecting articles that support your case)
- Convenience sampling (selecting articles that are most accessible to you)

It tries to achieve this through the following elements;

- Clearly defined (and justified) choice of search engines
- Clearly defined (and justified) choice of keywords
- Clearly defined selection criteria
- Clearly defined prioritization criteria
- Evaluation (critical analysis) and synthesis of papers

Part of the formal literature review is forward and backward searching. Backward searching is looking up papers that are referenced by other papers that have been found. Forward searching is looking up papers that cite the papers that have been found.

The formal literature review provides a way through which one can systematically search literature on a relevant topic (Webster & Watson, 2002). Conducting the literature review in a formal way offers two different advantages.

First, the reader gains insight into how the search process was set up and is able to reproduce this search process. By giving insight into the search process the reader will be able to judge its general quality.

Second, by conducting the review process in a systematic way, chances of leaving out highly relevant research papers from the review are minimized. In order to present a quality thesis on a topic such as demand-based learning, high quality and highly cited research should have been explored. The systematic literature review allows the author to support any claims about the current level of the research already conducted in a specific area.

The literature review was used to answer sub-question 1. The results of this review are presented in part II of this thesis, as they have been an important component in defining demand-based learning.

### 1.6.2 KPMG inside material

KPMG has been involved in several different demand-based learning projects. As an advisory company, sales proposals and department presentations are available to interns. This material was relevant for answering all three of the research questions as they serve as a source of practical information.

### 1.6.3 Practical material

Different educational institutions have already made attempts to implement demand-based learning in their organization. Some have been more successful than others. Various institutions have given presentations on their results so far. These presentations are available for public view. Most of these presentations were acquired using non-scientific search engines and through references of KPMG experts. Practical material was used in answering all three sub-questions.

### 1.6.4 Focus sessions with KPMG experts

KPMG employs several different experts on the topic of demand-based learning. Their expertise mainly derived from the participation of both general and demand-based learning specific projects at different educational institutions. These experts also worked closely with vendors of student support applications. Their knowledge on the subject was regarded as highly relevant and focus sessions were held to incorporate this knowledge into this thesis. Focus sessions with KPMG experts mainly contributed to answering sub-question two. Contact information for each of the interviewees can be found under Appendix A. A formal interview format for these sessions was not included; the sessions took place mostly in an informal and conversational setting.

### 1.6.5 General Industrial Engineering & Management literature

Implementing demand-based learning is regarded as an organizational change and topics such as change management, project governance and business models are highly relevant to this change. Organizational literature used throughout different courses at both the TBK bachelor track as well as the IEM master track was therefore also used in this research. This literature was not derived from the formal literature review.

### 1.6.6 Interview with local experts

To validate the quality of the model, several interviews with local experts were held. These interviews were aimed at the elicitation of problems during the implementation of demand-based learning. Interviews with local experts add an extra dimension of information used to create and validate the model. By using both written material and interviews the external validity of the model will improve greatly. Contact information for each of the interviewees together with the formal interview format can be found under Appendix B.

## 1.7 Impact and relevance

### 1.7.1 Practical relevance

The framework can be used to systematically assess the quality of a DBL design in educational institutions. We define quality of DBL design as: The extent to which attention has been paid to relevant elements relating to DBL and the extent to which an organization has addressed these elements in its DBL design and implementation plan. This will allow for identifying possible areas of improvement. Addressing potential design problems and inconsistencies will prevent such issues from arising during the actual implementation, where they can cause significant delays and potentially harm the project's chances on success.

### 1.7.2 Theoretical relevance

Demand-based learning as a concept has been ill defined in literature. Several concepts are described which connect to DBL, for example distance learning, e-learning and flexible learning (Taylor, 2001; Zhang & Nunamaker, 2003; Normand, Littlejohn & Falconer 2008).

This thesis should provide an organizational view on how DBL could be implemented by organizations.

Not much literature could initially be found on specific organizational dimensions that characterize a demand-based learning model. This research could provide new insights as to what properties in an organization especially need attention in order for DBL initiatives to succeed.

# 2. Organization

This chapter describes the organization and the context in which this thesis was written. The chapter starts with a short history of how the company came to be. After that several key figures are presented. The chapter ends with a description of services Delivered.

## 2.1 Brief history

KPMG is a combination of several different accountancy firms. In 1911 William Barclay Peat & Co. merges with Marwick, Mitchell & Co. to form Peat Marwick International (PMI). In 1979 the Dutch accountancy firm Klynveld Kraayenhof & Co. merged with Deutsche Treuhandgesellschaft and McLintock Main Lafrentz & Co., which formed KMG. Together PMI and Peat Marwick International form KPMG in 1987.

## 2.2 Mission statement

The mission statement as found on KPMG's webpage is:

*"Outstanding professionals, working together to deliver value. We offer Audit, Tax and Advisory services. Three complementary areas of knowledge and insight that enable us to meet the needs of our clients. We turn knowledge into value for the benefit of our clients, our people and the capital markets."*

## 2.3 Key figures

KPMG delivers global services in the areas of Audit, Tax and Advisory in over one hundred forty-four countries. Worldwide KPMG employs more than 137.000 employees. In 2008 the company realized a turnover of 22,7 billion US dollars. The member firms of KPMG International are divided into three regions: EMA (Europe, Middle-East and Africa), the Americas and Asia Pacific.

In The Netherlands KPMG employs over 3.900 employees in seventeen offices throughout the country. Annual turnover in 2008 was 715 million Euros combined over tax, advisory and audit. The company's national headquarter is located in Amstelveen.

## 2.4 Competitors

KPMG is one of the 'big four', which constitutes of KPMG, Deloitte, Ernst & Young, and PriceWaterhouseCoopers. These are currently the largest four accountancy and professional services firms in the world. Table 1 shows revenues and employees during the fiscal year of 2008 for each of these companies.

| Firm | Revenues | Employees | Fiscal Year |
|---|---|---|---|
| PriceWaterhouseCoopers | $28.2bn | 155,693 | 2008 |
| Deloitte Touch | $27.4bn | 165,000 | 2008 |
| Ernst & Young | $24.5bn | 135,000 | 2008 |

| | | | |
|---|---|---|---|
| KPMG | $22.7bn | 137,000 | 2008 |

*Table 1: 'big four' figures*

## 2.5 Services

For each of the three areas KPMG specializes in, the company is active in different branches. Some examples are consumer goods & retail, financial services, private equity, transport & distribution and education. Most of the work carried out by KPMG is staged in a multi-disciplinary setting where experts from different departments work together to successfully assist KPMG's clients.

Part of the advisory group is KPMG IT (ITA) Advisory. ITA provides advice for specific improvements of existing information and communication technology (ICT) applications and assists the client in further development of the ICT function. In a digital world, ICT is crucial for the improvement of business processes. ITA assists organizations with managing the risks of IT applications. A thorough review and evaluation of the ICT application forms the basis for specific recommendations. In addition to providing support to auditors in their audit activities, the ITA services include IT assessments, the evaluation of the quality of existing and new systems, risk analyses, information security and reports about it, the drafting of continuity plans and assessment of internet applications.

ITA advises educational institutions on different aspects of their IT. Examples of where ITA offers expertise in this branch are;

- Mergers and cooperation
- Setting up Shared Service Centers (SSC)
- Professionalizing ICT service provision

Risk Management

# Part II: Exploring demand-based learning

This chapter explores demand-based learning using various internal and external sources. Part of this is a formal literature review which will be presented in chapter 3.

**Contents:**

# 3. Literature review

Reviewing scientific literature on the topic serves three purposes. First of all it gives insights into what had already been done in the field of research. Second, conducting a literature review can provide insights on what scientific research regards as demand-based learning. Third, an initial literature scan showed that different authors include different concepts in their definitions.

An initial scan through some of the projects done by KPMG involving DBL showed that DBL is concerned with the student and his or her educational needs. DBL tries to satisfy educational needs by offering education that is tailored to the individual. This can be done to differing extents. Difficulties arise when trying to explain how one student's study demand should differ from that of another. At the same time, to what extent can education actually be individualized? Different interpretations make it difficult for educational institutions to see what demand-based learning really is, and how they should respond to it.

This chapter contains findings on literature and other theoretical materials. One of the main conclusions is that demand-based learning includes elements of e-learning, distance learning and blended learning. These concepts have been extensively described in scientific literature, mainly from the perspective of teachers and students. Flexibility in course programs is mentioned by only a few authors. There is however a fair amount of practical documents available, like presentations, KPMG inside material and practical websites. This shows that organizations are indeed implementing DBL.

## 3.1 Search terms

The review process consists out of several iterations. Because the literature review has an explorative purpose a wide range learning related concepts was used. For each concept a basic search in both Scopus and ISI was performed. The search terms were also expanded using the following terms: *flexibility*, *technology*, *university* and *university technology*. This resulted in the set of search terms listed in table 3.

| | | |
|---|---|---|
| *"Distance learning"* | | |
| *"Distance learning"* | AND | Flexibility |
| *"Distance learning"* | AND | University |
| *"Distance learning"* | AND | Technology |
| *"Distance learning"* | AND | University AND technology |
| *"Flexible learning"* | | |
| *"Flexible learning"* | AND | Flexibility |
| *"Flexible learning"* | AND | University |
| *"Flexible learning"* | AND | Technology |
| *"Flexible learning"* | AND | University AND technology |
| *"Demand-based learning"* | | |
| *"Demand-based learning"* | AND | Flexibility |
| *"Demand-based learning"* | AND | University |

| | | |
|---|---|---|
| *"Demand-based learning"* | AND | Technology |
| *"Demand-based learning"* | AND | University AND technology |
| *"Blended learning"* | | |
| *"Blended learning"* | AND | Flexibility |
| *"Blended learning"* | AND | University |
| *"Blended learning"* | AND | Technology |
| *"Blended learning"* | AND | University AND technology |
| *"Technology-enhanced learning"* | | |
| *"Technology-enhanced learning"* | AND | Flexibility |
| *"Technology-enhanced learning"* | AND | University |
| *"Technology-enhanced learning"* | AND | Technology |
| *"Technology-enhanced learning"* | AND | University AND technology |
| *"Open learning"* | | |
| *"Open learning"* | AND | Flexibility |
| *"Open learning"* | AND | University |
| *"Open learning"* | AND | Technology |
| *"Open learning"* | AND | University AND technology |
| *"E-learning"* | | |
| *"E-learning"* | AND | Flexibility |
| *"E-learning"* | AND | University |
| *"E-learning"* | AND | Technology |
| *"E-learning"* | AND | University AND technology |
| *"Flexible program delivery"* | | |
| *"Flexible program delivery"* | AND | Flexibility |
| *"Flexible program delivery"* | AND | University |
| *"Flexible program delivery"* | AND | Technology |
| *"Flexible program delivery"* | AND | University AND technology |

*Table 3: Search terms used*

## 3.2 Search process

For each of these combinations the total set of articles was reduced by excluding articles published before 2001, excluding non-related research fields and excluding non-relevant journals. Journals that were not peer reviewed were not excluded from the search. The main reason for this was that relevant papers were published in different fields of research, including information systems, management and education. Due to this variety the timeframe for this work did not allow a full assessment of the different journals in which the works were published. A list of journals used has been included under Appendix E. For each combination of search terms a selection of papers was made based title and abstracts. The resulting set of papers was selected based on an overview of its contents. For each iteration special attention was directed towards highly cited papers and papers that were published as recently as 2007 and 2008.

Forward and backward references were also found and included in the selection of relevant papers. The extended search also includes two papers that were found using a search engine at the University of Utrecht. Other scientific references used originate from courses that were taught during the Information Technology &Management (IT&M) master track. This material was mostly used as foundation for more general statements within the assessment model in chapter 6. The literature review process has been schematically shown in figure 2.

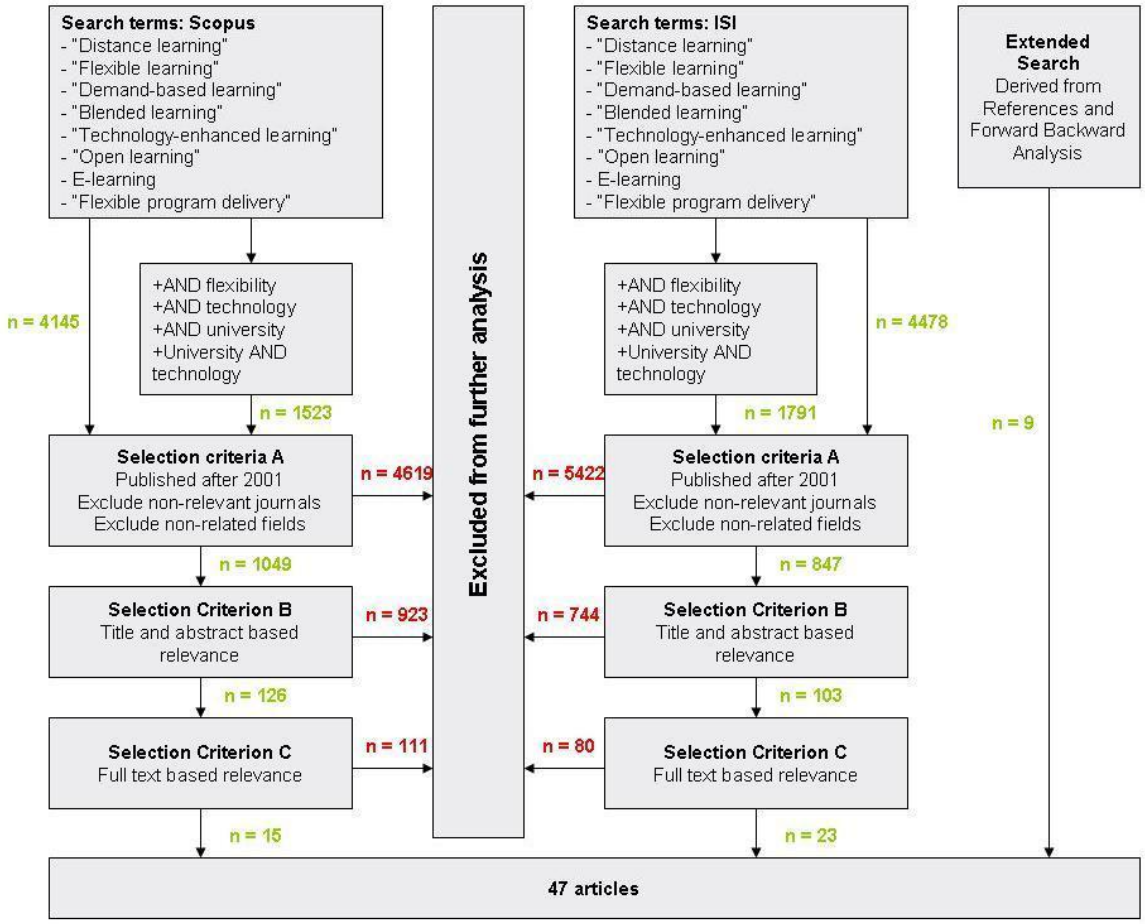


*Figure 2: Schematic literature review*

## 3.3 Concept matrix

All papers found during the literature were compared on a number of dimensions important to flexibility, technology and education. Some of these dimensions show similarity with the names of the concepts mentioned in the previous paragraph. For example for the reader it may seem clear that distance learning embraces the concept of remote education. However several authors use overlapping definitions of the different concepts. Making a comparison for each concept over different dimensions is therefore a useful effort.

The concept matrix is shown in table 4, and clearly shows some of these overlaps. A checked box implies that the author mentions the respective dimension with regard to the concept used. For example, most authors agree that distance learning should not require physical student presence in classes and that different types of technologies are required to support

this. Most distance learning efforts described were part of an institutional program to offer education to students not able to attend traditional lectures.

| Author(s) | Concept | Flexibility in program | Remote education | Blended learning | General technologies | Advanced technologies |
|---|---|---|---|---|---|---|
| Akkoyunlu and Yılmaz-Soylu (2007) | blended learning | | | v | v | v |
| Alonso, López, Manrique and Viñes (2005) | e-learning | | v | v | v | v |
| Bo-Anders and Jonsson (2004) | e-learning | | v | v | v | v |
| Bouhnik and Marcus (2006) | distance learning, e-learning | | v | | v | v |
| Cartwright and Menkens (2002) | distance learning | | v | | v | v |
| Carchiolo, Longheu, Malgeri and Mangioni (2007) | web-based learning, e-learning | | v | | v | v |
| Chan and Law (2008) | blended learning, open learning | | | v | v | v |
| Clarke, Butler, Schmidt-Hansen and Somerville (2004) | distance learning | | v | | v | v |
| Collis and Moonen (2004) | Flexible learning | v | v | v | v | v |
| Davis and Fill (2007) | blended learning | | | v | v | |
| Dorrian and Wache (2009) | distance learning, flexible learning | | v | v | v | v |
| Dernt and Motschnig-Pitrik (2005) | blended learning | | | v | v | v |
| Dearnley (2003) | open learning | | v | | | |
| Eynon (2008) | e-learning | | v | v | v | |
| Faulhaber (1996) | distance learning | | v | | v | v |
| Forman, Nyatanga and Rich (2002) | e-learning | | v | v | v | v |
| Gannon Cook, Ley, Crawford and Warner (2009) | e-learning, distance learning | | v | | v | |
| Garrison, Kanuka (2004) | blended learning | | | v | v | v |
| Green (2005) | flexible learning | | v | v | v | |
| Hayes and Jamrozik (2000) | distance learning | | v | | v | v |
| Heilesen and Josephsen (2007) | e-learning | | v | v | v | |
| Henrich and Sieber (2009) | blended learning, e-learning | | v | v | v | v |
| Hill (2006) | flexible delivery | v | v | v | v | v |
| Hodgins (2007) | distance learning | v | v | | v | v |
| Katz (2002) | distance learning | | v | | v | v |
| Kirkwood and Price (2005) | flexible learning | | v | v | v | |
| Mahdizadeh, Biemans and Mulder (2008) | e-learning | | | v | v | v |
| Marshall and Mitchel (2005) | e-learning | | v | | v | v |
| Martin and Treves (2007) | e-learning | | v | v | v | v |
| Mor and Winters (2007) | technology-enhanced learning | | | v | v | v |
| Normand, Littlejohn and Falconer (2008) | flexible learning | v | v | v | v | v |
| Nunan, Reid and McCausland (2002) | flexible delivery | v | v | v | v | v |

| | | | | | | |
|---|---|---|---|---|---|---|
| Passerini and Granger (1999) | distance learning | | v | | v | v |
| Rovai, Ponton, and Baker (2008) | distance learning | | v | | v | v |
| Stubbs, Martin, and Endlar (2006) | blended learning | | | v | v | v |
| Sadler-Smith and Smith (2004) | flexible learning | | v | v | v | v |
| Selim (2007) | e-learning | | v | v | v | V |
| Taylor (2001) | distance learning | | v | | v | V |
| Vencatesan (2006) | distance learning | | v | | v | V |
| White (2007) | e-learning | | v | v | v | V |
| Webster and Hackley (1997) | distance learning | | v | | v | V |
| Wade and Ashman (2007) | distance learning | | v | v | v | V |
| Williams, Nicholas and Gunter (2004) | distance education | | v | | v | V |
| Yong (2006) | e-learning | | v | | v | V |
| Zhang and Nunamaker (2003) | e-learning | | v | | v | V |

*Table 4: Concept matrix*

For each of the papers several properties are defined;

- Whether the concept includes flexibility within program
- Whether the concept allows remote education or not,
- Whether the concept includes blended learning,
- Whether the concept includes the use of general technologies,
- Whether the concept includes the use of advanced technologies.

### 3.3.1 Flexibility in program

An overview of flexibility in education has been given by Collis and Moonen (2004). Collis and Moonen describe flexibility over a number of dimensions ranging from flexibility in content, study location, course enrollments and tempo both within courses and curriculum.

An important aspect of demand-based learning is to provide such flexibility to students. Summarizing findings by Collis and Moonen, three dimensions seem to be prevalent. These are flexibility in study pace, flexibility in study location and flexibility in courses. Hill (2006) defines the same dimensions but uses the simpler terms ‘what’, ‘where’ and ‘when’. These elements will be further reviewed later on.

Flexibility in program is defined as flexibility in curriculum and flexibility in study pace. Flexibility in curriculum involves the delivery of teaching programs tailored to the individual student and the degrees of freedom through which this is done. Flexibility in study pace relates to enrollment times and the ability to accelerate or slow down a student’s study planning. These dimensions relate to ‘how’ and ‘what’ such as proposed by Hill (2006). For every paper in the review, references to program flexibility by the author were listed. Only four authors in the review made notion of flexibility within and between programs. This indicates at a deficiency in the literature.

### 3.3.2 Remote education

Remote education allows students to follow education without physically being present at a university or college. This is different from blended approaches, where a mix between on-campus and e-learning or distance learning approaches is used.

Remote education can be realized in a number of ways. Most authors that mention remote education as part of their view on technology and education see a dominant role for video or streaming-video to allow for a rich transfer of knowledge (Hayes & Jamrozik, 2000; Clarke, Butler, Schmidt-Hansen & Somerville, 2004).

Interaction between student and teacher is also mentioned by several authors (Bouhnik & Marucs, (2005); Henrich & Sieber, (2008)); Clarke, Butler, Schmidt-Hansen and Somerville, 2004) as a critical component in remote learning. An interesting distinction is made by (Moore & Kearsly, 1996). They define three types of interaction that are critical in remote education. The three types are; interaction between students, interaction between student and teacher and interaction between student and course materials. Each type of interaction could have different effects on learners or the effectiveness of a course.

### 3.3.3 Blended learning

According to Akkoyunlu and Yılmaz-Soylu (2007) blended learning combines various models of traditional and distance education and makes use of all types of technology, which refers to a hybrid form of education. This means that part of the course can be followed physically away from the university, while the other part cannot. Authors do not prescribe which parts of courses should be on- and offline. Some examples are given, for instance by Dearnly (2003) who describes a form of blended learning where physical lectures only fill the role of troubleshooting sessions.

Blended learning is used by authors as a single concept, but also as part of other concepts, for example e-learning. Most Dutch educational institutions currently apply some form of blended learning. The relation between on- and offline parts of the course widely differ however.

### 3.3.4 Technologies used

The review also identifies which technologies are mentioned as part of the concept that is presented by the respective author. It was found that not all authors actually defined what technologies were most prevalent in their concept. Mahdizadeh, Biemans and Mulder (2008) conducted a survey on the use of technology in education in a large Dutch university. Some of these technologies were found to be used on a wide scale already. These are;

- Online course materials and literature,
- Course information,
- PowerPoint presentation,
- E-mail and mailing lists,
- Course calendar and schedule,
- Announcements (news),

This group of technologies is referred to as ‘general technologies’. There were also several technologies that were used to much lesser extent;

- Online simulation programs and software,
- Computer-based assessment,
- Online discussion,
- Videoconferencing and net-meeting,
- Recorded lectures,
- Message boards,

- Voice conferencing.

This group of technologies is referred to as 'advanced technologies'. These technologies can be seen as more advanced, but also as more intrusive to the ways in which teaching in organized (for example videoconferencing means teaching is no longer done physically and can also change how interaction takes place). This intrusive nature changes the way in which teaching takes place. Not all teachers and professors are open to innovation however and this might also be the reason why general technologies are used much more often: general technologies can be used without making large changes in the way the education takes place.

Wide differences exist between authors and what they perceive as essential technologies. One of the main conclusions is that technology should fit the way in which education is set-up and not the other way around (Bouhnik & Marcus, 2006; Akkoyunlu & Yılmaz-Soylu, 2007; Eynon, 2008). Most authors also consent on this.

For each paper studied, we identified which of the two groups of technologies were referred to within that paper. All papers made some reference to the use of general technologies. Furthermore, most of the papers also referred to several of the advanced technologies. Few papers also mentioned the use of backend applications such as those used for student administration. None of the articles made reference to connectivity, specific levels of application integration or information flow requirements in a demand-based learning environment. This again points to a deficiency in literature.

## 3.4 Concept map

The review provides several insights on the different concepts that are used and how they relate to each other. These relationships are modeled using a concept map which is shown in figure 3 on the next page. Within figure 3 e-learning can be seen as a central element. Zhang and Nunamaker (2003) define e-learning as follows: *"e-Learning refers to any type of learning situation when instructional content is delivered electronically via the Internet when and where people need it."* Another definition is given by the Commission of European Communities1 as *"the use of new multimedia technologies and the Internet to improve the quality of learning by facilitating access to resources and services, as well as remote exchange and collaboration"*. E-learning is also a topic which numerous articles have been written on. This could explain why e-learning is defined as such a general concept in literature.

### 3.4.1 Blended learning → E-learning

Blended learning is a combination of traditional learning and distance learning. Technology plays an important role in offering blended learning courses to students. For blended learning authors agree that changes in the content of education are essential for this concept to be successful. Such changes should address the fact that blended learning usually involves less contact hours and that parts of course content are transferred online. By Zhang and Nunamaker's definition, e-learning can be seen as generalization of blended learning.

### 3.4.2 Distance learning → E-learning

In much the same rhetoric distance learning can be defined as a specific form of e-learning. Most authors do agree that distance learning is about the physical separation of the student

1 http://ec.europa.eu/information_society/eeurope/2005/all_about/elearning/index_en.htm

from the institution and the facilitating role that technology has in this format. As with blended learning, distance learning authors also agree that changes in the content of education are required for this concept to be successful.

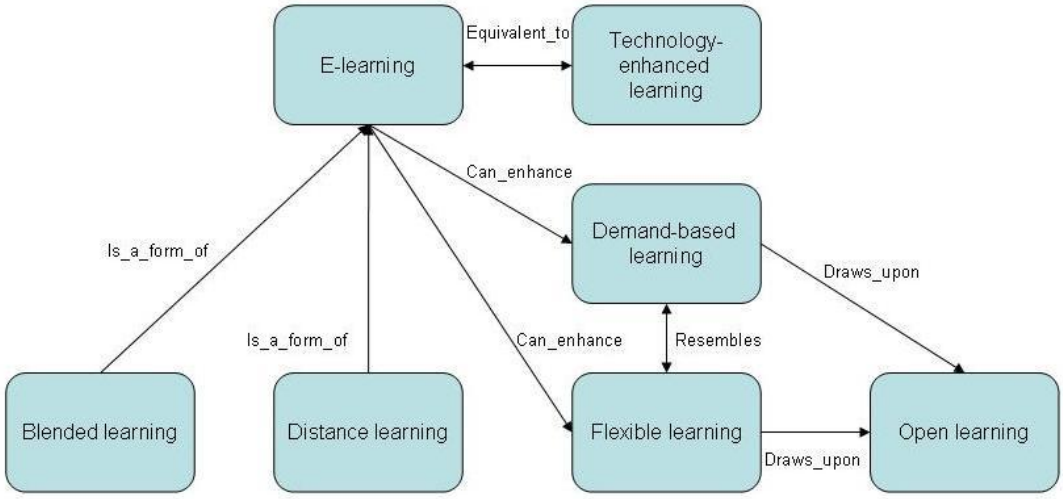


*Figure 3: Concept Map*

### 3.4.3 E-learning ←→ Technology enhanced learning

Technology-enhanced learning can be seen as some combination of technology that is used to enhance education. This remains a vague description however. Few articles were found that used the concept of technology enhanced learning and only one article made it into the final selection of most relevant papers. This shows that technology enhanced learning is not a well documented concept. This could be explained by the overlap the concept seems to have with e-learning. This becomes especially apparent when looking at the definition of e-learning given by the Commission of European Communities in paragraph 4.4.

### 3.4.4 E-learning → Demand-based learning

The relation between e-learning and demand-based learning is that e-learning can provide best practices and specific uses of technology that can enhance certain aspects of demand-based learning. E-learning environments also increase student responsibilities. Many of the e-learning articles that were found only described the concept on an individual classroom level. From an organizational perspective such papers add only moderate value.

### 3.4.5 E-learning → Flexible learning

E-learning techniques can enhance flexible learning. The electronic delivery of course materials can for example allow students to study at their own pace. This adds flexibility to the learning process. The same as in 4.4.4 applies however; most e-learning articles only described the concept on an individual classroom level. At this level only aspects relating to individual courses can be made more flexible. From an organizational perspective these papers add moderate value.

### 3.4.6 Demand-based learning ←→ Flexible learning

Demand-based learning and flexible learning can be marked as equivalent concepts, which both draw upon open learning principles aimed at self-directed learning. Both concepts are

aimed at empowering the student by allowing them to make more choices in their education. Several papers that described flexible learning addressed only the spatial dimension. In that sense flexible learning also has some overlap with distance learning and blended learning. However not much literature has been written on flexibility in course programs and study pace in general. Future articles on flexible learning could address these dimensions more elaborately than they are currently doing.

### 3.4.7 Demand-based learning → Open learning

Open learning is an educational principle based on self-determined, independent and interest-guided learning. Demand-based learning draws upon this principle by offering education more tailored to the individual student. The general notion is that students interested in their education will show a lower default rate than students who are not interested in their education. Default rates are directly related to the perceived level of educational quality and institutions aim to keep defaults at a minimum.

### 3.4.8 Flexible learning → Open learning

As flexible learning much resembles demand-based learning, flexible learning too draws upon open learning principles.

## 3.5 Discussion

From an organizational perspective not much has been written about demand-based learning, which shows that a literature deficit is currently present in this area. No best practices are available on an organizational level. One of the reasons for this may be that demand-based learning remains very much an experimental area. Demand-based learning can be marked as an organizational change or perhaps even a strategic change. From this perspective scientific material written on the topic should come from organizational and business journals. Both Scopus and ISI showed little relevant papers from such journals. On an educational level however several elements of demand-based learning have been described in different concepts such as distance learning, blended learning and flexible learning.

This may be a result of the number of researchers being involved in education and teaching compared to the number of researchers involved in organizational change in education. Several papers that were found were written by teachers and professors that had introduced for example distance learning in their own course, and decided to write down their experiences.

Other then providing an overview of scientific literature, the result of this review is a set of key papers which will be used as a reference in the next chapters. Most useful are the articles by the following authors: Chan and Law (2008), Hill (2006), Normand, Littlejohn and Falconer (2008), Selim (2007) and White (2007). The article by Collis and Moonen (2004) provided a good basis for analysis of flexibility in higher education, which will be used in part III.

While some overlapping concepts are present and seem to clearly relate to demand-based learning, the literature review has not yielded a satisfying definition. For example little has been said about the way education should be organized to facilitate a DBL model. Using the definitions of Collis and Moonen the literature provides information mostly on flexibility in study location. Chapter 4 will explore how important the other dimensions of flexibility are in

giving a definition on DBL. By scanning through project documents and presentations chapter 4 provides the practical view upon DBL.

The main conclusion from this chapter remains that there is room for more research in the area of demand-based learning and how it can and should be implemented.

# 4. Answering sub-question 1: What is demand-based learning?

This chapter will first look at some of the factors behind developments in modern education which fuel demand-based learning efforts. After that, findings from chapter 3 are combined with findings from non-scientific material. Finally an explanation is given as what is currently regarded as demand-based learning.

## 4.1 Modern education

Geerlings, Mittendorff and Nieuwenhuis (2004) make a distinction between the traditional approach to education and modern approaches. They compare the traditional approach with the industrial age corresponding with a push-production way of product delivery. According to them, typical properties of this educational model are rigid course planning, efficiency and a result-orientation. Freire (1994, quoted in Selim, 2007) states that the traditional view on education assumes that the instructor owns the knowledge and deposits it into the passive students who attend the class.

In modern education this vision no longer applies. Here students are becoming central to the educational process. At the same time students have more control over their education. A central notion to modern education is that students have specific interests in certain topics. Allowing students to pursue such interests increases the overall perceived quality of education.

## 4.2 Change in the field of education

The traditional view on education has been changing during the last part of 20$^{th}$ century. From a pedagogical perspective modern education is about pro-active learning. This means active involvement of students in education and implies a changing role for both students and teachers. KPMG sees an increase in educational institutions trying to modernize their educational structures.

The field of education is not characterized by fast moving innovative organizations. Changes in education in the last ten years have included changes in the use of technology. One such change is the introduction of web-based initiatives. These initiatives are often not systemic, but the result of random acts of innovation, initiated by risk-taking individual academics (Taylor, 2001). In a survey conducted by Mahdizadeh, Biemans and Mulder (2008) the use of technology in courses lectured at the University of Wageningen was measured. Their conclusion was that technology at the University of Wageningen was not well-integrated in the learning processes. The survey showed a high correlation between the adoption of different technologies and teachers' perceived attitudes towards such technologies.

Part of the reason why technology adoption in education has been slow thus seems to come from a lack of institutional effort. In the last few years universities and colleges in The Netherlands have started to innovate on an organizational level. Institutions are starting to realize that to compete with education offered by businesses, they need to renew parts of their organization. Further attributing to this organizational effort are changes in learning demands and changes in regulation. As was stated in the research background, some institutions have been more successful at implementing such changes than others.

## 4.3 Demand-based learning according to educational institutions

Guidelines for higher education were set during the Bologna summit in 1999. One of the results from this summit has been the Bachelor Master structure which is currently used in most colleges and universities. Most of the Bologna guidelines were aimed at standardizing the educational format in European higher education. Educational institutions use these guidelines as a basis for setting up their educational model.

In most cases this means that educational institutions cluster up their course offerings in modules of different size. Freedom is introduced when picking certain course modules. The content and size of such modules differs per organization. The rules and support mechanisms that guide students in choices for these modules also differ. Most organizations seem to agree however that 100% flexibility in the choice of courses is not desirable for several different reasons. Organizations do recognize that demand-based learning is an institutional effort that focuses on empowering the student.

## 4.4 Demand-based learning according to KPMG

According to KPMG demand-based learning has been implemented in different organizations in different ways. Such implementations have not gone without effort. Currently none of the demand-based learning models seems to be superior to the others. This also implies that different DBL models can actually be successful.

KPMG recognizes that for all educational processes increased requirements on the availability and quality of (student) information exist. Such information is needed for monitoring on both central and de-central levels in the organization. To facilitate such requirements this requires changes in applications (Hofland, Hoogstra, Smit & Manschot, 2009). Demand-based learning also requires changes in supporting processes:

*Financial administration:* the role of financial administration changes from registration to a strategic part of doing business.

*HRM:* HRM changes from personnel and salary registration to formation planning, performance management and.

The result of a KPMG project evaluation conducted at a higher educational institution showed that a lot of its employees viewed the DBL project as an IT project. In reality this is not the case. Demand-based learning requires changes in the educational model and processes. This in return also affects roles and functions, together making this more an organizational change than an IT change.

What are the potential pitfalls? Because implementing demand-based learning is an organizational change, the complexity of this change is high. Organizations can find it difficult to see how choices in one area will affect choices in another. Another pitfall is failing to include certain choices on the DBL model early on in the project. Having to make these choices later on may significantly increase implementation time and increase risk of failure (de Boer, 2008).

## 4.5 Related elements and concepts

As stated before, the main drivers behind demand-based learning are changes in learning demand. Demand-based learning is regarded as an institutional change because it moves the focal point of education onto the student (Normand, Littlejohn & Falconer, 2008). DBL means giving the student more freedom of choice in his or her learning program.

To this end distance learning literature has already pioneering with flexibility in study location. Types of flexibility in education were shortly discussed in paragraph 4.3.1. Location independent education offers options for curriculum flexibility as well. This is why flexible program delivery is not new to institutions teaching distance education programs (Evans, 1999). Distance education can be offered on a course or program basis however, which is not the case with DBL.

The general notion is that demand-based learning contains a set of core concepts over which decisions regarding the organization and its processes need to be made. Organizations seem to agree on which concepts these are, but not on how the organization should give meaning to these concepts. Some of these concepts are schematically shown in figure 4 and result from the different presentations and other written documents that were reviewed before writing this chapter. Table 6 in Appendix D gives an overview of this material. As most of these sources are not available to public they have not been included under references. All of the concepts in figure 4 are important for demand-based learning.

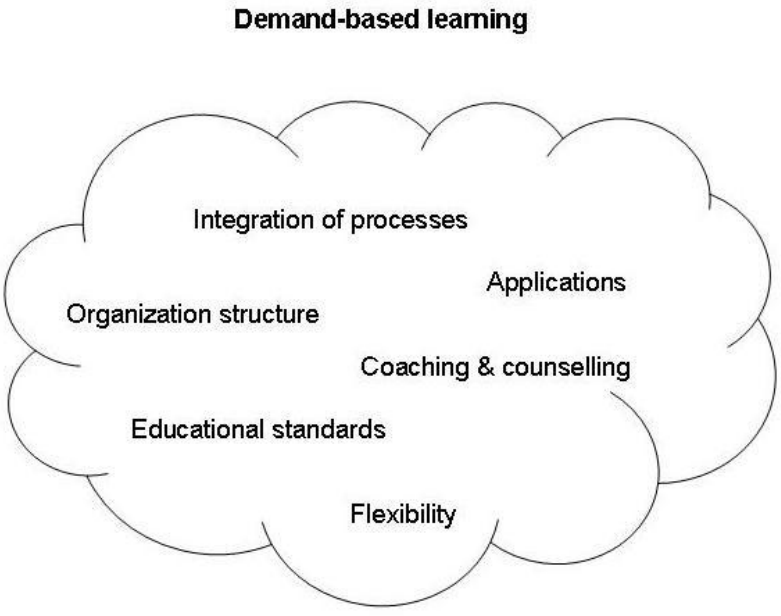


*Figure 4: Concepts important to demand-based learning*

Aligning choices that have to be made regarding different concepts that are important to demand-based learning is an important step in implementing a successful DBL model. The cloud represents how for each of these concepts organizations need to make a set of choices that is in line with the other concepts in the cloud. All of the elements in figure 4 will be used in chapter 5 where a more thorough exploration of DBL's impact on educational institutions will be given. Several of these elements were also discussed in a workshop held at the end of the project. A description and results of this workshop is given in chapter 7.

Several important notes are made while comparing the concepts within this cloud with some of the concepts that were mentioned in the concept map in chapter 3. While applications, flexibility and coaching and counseling were clearly mentioned in literature, standards, integration and organizational structure were only mentioned by few authors. In most of the reviewed project documents and presentations these dimensions were specifically mentioned as important. This is an interesting difference between literature and practice: While literature mostly looks at location flexibility and accompanying concepts such as distance learning and e-learning, schools seem much more concerned with flexibility in curriculum and the degrees of freedom students have in selecting what they want to learn.

## 4.6 Discussion

This chapter showed what the different views on demand-based learning were from literature, from KPMG and from educational institutions. Summarizing, DBL empowers the student in how, what and where choices regarding study and study program. Differences between literature and practice were also touched upon.

This section deserves a preliminary definition on DBL by the author, which will be used further on in this research. *DBL is concerned with delivering a level of flexibility in study curriculum and study pace on an organizational level, such that student's learning requirements are optimally fulfilled*. This definition fits more with the practical view on DBL than what has been found in literature. The definition regards location flexibility as less important. The author thinks that suitability of courses for location flexible teaching differs on a per-course basis. This suitability should be therefore determined on a course-level by a domain expert.

The changes that are required by an organization to facilitate DBL are influenced by the choices an organization makes regarding its DBL model. Flexibility and level of flexibility offered are key elements within this model.

Despite the review of theoretical material some important questions remain unanswered; 'to what extent should an institution individualize teaching programs?' and 'what are best practices for structuring processes in order to facilitate flexibility in teaching programs?'. Best practice models are not available and organizations have trouble answering these questions. This shows that demand-based learning is still very much in an experimental phase. The next chapter will explore what the effects are of introducing different types of flexibility to educational institutions.

# Part III: Organizational implications

The implications of demand-based learning for organizations can differ widely. The independent variable is the difference between the current situation and the desired situation. Current situation and desired situation will be different per organization. In this chapter the impact of demand-based learning on educational institutions and how they organize education is explored. Implications that derive from general organizational change are not included here but will be added as part of the assessment model in chapter 6.

**Contents:**

# 5. Implications

Introducing a demand-based learning model into an educational organization has several implications. Understanding these implications and how they relate to other areas in the organization is important to prevent complications during and after implementation.

The previous chapter mentioned flexibility as an important enabler for DBL. The concept of flexibility will be further explored in this chapter. The use of educational standards will also be introduced in this chapter. A description will be given that shows how seemingly distant concepts such as standards and flexibility interrelate. As students are offered more flexibility, their flow through the organization becomes more organic. The chapter also gives a thorough description as to how this will affect processes and information flow.

The chapter will finish of with a stakeholder analysis. The reason for placing the stakeholder analysis at the end of this chapter is that within this analysis it is not only important to identify who the stakeholders are, but also how they are affected. To see how each stakeholder is affected one should first know how the program affects the general organization.

## 5.1 Flexibility

Flexible delivery in education is concerned with ‘what’, ‘how’ and ‘where’ (Hill, 2006). This is a very gross distinction, however relating this to the different dimensions of flexibility by Collis and Moonen (2004), three broad categories of flexibility can be defined. These are flexibility in study pace, flexibility in study location and flexibility in study program.

### 5.1.1 Flexibility in study location

Flexibility in study location is concerned with when and where students can follow courses. Synchronous and asynchronous distance learning programs offer high degrees of location flexibility. In synchronous distance learning teleconferencing techniques are often used to lecture students in an online classroom. Asynchronous distance learning often involves recorded lectures and offers more freedom to the student as to when he or she can study the material. Both types of distance learning involve the use of digitalized study material and online feedback (Zhang & Nunamaker, 2003). Not all courses and programs are suited to be taught through distance learning. Especially courses that require high student-student and student-teacher interaction are less suited (Moore, 1989; Alonso, López, Manrique & Viñes, 2005; Henrich & Sieber, 2009). The use of message boards can partially negate the effects of lack of interaction however.

### 5.1.2 Flexibility in study pace

Flexibility in study pace is about whether students are able to slow down or accelerate their learning, for example due to having already attained selected skills in previous education. Slowing down study pace is usually not desirable by educational institutions as government funding is determined by study pace of individual students. However, accelerating or exempting parts of the program can be desirable from both the student’s and the organization’s perspective. Flexibility in study pace can be realized by setting rules for both exemption and the acceleration of study programs. By speeding up parts of the learning program the student will move outside of his or her regular curriculum. Following courses outside the regular planning or program means that overlap can occur between courses. The

organization must decide how it will deal with such overlap. For example, is presence at both overlapping courses mandatory?

### 5.1.3 Flexibility in curriculum

Flexibility in curriculum is concerned with the amount of times students can enroll in study programs and the extent to which students are free to replace courses in their programs. The main inhibitor for curriculum flexibility is the overlap between desired courses and the level of knowledge required to enroll in these courses. Flexibility in curriculum can be implemented in several different ways. For example students may have the option to select a number of predefined course packages. The educational institution determines which packages contain what courses. The student is free to choose several of these packages, which will form his personal study program. Distinguishing between a set of mandatory courses and a set of electable courses in a learning program is another way of providing curriculum flexibility.

Several factors prevent an organization from offering full flexibility on each of the three dimensions. These are cost effectiveness, teaching and quality and regulations and market demand.

### 5.1.4 Cost effectiveness

Over the past years cost cutting has put considerable constraints on educational institutions. A condition to DBL is therefore that costs remain maintainable (M. Elfers, personal communication, April 24, 2009). Teaching selected courses multiple times a year to facilitate a just-in-time way of education will benefit flexibility within a curriculum, but it will also set back its cost effectiveness. Flexibility could also mean that students can review their individual study plan on a periodical basis. Planning and scheduling processes should be optimized for this. For educational institutions cost effectiveness also means looking at rate of return. This is done by assessing the total portfolio of courses that is offered, the costs associated with these courses and the level of interest in such courses by students. Courses with few enrolments may not be as cost effective. The tradeoff is that excluding such courses from the organizational course portfolio means that several students can no longer attend these courses.

### 5.1.5 Teaching and quality

Distance learning applications and the use of technology can increase the amount of flexibility within courses without exponentially raising costs. This can be done for example by asynchronous teaching, using pre-recorded lectures and teaching material. The lack of teacher-student and student-student interaction has been deemed valuable in the past however (Alonso et al., 2005), and may negatively affect the quality of education.

Certain courses may require the knowledge of other courses to successfully complete them. Other courses may complement each other. This forces a trade-off between how flexible students can select their courses and how well they are educated in relevant areas at the end of a program. This is another area where flexibility can affect quality.

### 5.1.6 Regulations and market demand

Accreditation will always remain an important aspect of education. Government agencies and businesses demand that students possess a certain set of skills belonging to the type of

program that they enroll in. Professional institutes such as NIVRA2 may also put constraints on the content of courses and programs. Although flexibility is an important aspect of DBL, the offered level of flexibility should be in line with market demands and regulations.

The interaction between the concept of flexibility and each of these constraining dimensions is schematically presented in figure 5. Individually these dimensions also influence each other directly. The figure is shortly discussed below.

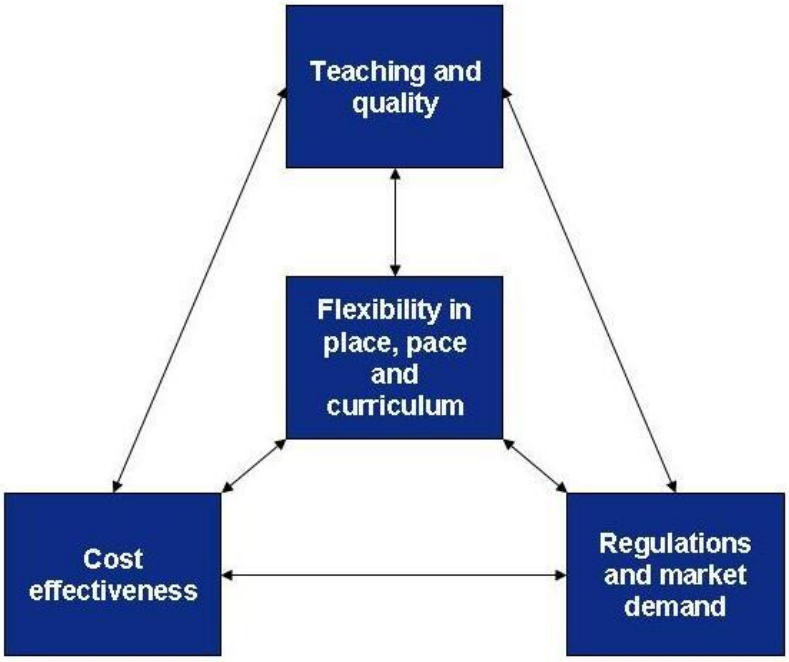


*Figure 5: Constraints on flexibility*

The relationship with the different types of flexibility and the other three constraining dimensions has been discussed above. In short, teaching and quality constrain the level of flexibility because certain types of programs have specific attendance and content requirements which guarantee a certain level of educational quality. Regulations and market demand are formed by a set of demands from government, students and the labor market. Such demands make sure that students are actually able to participate in the field they studied in. Finally, cost effectiveness is an important topic for any educational institution. There is a maximum level of flexibility an institution can offer, considering its budget and educational model.

The three areas that influence flexibility also interact with each other. (1) Teaching and quality and regulations and market demands have a certain overlap. Government regulations are in part imposed to guarantee the quality in education. Perceived quality and demand by students are also considered to be higher when quality of an educational program is high. Market demand and teaching are also closely related. An example of this is that computer science students gain a certain level of programming skills because a) potential employers expect computer science students to have programming skills; b) some students that enroll as computer science students expect to become programmers. Most computer science programs will contain a considerable amount of practical sessions where students learn how to write

2 http://www.nivra.nl/

software components. It is expected that potential employers looking for programmers, will be hesitant to recruit computer science students that follow a program that does not contain any practical programming sessions. (2) Regulations and market demand are also connected with cost effectiveness. First, expensive programs will be less attractive to students. Second, government agencies are concerned with the accessibility of higher education. On the other hand cost effective programs may allow for lower tuition fees and in return generate more enrollments. (3) Cost effectiveness and teaching and quality are also related. A cost effective educational model or program creates additional space in the organization's budget to attract better qualified personnel. On the other hand certain educational programs may be enhanced by introducing more contact hours. This may negatively affect cost effectiveness of certain programs.

## 5.2 Standards

By offering curriculum flexibility a flow of students between different faculties occurs. To support and facilitate this flow, educational standards are required. Such standards will allow for a smooth transition of students between different faculties. Most important standards are;

- College times
- Periods in curricular year
- Educational currency points

Other standards such as the grading format of assessments can also be important. To illustrate how educational standards can influence cross-faculty education, a simple example is given in figure 6. The faculty of financial mathematics teaches students by offering a four-period curriculum, while the faculty of computer science uses a three-period curriculum. A student looking to attend courses C1, C2, C3 and C4 will have great difficulties doing so, because he or she will have to attend the C3 course while still attending the C2 course. This is only a simple example showing why educational standards are important.

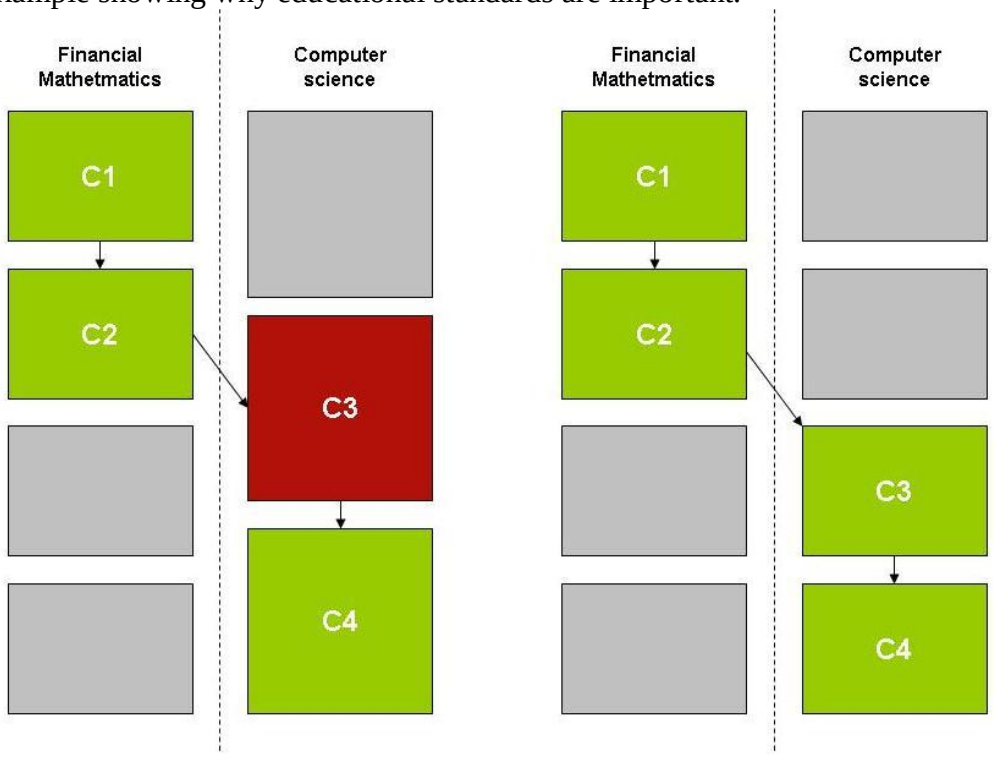


*Figure 6: Educational time periods*

## 5.3 Processes

DBL can have large implications for process structure. A distinction can be made between educational processes and supporting processes. This distinction is also made in a process map of the University of Amsterdam. Educational processes are those that directly involve the student. Supporting processes are required to sustain and support educational processes. Flexibility in study location will generally affect educational processes while flexibility in study pace and study program will mostly affect supporting processes. The main question is how will these processes change? While this largely depends on how organizational processes are currently organized several conceptions can be made. An overview of how these different processes may interact in a DBL environment is shown in figure 7. A description is given below.

When a student enrolls to a study program, an intake will reveal whether he or she possesses the required knowledge to start the program. Results of this intake process are stored for future reference. Individual program planning is concerned with setting up a program that suits the student. As stated earlier, several constraints which limit the extent to which different courses can be added to the program are in place. These constraints are documented during the process of educational program development. Ideally this process is centralized and has access to domain expertise. Reviewing the individual study plan, taking courses and finishing assessments is an iterative process which will eventually lead to certification of the student. Student administration monitors student information and progress during every step of the way, and uses this information to produce management reports. DBL increases student responsibilities which may not be appropriate for every student. Support and counseling is aimed at guiding students in their responsibilities. This process can be a task which resides with teachers. Another possibility is that employees are designated for this role. Master program planning is responsible for scheduling courses which together form the master schedule. This schedule should be optimized in a sense that it can provide courses to students at their most desirable time and location.

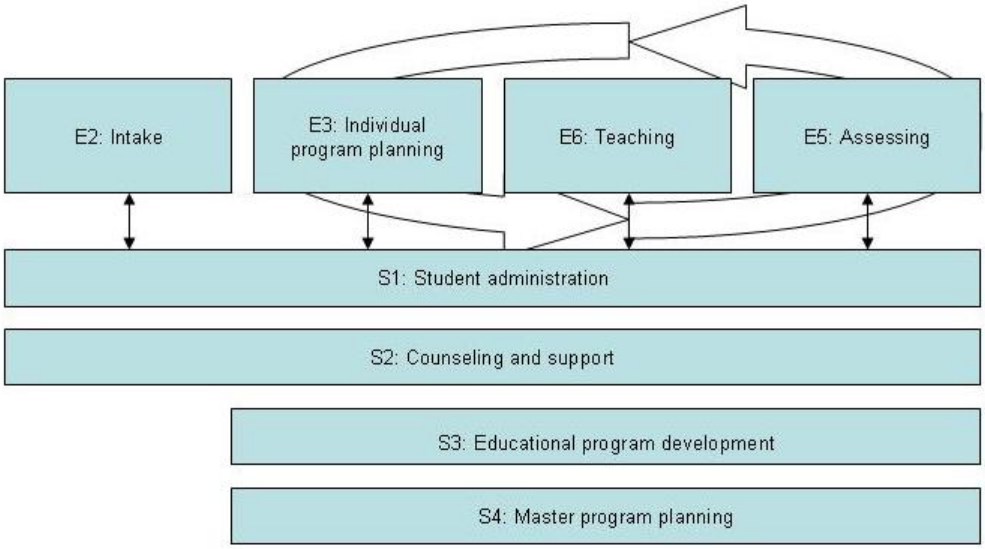


*Figure 7: Educational and supporting processes in DBL*

### 5.3.1 Student administration

In a traditional business model, student progress can be measured against the schedule of the respective educational program. At the end of each period a certain set of courses should be completed. The program schedule can act as a benchmark on an individual student's progress. Flexibility in study pace and study program implies that there no longer is a 'single educational program'. Student progress can only be measured by looking at a student's individual planning. This means that a process should be in place which regularly reviews a student's personal education plan and compares this to the student's progress. This makes the process of student administration more dynamic. Maintaining up-to-date student information also becomes more important, as it becomes the only source available to monitor individual student progress.

Flexibility in curriculum can mean that students attend courses at other faculties or institutions. Results attained at these faculties will have to be registered as well. Organizations need to create procedures that ensure seamless transition of student results between other faculties or institutions.

### 5.3.2 Planning and scheduling

The process of planning and scheduling takes up a more prominent role within the DBL organization. In traditional learning organizations, an educational program consists out of a predefined set of courses, forming a program. Every student that enrolls to a program also enrolls to courses that belong to that program. DBL and more specifically flexibility within curriculum mean that this is no longer the case. In effect, planning and scheduling can no longer be based on the number of students enrolling to a program. Planning and scheduling should now also consider enrollment to individual courses. This greatly complicates the process because an optimal course planning will be a planning that maximizes the number of students that see their learning requirements fulfilled, during a period. This is contrary to traditional organization in which planning has to minimize overlap of a fixed set of courses in a single teaching program, for each period in an educational year.

Planning and scheduling is bound by constraints, such as the amount of times an educational institution can offer certain courses and the availability of personnel and locations. In an organization where study demand is leading, such constraints can greatly complicate the planning process. As a response, organizations should define goals, recourses and scope of the planning process. This information should be used to see whether the organization needs to consolidate, to make the planning process manageable.

The use of clustered course packages can simplify the planning process. This approach is used at several education institutions that were interviewed at later stage of this project, and is known within these institutions as a major-minor structure (A. Vethman, personal communication, June 19, 2009). This structure does however reduce the level flexibility that is offered to students and therefore may not always be desirable.

### 5.3.3 Educational program development

As educational programs become more dynamic, the task of educational program development changes. Where this process was previously concerned with creating high quality study programs, in DBL this process is aimed at setting up rules and guidelines for creation of individual study programs. Such rules and guidelines act as a basis on which students can build their study programs. Rules and regulations serve two main purposes. First, they should prevent students from minimizing study efforts by only picking courses which

require little study time. Second, they should ensure that both regulations and market demands are met within individual teaching programs. Setting up guidelines and regulations for educational programs requires domain specific knowledge. Teachers are often experts in specific areas and will be able to identify which areas should minimally be represented in specific programs.

### 5.3.4 Counseling and support

Most educational institutions that implement DBL require some control over how students can use flexibility that is offered to them. This is because not every student can handle this type of freedom in a responsible way and not every student is able to judge the quality and coherence of a selected bundle of courses. From an educational quality perspective it is often not desirable for students to select multiple unrelated courses. Organizations can use different mechanisms to control the course selection process.

Within this process of course selection, just in setting up program guidelines, expert judgment will usually be desirable. Expert knowledge can be used to see how different courses relate to each other and what the general educational quality of such a bundle of courses is. In most cases this expert will be a teacher or professor, which is a domain expert. To this end, part of the time that was previously spent on teaching and education will now be spent on counseling and support activities.

Indeed, counseling and support is a process that requires more attention in DBL programs and recourses should be dedicated to this as such. In most cases this will be a cultural change, as teachers traditionally only focused on the transfer of knowledge. From some of the interviews held at later stages in this project it was also concluded that this is not always a smooth transition.

### 5.3.5 Educational processes

Demand-based learning does not aim at changing the content of courses. The same applies for the content of assessments and projects. These are pedagogical aspects of education. Flexibility in study location may affect how individual courses are organized however. Certain technologies may be introduced to facilitate such flexibility. Organizations agree that teaching should remain a teacher responsibility. Changes to the organization of individual courses should therefore be made at least in agreement with teacher expertise.

## 5.4 Information technology

### 5.4.1 Information

An important process in educational institutions is monitoring student progress. Because DBL introduces education tailored to the individual, monitoring group progress is no longer sufficient. DBL therefore introduces new requirements to student information. The following list shows the main categories of student information in traditional educational institutions. Some of these categories may be less applicable than others, such as the intake information which is not included at every institution.

- Student personal information
- Intake results
- Assessment results
- Student progress

DBL introduces two new student information types:

- Course demand
- Individual study plan

Course demand and individual study plan are related; course demand is formalized within the study plan. Assessment results are compared with the individual study plan and together provide information on student progress. Because DBL removes focus from classrooms to individuals, information that was previously monitored on a classroom level will be less relevant.

DBL offers students more responsibility. As a result, students will require closer attention from their coaches and supervisors to guard their overall progress (Sadler-smith & Smith, 2004). Because of this individual approach, information on planning and progress has to be accurate and up-to-date. One way in which organizations can realize this is by clearly communicating responsibilities for updating student information. This ensures responsibility and accountability.

### 5.4.2 Information systems

Technology is an important enabler for demand-based learning. Where infrastructure is concerned with providing a basis for processes and applications to function on, applications themselves are required to support and facilitate processes. Educational processes cannot function without information systems. Restructuring processes and information flows will therefore have consequences for information systems. Integration of processes and faculties may cause redundancies. Interoperability demands may also enforce a more uniform application landscape.

Other than integrating certain processes, new business processes will also generate new functional demands. One of the studied educational institutions defined the following functional applications as required to implement DBL.

- *Portal technology*; gateway for both students and teachers.
- *Digital portfolio*; store student results.
- *Digital educational catalogue*; catalogue which shows course offerings for each period.
- *Digital program planning*; used to digitally plan individual program.
- *Digital study plans*; digitally documented study plan.
- *Study progress*; shows student progress relative to original study plan.
- *Electronic study environment*; online course materials.
- *Planning and scheduling*; online roster.

These requirements will not apply for every demand-based learning organization. Exact requirements will depend on how flexible the organization wants to offer its programs. As organizations align their educational standards and integrate processes, new application requirements may also come up. This is especially true when current applications have been specifically tailored to meet faculty requirements.

### 5.4.3 Infrastructure

As stated before, infrastructure is concerned with providing a basis for processes and applications. Infrastructures can be designed in different ways and it would be outside the scope of this project to fully discuss how the technical infrastructure should look.

One interesting development which deserves special attention however is the use of Service Oriented Architectures (SOA). Service Oriented Architectures involves the use of services. Services are individual units of logic which conform to a set of principles that allow them to evolve independently, while still maintaining a sufficient amount of commonality and standardization (Erl, 2005). Services can be combined to form small application-like modules, often Web services, which connect with each other through a service bus. Because of this loosely coupled structure, reconfiguration of services requires significantly less effort than redesigning parts of traditional applications. This is also one of the major benefits of using SOA. SOA realizes its technology independence through the use of an open standardized messaging model. SOA provides several benefits over more traditional architecture solutions. According to Erl (2005) some of these are:

- Improved integration
- Inherent reuse of services
- Streamlined architectures and solutions
- Leveraging the legacy investment
- Organizational agility

Most of these can benefit educational institutions implementing DBL as well. Especially where faculties mostly use separate applications, SOA can restructure and integrate such applications quite well. Reconfiguration of services can also be used to fulfill faculty requirements without using completely different applications.

## 5.5 Stakeholders

Stakeholders are involved in all types of organizational change. Wieringa (2007-2008a) defines stakeholders as persons who experience the problem or who are impacted by reducing it. In this case, 'the problem' is the implementation of DBL in higher educational institutions. These persons are of interest for two important reasons:

- They own specific knowledge concerning the problem area
- They Have the power to influence outcomes of the project

This stakeholder analysis looks at internal and external stakeholders and combines information from previous paragraphs to see how each of these stakeholders is affected by the introduction of DBL in an organization. Internal stakeholders are those that are in some way affiliated to the institution. External stakeholders are stakeholders that are not directly affiliated but do have influence over outcomes of the project.

### 5.5.1 Internal stakeholders

*Students:* DBL changes the role of the student by allowing more freedom within his or her educational program. One of the goals that DBL tries to achieve is to increase perceived institutional quality by students. A poorly implemented DBL program will have direct negative effect on perceived institutional quality.

*Teaching staff:* Teaching staff is affected by DBL because it impacts the roles and functions of teachers. Because students gain more responsibility they will also require guidance and support. This means that part of the daily activities previously aimed at direct knowledge transfer, will now be used for guidance and support.

*Support staff:* Demands on support staff will likely increase by the introduction of DBL in the organization. Different actors in the organization will have increased requirements on the availability, content and quality of student information. This will complicate the administration process and thereby impact support staff.

*IT staff:* The IT staff is concerned with maintaining a healthy application landscape. Applications should support both educational- and support processes. Increasing reliability on information systems in educational institutions has increased demands on this stakeholder group. DBL may force different IT staff to work together on a single common goal. New application requirements may also require considerable effort from IT staff in terms of both time recourses and knowledge.

*Middle management:* Middle management forms a bridge between top management and operational management. Because of liaison role middle management should be highly involved in every step of the project.

*Board of directors:* The board of directors is concerned with a successful implementation. Not only should DBL increase the institution's competitive position, it also aims to lower the costs of education by decreasing the drop-out rates of students. As DBL requires different faculties to work together, the board of directors should be involved to communicate the necessity of the change and to show dedication to the project.

### 5.5.2 External stakeholders

*External employees:* These can be external advisors and support staff. This group of stakeholders is involved because the organization requires them to be. Clear communication of requirements to each of these stakeholders is important so that expectations are known. Possibly such requirements are already included in a contractual agreement.

*Professional institutes:* Institutes such as Nederlands-Vlaamse AccreditatieOrganisatie (NVAO) influence the content of teaching programs by setting up guidelines on the content and quality of teaching programs. The NVAO is responsible for accreditation of educational programs. For some educational programs other professional institutes can influence the accreditation process as well, for example institutes such as the KNMG (medicine) and NIVRA (accountancy3). The relation between such professional institutes and the NVAO differs.

*Government agencies:* For the government the accreditation of educational programs is an important topic. Accreditation information which comes from the NVAO is for example used to determine funding of colleges and universities. Accreditation is also used to determine which students are eligible to receive student grants. Funding is one of the main ways through which the government can influence the educational sector. The government also sets general guidelines for the educational sector.

## 5.6 Discussion

This chapter showed some of the implications demand-based learning may have on the organization and its processes. The chapter specifically looked at elements that related to

3 http://www.nivra-nyenrode.nl/relaties/overlegorganen

education. Choices regarding the level of flexibility seem to form the basis for any DBL project. Choices made regarding flexibility will a) provide implications for other aspects that relate to DBL; b) provide areas in which further choices should be made. For example offering flexibility in the choice of courses implies that the organization should set up a mechanism through which it can guide students in these choices. How this is done, is up the organization.

The stakeholder analysis provided insights into which stakeholders are involved when organizations decide to implement DBL. This information is highly relevant when it comes to people aspects of implementing DBL, for example change management and communication to stakeholders.

The next section uses the elements presented in this chapter and translates these to a specific organizational model. This model tries to link the specific areas that were reviewed here. Other more general elements which often accompany organizational change have not been included in this chapter. These elements were drawn from literature however and are included in the model.

# Part IV: Assessment model

This chapter describes the tool for assessing organizational readiness to demand-based learning. The tool provides a structured framework through which users can assess whether critical elements of a demand-based learning structure have been addressed and are mutually aligned. Failing to have done so will increase the likelihood of complications occurring during the implementation of demand-based learning.

**Contents:**

# 6. Assessment model

This model draws upon both elements presented in chapter 5 as well as general literature used in courses during the Industrial Engineering & Management track. The elements presented in chapter 5 are mostly specific to demand-based learning organization context. The elements that were presented in chapter 5 grossly covered the the areas of flexibility, (educational) standards, processes and information technology.

Because implementing DBL is an organizational change, several (general) best practices could be found within literature concerning such a change. Some examples of this are best practices in change management (e.g. Oakland and Tanner, 2007), best practices in project governance (e.g. Müller, 2009) and best practices in setting up business cases (e.g. Ward, Daniel and Peppard, 2008). These are generic business topics for which best practices were translated to the context of this model. Throughout this chapter and the next the terms business model and educational model are used interchangeably.

## 6.1 Design framework

Implementing a DBL teaching model follows certain steps. These steps are not uncommon to implementing strategic changes in organizations and can generally be categorized according to figure 8. The first step is forming a vision. This vision is then translated to a global design, which includes the general outline for the organizational business model. The detailed design includes more detailed information. These first three phases are preparatory and required before the organization can start its implementation. The final step is evaluation.

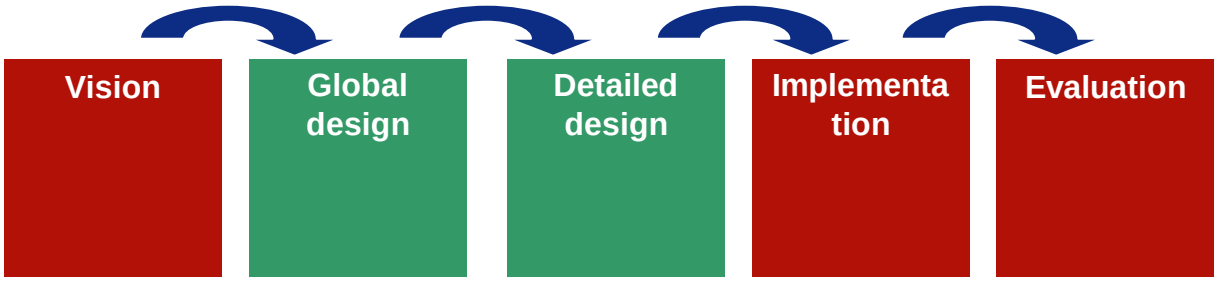


*Figure 8: Program development* *Source: KPMG*

For each phase multiple considerations are of importance. As the program approaches the implementation phase, the organization should have addressed most of the statements within the assessment model. More specifically, the organization should have addressed most of the indicators that have been listed under each of the statements in the model. Sequence and timing related issues are not discussed within this model. The reason for this is that this is an area of research on its own. The topic was however briefly touched upon during a workshop session which was held near the end of this thesis project. A short summary of this workshop is included in chapter 7.3.

The four main areas on which statements concerning the implementation of DBL were made are derived from the 'Klaverblad' model by KPMG Consulting (Noordam, Derksen & Vlist, 2004). This model looks at four different areas in an organization, namely organization, processes, people and culture and infrastructure. For each of the main statements in the model

a short description is included, summarizing parts of previous chapters. Figure 9 shows the general structure of the model.

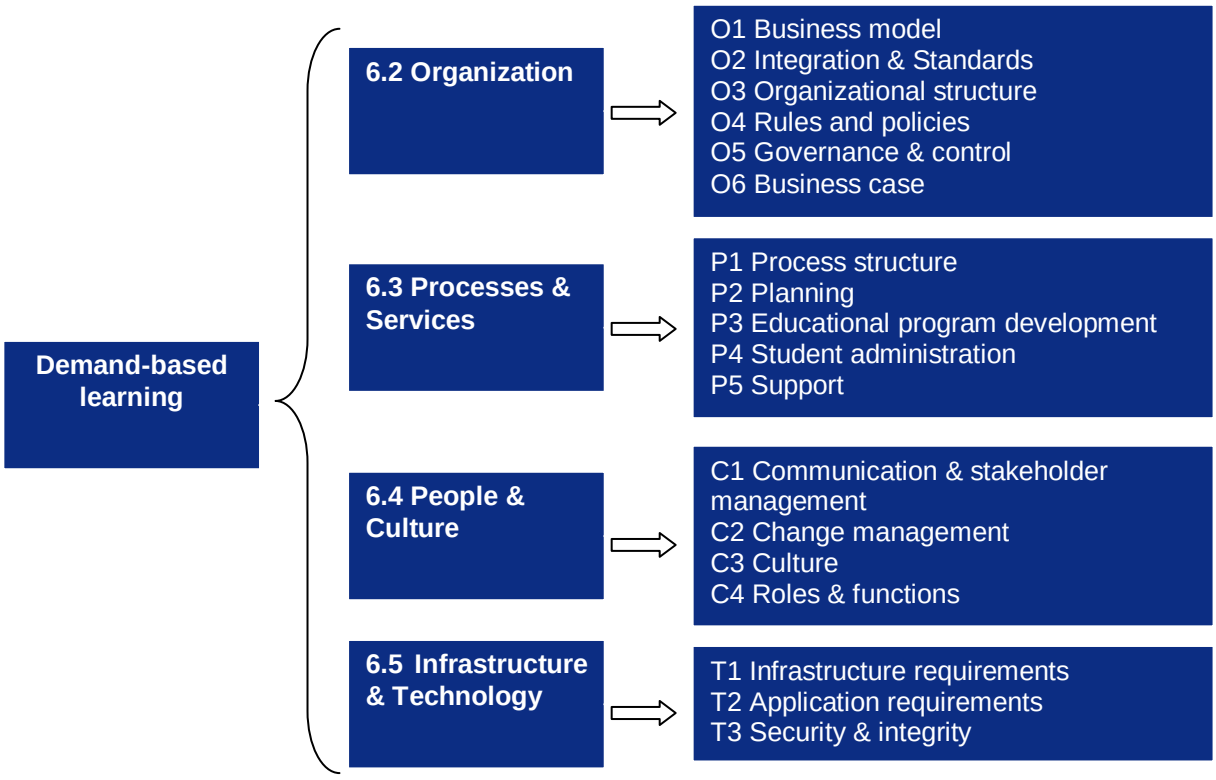


*Figure 9: Model layout*

## 6.2 Organization

**O1 Business model:** Desired level of flexibility is determined and evaluated on dimensions of cost effectiveness, regulations and quality of education.

**Description:**
The main dimensions over which flexibility can be offered are flexibility in study pace, study location and study program (Collis & Moonen, 2004; Hill, 2006). Organizations can choose to offer flexibility in any of these dimensions, but are also bound by constraining factors. The three most important factors that may inhibit the degree to which flexibility can be offered to students are market and regulations, quality and cost effectiveness. First, market relates to the skills that potential employers will require from their future employees. Regulations are imposed by governments and professional institutes. Second, the educational quality of a program can be measured by how well a certain set of courses ties together to form a holistic and coherent learning program. In traditional education quality insurance was regulated by educational program development which 'pushed' teaching programs into the organization, leaving little choice for individual students. By offering flexibility students have a proactive role in selecting the courses of their individual learning program. However students will not always be able to judge the quality of their program choices without intervention and a full degree of flexibility in the selection of course will therefore rarely be desirable. A history program could contain more freedom in the choice of courses than a program that will train a student to become a basic physician. The same applies for study location and study pace, some courses and programs are better suited for flexibility than others. Finally, for any form

of flexibility an organization wishes to implement, the formation of a cost effective business model will remain a priority.

**Indicators:**

1 Regulations for accreditation of study programs by governments and/or professional institutes have been used to determine the extent to which study programs can be flexible.
2 Quality of educational programs is guaranteed through the involvement of dedicated educational program development.
3 Profitability and yield of the business model have at least been assessed on the following areas;
   - Cost of programs
   - Cost of courses
   - Cost of 'flexibility'
   - Enrollment rates required for profitability of courses, modules and programs
4 Expert knowledge of teaching staff is used in developing course content.
5 The organization has established on which dimensions it wants to offer flexibility. Most relevant dimensions of flexibility are study location, enrollment, study length and pace and flexibility within study programs.
6 General information on student background is used in assessing the desired levels of flexibility.
7 Information on student ability and desire to be proactive within their education is available and is used to assess the desired levels of flexibility.
8 A documented business model has been setup which describes how the organization approaches the different flexibility dimensions and how this model interacts with constraints such as market and regulations, cost effectiveness and quality.

**O2 Integration & Standards:** Organizational and educational standards have been reviewed to support flexibility between study programs, faculties and other educational institutions.

**Description:**

When organizations offer their students the option to take courses at different faculties and study programs, interoperability becomes an important concept. Interoperability mainly concerns educational standards between programs and faculties involved. A simple example is that educational credits attained at one faculty should match with credits used at another faculty. Failing to implement such standards can for example force faculty administrations to manually translate the amount of currency points attained for a cross faculty course. Other standards that should be considered relate to lecture times, time frames within the educational year, storage and format of student results and assessment formats. Several benefits related to the introduction of standards are; lower costs, consistency, controllability of management information and transparency.

**Indicators:**

1 Educational currency point format has been aligned to support the desired level of cross faculty and cross institutional education
2 General time frames within the educational year have been aligned to support the desired level of cross faculty education
3 Planning activities and procedures have been aligned to support the desired level cross faculty education.

4 General standards for lecture times and practical sessions have been applied to support the desired level cross faculty education.
5 A general policy for the delivery of assessment results is in place. This includes guidelines for storing written papers, finished projects and examination results in a central location as part of a student's result portfolio.

**O3 Organizational structure:** Organizational structure fits with demands for coordination and interoperability.

**Description:**
Daft (2004) describes several organizational structures through which organizations can be managed. Most frequently applied organizational structures are the functional and the divisional structure. A functional structure contains centralized organizational functions, whereas in a divisional structure each business unit contains its own organizational functions. Most notable benefit of a divisional structure is localized responsiveness. The biggest downsides are poor *strategic* responsiveness and efficiency, with every faculty having its own leadership and support processes. Organizations looking to implement DBL should re-assess their organizational structures to see how organizational changes can be enhanced by adapting their organizational structure to become better aligned with organizational processes and the way in which these are organized and coordinated. Organizations looking to offer a high degree of educational flexibility will require significant coordination between faculties. In such cases a functional structure is more suited. Organizations which offer little educational flexibility and house several stand-alone programs with unique requirements, should consider a divisional structure.

**Indicators:**
1 Demands concerning localized responsiveness of individual faculties are known.
2 An assessment has been made through which costs and benefits of the different levels of centralization have been measured.
3 Changes to organizational structure are aligned with new requirements for organizational processes, standards and policies.

**O4 Rules and policies:** Current policies and regulations have been reviewed to support a demand-based learning organization.

**Description:**
Policies and regulations are important to provide consistency. They also provide an anchor through which decision makers on different organizational levels can base their choices. Most educational institutions already have mechanisms in place which regularly review and update such rules and regulations, not always on an organizational level. Demand-based learning can have several implications on how students move through the learning organization. Rules and policy changes should receive extra attention in this area. The desired DBL structure may also require that faculties bring their policies in line with each other. Rules and policies should not force changes upon educational content itself however. This is because from a pedagogical perspective teachers will always be in the best position to determine the relevance of different types of content and the media through which this content is taught to students.

**Indicators:**
1 An assessment has been made on how rules and policies are currently applied.

2 A plan is included to align rules and policies between different faculties, in line with the demand-based learning structure.
3 A policy that describes students' responsibilities and choices through the DBL program has been included.
4 A policy for exemption criteria has been established in line with program and study pace flexibility
5 A set of general rules for passing and failing of courses and programs determined by educational program development is included.

**O5: Governance & control:** Project governance and control measures have been included to support the program implementation.

**Description:**
Governance is the means by which the leading authority, often the board of directors in foundations, guides and monitors the values and goals of its organization through policy and procedures (Philanthropic Foundations Canada[4], n.d.). While Governance and more specifically project governance covers a huge base of literature, only several key points have been included here. Part of project governance is the development of a business case which includes project and business goals. Because many organizations have trouble with business case development (Müller, 2009), a separate section has been dedicated to the topic. As DBL programs also concern IT goals, IT governance should not be excluded from this. Project governance is different from organizational governance in the sense that the latter is more static than the first. As a program moves through different stages different results will be attained. Such results need to be compared with original project goals and corrective action should be taken where necessary. For a continuous review process to take place responsible actors have to be assigned and more importantly, relevant information should reach them in a timely manner. An overview of how different groups within the program relate to each other should also be included. This includes information on who reports to whom.

Organizations should also make a distinction between IT demand and IT supply. IT demand is concerned with identifying business needs and making sure applications will meet these needs. As IT demand operates on the business side they are also responsible for carrying out changes to the business that are required to realize IT benefits. IT supply is concerned with the supply of IT either through development or purchasing. Translating business requirements to IT requirements is another responsibility of IT supply (Ward, 2002). Roles for both IT demand and IT supply functions should be assigned.

**Indicators:**
1 A system is in place through which information gained from the periodic review of project goals and progress reaches the responsible actors.
2 A chart clearly outlines the relationships between all internal and external groups involved in the DBL program implementation.
3 Responsibilities, authorizations and restrictions have been documented for relevant actors at different levels of the program.
4 The use of a formal program methodology such as Prince2 has been considered.
5 Roles have been included in the program that represent IT demand (business) and IT supply (IT).

[4] http://www.pfc.ca/cms_en/page1112.cfm#g

**O6 Business case:** A business case for the project has been setup.

**Description:**
The business case is an essential part of any program and contains a thorough list of costs, financial and non-financial benefits (Ward, Daniel & Peppard, 2008). According to Ward et al. the goal of the business case is to express as many of the benefits as possible in financial terms. An exclusive focus on such benefits can raise several issues however, for example the encouraging of "creative" calculations of financial benefits based on inadequate evidence. It may also lead to the discouragement of innovative uses of IT because the financial benefits of innovation may be less certain. Like any strategic change, implementing DBL is subject to budgetary constraints and here too a business case should be included. Business cases also contain program guidelines which allow for better control during the implementation. Furthermore business cases help in determining viability and cost effectiveness of the desired business model by looking at current and future cash flows resulting from the implementation.

Some general notes from Ward et al. (2008) for setting up business cases are presented here. Every investment has a set of objectives and meeting these objectives will produce benefits for different stakeholders. This means few objectives may provide a large number of benefits. Two things are important; first, organizations need to decide upon how each benefit should be measured. Second, organizations should assign an 'owner' for each benefit. According to Ward, this owner "is an individual who either personally gains the advantage inherent in the stated benefit or represents the interests of the group of stakeholders that gain the benefit. He or she is therefore willing to work closely with the project team to ensure the benefit is realized." Structuring benefits is another important step and this can be done by comparing benefits on two dimensions. The first dimension is the degree to which the benefit can be made explicit and measurable. The second dimension concerns the type of change that gives rise to the benefit. Three types of change are possible; changes which improve 'things', changes which allow for doing new 'things' and change which causes the organization to stop doing 'things'. Organizations should set a priority on making benefits with low degrees of explicitness more explicit. In terms of costs Ward et al. define the following broad categories: Purchases, development, infrastructure, business change and recurring costs. In terms of risks the following broad categories can be used: Financial, technical, business and organizational change.

**Indicators:**
1 Business drivers and investment objectives are clearly defined.
2 Benefits, measures, and owners have been identified.
3 Program benefits have been clearly structured.
4 Organizational changes required to enable benefits have been identified.
5 The explicit value of each benefit has been determined.
6 Costs and risks have been identified.

## 6.3 Processes & Services

**P1 Process structure**: Organizational process structure has been defined and is aligned with the desired business model.

**Description:**
After the organization has established how it will introduce flexibility in the learning process, the level of integration and standards are determined. This in effect will imply changes to

processes. Two types of processes can be distinguished namely learning processes and supporting processes. Learning processes directly involve the student and his or her teaching process. Supporting processes such as student administration and planning and scheduling help facilitate these learning processes. Organizations looking to implement DBL should review the structure through which these processes operate. This can be done by creating process maps, which signal which information flows between processes, which actors are responsible and how different actions and events trigger responses at each of these processes. Different techniques can be used in mapping such process structures, including Flowcharts, UML or less formal process notations.

**Indicators:**
1 For each educational and support process the information input and information output have been determined.
2 For each educational and support process the involved actors are known.
3 Actors responsible for maintaining and managing information at each of the processes have been assigned.
4 Control mechanisms for timely response by responsible actors to changes in data are in place.

**P2 Planning:** Planning process is in line with and supports desired level of educational flexibility.

**Description:**
Planning and scheduling are essential processes in DBL. Where the business model is a translation of an organization's vision on flexibility, planning and scheduling is concerned with realizing this level of flexibility. Planning and scheduling should therefore be aligned with choices that have been made regarding flexibility. In organizational logistics planning and scheduling is often concerned with attaining an optimal solution (Hopp & Spearman, 2000). In DBL the level of individualization of teaching programs will affect to which degree such an optimal solution can be found. While this is a research topic on its own, several generic comments are given here. First, planning and scheduling should be organized on a level which at least equals the level on which the organization offers flexibility. This means that if an organization wants to offer flexibility between different programs at a single faculty, planning and scheduling should at least be organized on faculty level. Failing this can result in for example popular courses being scheduled at similar times, mutually excluding their attendance. Second, the organization should establish to what extent student course demand is leading for planning and scheduling. This is a spectrum with on one end a traditional educational model where students enroll in courses that are offered by the organization. On the other end student planning is fully tailored to student course demand at a certain point in time. Finally formal criteria should be setup through which the planning process be evaluated. The number of students that is unable to enroll in their desired courses during a period could for example be used as a Key Performance Indicator.

**Indicators:**
1 The degree to which student course demand is leading for planning and scheduling has been established.
2 The level at which the planning at scheduling function is organized fits with level at which the organization offers curriculum flexibility.
3 Formal criteria are in place by which the planning process can be evaluated.
4 The frequency by which planning and scheduling is reviewed has been determined.

**P3 Educational program development:** EPD supports desired level of educational flexibility and quality.

**Description:**
Educational program development is concerned with the content and quality of learning programs and courses. Two types of input are important for this process. First, government regulations, accreditation by NVAO and guidelines by professional institutes like KNMG and NIVRA will put demands on the educational content of certain programs. Second, (quality) guidelines setup by the organization itself, through for example an educational policy. Together with the desired level of flexibility offered through DBL, educational program development sets up educational guidelines. These include different options in choices that individual students will have, requirements for passing certain educational programs and guidelines for assessment and deliverables. Such guidelines should be clearly documented and openly available to both students and employees. If the organization chooses to introduce distance learning courses or programs, content of such courses and programs should fit with the media technologies used in teaching.

**Indicators:**
1 Degrees of freedom in individual program choices have been clearly documented.
2 Measures are in place which guarantee the quality of individual course content and composition of educational programs.
3 Programs have been assessed in their suitability for asynchronous learning. Results are used to determine the extent of location flexibility in the program.
4 Learning outcomes for each course are summarized in a clearly written, straightforward statement.
5 A general policy for finishing courses is in place which includes possible modes of assessment, minimally required results and options for repeating assessments.
6 Clear program goals and demands are documented which include finishing terms.
7 A plan for a central database or catalogue through which students can select suitable courses for their individual programs is available.
8 Depending on the desired level of flexibility, courses are designed to support a diversity of learning styles and to ensure accessibility.

**P4 Student administration:** The institution has determined which and on what levels information is required to continually monitor students and student performance.

**Description:**
Individualization of education puts constraints on how well educational institutions can monitor student performance and progress. Because every student is in an individually tailored learning program, classes and groups become less prevalent. This means that it becomes harder to measure student performance against a reference group. However because DBL requires students to be proactive in their education it becomes even more desirable to monitor progress. Registration of student information, progress and performance is therefore a highly important process. For each type of relevant information responsible actors should be assigned. Organizations should have control mechanisms in place that make sure such information is up-to-date. It is also important that organizations determine which departments will require which types of student information and in what form. For example faculty management will not be interested in student A's result on Marketing, while student A's

councilor will be. Faculty management on the other hand is more interested in enrolment numbers and completion rates.

**Indicators:**
1 The organization has established how intake processes assess students on initial program requirements and ability to deal with proactive learning.
2 Different types of information required to monitor student progress are known.
3 The organization is aware of requirements for summative data such as enrolment numbers, completion rates and costing.
4 Responsible actors have been assigned to keep student progress information updated on at least the following information types;
   - Grading and results
   - Student personal information
   - Enrollment information
   - Progress information
5 A list of actors and processes that require access to student progress is available.

**P5 Support:** Supporting processes included for students, teachers and supporting staff.

**Description:**
While flexibility may offer students a wider variety of choices in their study programs, this variety can also give rise to questions. Policies and regulations should be written in such a way that different actors can use them as references to answer questions and problems as they come up. When such policies and regulations cannot provide the answers or solutions to certain problems, help and support should be available. Organizations should decide upon how they will offer help and support and be aware of issues regarding responsiveness that may arise. Such issues can have damaging effects on perceived educational quality by students (Davis & Fill, 2007).

**Indicators:**
1 Technical and program related support is made available for students.
2 The organization has addressed through what media and programs it will inform its students about its demand-based learning education.
3 The organization has addressed guidelines for responsiveness and its effects on perceived organizational quality.
4 Help and support is made available for teachers and support staff.

## 6.4 People & Culture

**C1 Communication & stakeholder management:** A communication plan has been set up that describes communication to different actors at different phases in the project..

**Description:**
Creating awareness on the program is of importance to create “draagvlak”. The organization should take measures to timely inform relevant actors, most importantly students, teachers and support staff (Hill, 2006). Clarifying how the program will affect each of the actors should also be part creating awareness. A planning schedule listing different phases and goals at each phase should also be made available. Finally, sources for further information (for example department heads or student advisors) should be assigned for each group of actors.

**Indicators:**
1 A plan is available which states program benefits, goals and targets and their communication to relevant actors.
2 Students have been made aware of the program and implications on their educational program are understood.
3 The organization is aware of how it will inform teachers about the program and implications for their daily teaching activities.
4 The organization is aware of how it will inform students on the program and implications for their daily activities.
5 The organization has considered how it will communicate changes in process structure to support staff.

**C2 Change management:** The impact on the organization has been assessed and appropriate change management techniques have been included in the program.

**Description:**
Change management has been thoroughly described in literature. Several essential points in realizing organizational change have been included here, as change management is an important topic in organizational change. Organizations should set up appropriate change management measures to be taken during the project implementation. Assessing the project size and impact on the daily organization is one of the first things to be done. An assessment of different organizational cultures involves will indicate where possible cultural problems may arise (Oakland and Tanner, 2007). Within change management research different techniques are available to ease such cultural issues. Top management support is also a critical change management aspect. Middle management often fills the role of intermediary between strategic goals and the operational organization. This should be reflected in its role within the project organization. Another important aspect is the assessment of available recourses and expertise. Such assessment should indicate whether the organization will be in need of external personnel for duration of the project.

**Indicators:**
1 The magnitude of organizational change is assessed in terms of cultural differences, changing processes, roles and the use of new technologies and applications.
2 The level of top management support has been assessed and its commitment to the project clearly communicated.
3 The organization is aware of the liaison role of middle management in change efforts and middle managers are involved as such.
4 The level of required external support has been determined by assessing in-house experience and recourses.
5 The project organization represents liaisons from different organizational departments and functions.

**C3 Culture:** Cultural status within and between relevant departments has been assessed and potential problem areas have been identified.

**Description:**
Organizational culture plays an important role in change programs. Schein (1990) defines mechanisms that embed organizational culture in organizations. These mechanisms can be distinguished between primary and secondary mechanisms. Primary mechanisms can be what leaders pay attention to, measure and control; how leaders react to critical incidents and

organizational crises; and operation criteria for the allocation of rewards and status. Secondary mechanisms are organizational design and structure; organizational systems and procedures; stories, legends, myths and symbols; and formal statements of organizational philosophy. Changes in organizations will often bring groups of different cultures together. This may lead to 'cultural indigestion' and the eventual divestiture of units that cannot become culturally integrated (Schein, 1990). A premature diagnosis to determine cultural compatibility should be considered. The way in which decisions are made within an organization also tells something about culture. Informal decision making means that there is a loose control structure and individuals have a high degree of freedom within their day to day activities. This freedom can be problematic in large change programs, as became apparent in a project evaluation performed by KPMG in 2008 at a higher educational institution implementing DBL. In a dynamic organization the willingness to change has been embedded in the organization. Where this is not the case, organizations should include measures within their change management program to reduce potential resistance.

**Indicators:**

1 Organizational culture has been assessed regarding its control structure and appropriate measures have been included within the change management plan.
2 Cultural compatibility between relevant departments has been assessed and appropriate measures have been included within the change management plan.
3 Change willingness of the organization has been assessed and appropriate measures have been included within the change management plan.

**C4 Roles & functions:** Different roles and functions have been documented and assigned to relevant actors.

**Description:**

Changes in organizational structure and processes have implications for roles as well as functions. While some functions may not change at all, others can be combined with other functions or disappear completely. Changes in functions and roles can be significant when different back office operations are integrated. The realization of advantages of scale may even force the organization to lay off some of its employees. Important is that for new roles and functions a clear documentation on expectations and responsibilities becomes available. Organizations should also consider workload while designing the content of such roles and functions. Especially in the startup phases, different help and support activities will take up more time. As employees participate in new roles and functions, training also becomes important. Time and recourses should be allocated to organize such training. Because DBL transfers responsibilities for education that previously resided within the program or its teachers to the student, changes in roles and functions should reflect this.

**Indicators:**

1 Roles have been assigned to appropriate staff for individual student coaching and counseling, these activities are budgeted in the staff workload allocation.
2 A clear job task description is available for professionals filling coaching and counseling roles which includes activities and responsibilities.
3 Time recourses have been budgeted for support activities such as answering technical and content related questions by students.
4 Students are advised on their study choices within the study program with regard to quality of their program and job market opportunities.

5 Training time for the use of new applications and technologies for DBL purposes is available.
6 Implications of new organizational structure and processes on back office personnel requirements are understood.

## 6.5 Technology and infrastructure

**T1 Infrastructure requirements:** Infrastructure requirements have been assessed and a plan is included to implement desired changes

**Description:**
Chapter 5 has shown that demand-based learning can have large consequences for organizational processes. This often means that changes in information flows and applications will occur. Assessing infrastructure requirements is therefore something that cannot be excluded in a DBL project. Because DBL usually involves some degree of integration between faculties or study programs, a review of network and connectivity should be conducted. The use of new applications may also lead to new hardware requirements. In one studied case the new application structure was based on a Service Oriented Architecture (SOA). This included the use of a Service Bus, to which different services required access. Where the infrastructure was previously fragmented, the introduction of SOA has large implications. Some benefits of using SOA are improved integration, possible reuse of application components, organizational agility and possibilities to integrate legacy systems.

More basic infrastructure requirements are those that deal with distance learning technologies. Infrastructure not only involves technical elements but should support organizational aspects such as the organization of processes. Finally, organizations should also consider how they wish to organize education in the future and how this will impact infrastructure demands. Because such demands are often unclear, organizations should opt for flexibility in infrastructure design.

**Indicators:**
1 Connectivity requirements between different faculty systems have been assessed and aligned with desired process structure.
2 Hardware requirements are assessed and brought in line with application requirements.
3 The distance learning component of programs is supported by appropriate technologies such as message boarding, (a)synchronous video conferencing and online course materials.
4 Infrastructure is recognized as not only being a technical aspect; relationships between processes have been included in setting up IT infrastructure requirements.
5 New technology and applications have been assessed on their future readiness to changes in the field of education.

**T2 Application requirements:** Current and new application requirements have been assessed and support desired educational structures.

**Description:**
Application requirements will mainly depend on the types of applications that are currently in place and the extent to which the organization plans to change its processes to facilitate DBL. These two factors should be included in the assessment of current applications and the elicitation of new application requirements. Assessing current applications should yield a list of redundancies and requirements that cannot be met without adapting or introducing new

applications. The organization should also consider how it wishes to 'digitalize' different functions. The use of portal technology is an appropriate alternative for this, but not a necessity. In searching for alternatives the organization should decide upon using custom-made applications or packages in the market. Criteria should be setup that assess to what extent different applications can fulfill functional demands. However applications should fit business demand, not the other way around (Hofland, Manschot, Hoogstra & Smit, 2009).

**Indicators:**

1 A high level application requirements analysis has been conducted and includes requirements for the use of;
   - Portal technology
   - Digitalized personal study planning
   - Roster and scheduling
   - Student performance and progress
   - Course information and registration
   - Student result portfolio
2 Applications requirements have been linked to the new processes and process structure.
3 Current applications have been assessed on an organizational level, to the degree in which they support new requirements.
4 A complete list of applications to be replaced throughout the organization is available.

**T3 Security and integrity:** Security and integrity policies have been reassessed and are in line with desired educational structures.

**Description:**

Integration of processes may leave old security and policy statements outdated. Bringing these policies up-to-date is of importance to prevent privacy and authentications problems. DBL allows students to move more freely through the organizations by offering a higher degree of freedom in study choice. Such movement should not be restricted by security guidelines. More flexibility in study programs can also mean that student deliverables are interchanged more frequently. Therefore a policy on security and integration may also include guidelines for fraud detection.

**Indicators:**

1 Professional and support staff access rights have been brought in line with new process structures.
2 A holistic approach is taken on student access management, possibly through the use of portal technology.
3 Login and authentication standards are designed to support current and future cooperation efforts between other organizations.

# 7. Model validation

To start the validation process on the quality of the model three interviews were held at different educational institutions. The format which was used to conduct these interviews is placed under Appendix B. The goal of the interviews was to get a practical view on the types of problems that organizations face when implementing DBL. The interviews also explored how these organizations implemented their view upon DBL. A workshop session was also held with several KPMG experts to see how the model could be used to create advisory products. This session helped in structuring how the different points in the model interacted through the dimension of project planning.

This chapter starts with a description of the interviewed organizations and their views on DBL. After that a list of stated problem areas is presented. After that the different problem areas are cross linked with different statements in the model. Finally a summary of the workshop session is presented. The chapter ends with a discussion.

## 7.1 Interviews

### 7.1.1 Description: Organization 1

Organization 1 is a large Dutch higher educational institution with schools over several cities within the Dutch 'Randstad' area. The organization offers a wide variety of programs ranging from accountancy, to computer science, to engineering. The organization has started implementing DBL in 2002 as one of the first higher educational institutions in The Netherlands.

Organization 1 sees demand-based learning as demand from students and demands from the market. This viewpoint is taken because Organization 1 teaches its students for certain professions. It has implemented demand-based learning in the following way: All students that enroll in a program follow a standardized module, called a major. The major constitutes 50% of the total credit points in the program. 25% of the program is formed by a specialization minor, which is also a standard module which can be chosen by students. The last 25% is the differentiating minor which can be filled in with courses by students in a flexible way. However through coaching and counseling a coherent set of courses within this minor is guaranteed. Figure 10 schematically shows this structure. The implementation process of DBL in this organization has mostly been a top-down effort, with bottom-up communication used in continuing feedback.

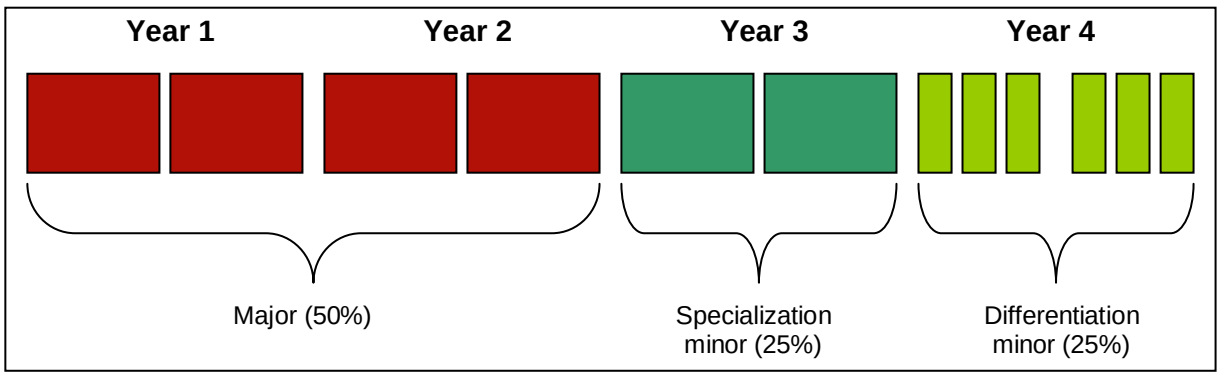


*Figure 10: Educational model in organization 1*

### 7.1.2 Description: Organization 2

Organization 2 is a mid-sized educational institution in the northern part of The Netherlands. It offers over seventy different programs to students. Organization 2 was at the first steps of implementing DBL in their organization at the time of the interview. These first steps involve the alignment of educational standards between different faculties. The organization aims to achieve this by implementing a student support application in which these standards are embedded. No definite demand-based learning model had been determined at this point.

Organization 2 is a highly informal organization, and this makes it difficult to align different faculties with each other. From the interview it was established that the informal culture made it hard to initiate organization-wide change. In effect different faculties already implement their own forms of DBL, albeit with limited flexibility in cross faculty education. A concise definition of how DBL will look on an organizational level, has not been established at this point. The interviewees also stated their doubts concerning DBL as a panacea to perceived educational quality. Organization 2 recognizes that certain groups of students will continue to demand flexibility in their programs. However the organization feels that this group consists of mostly part-time students who already participate in the workforce.

### 7.1.3 Description: Organization 3

Organization 3 is a large educational institution in the eastern part of The Netherlands. The organization has multiple locations in different cities offering fifty three different bachelor programs and thirteen master programs. DBL was placed on the educational agenda of the institution around four years ago.

Organization 3 has implemented DBL by introducing a major-minor structure. This type of structure where a program major is accompanied by a single minor only offers moderate degrees of flexibility. The organization chose this form for three reasons. First, because the institution wanted to implement DBL in the same form for every faculty, the faculty with the highest program constraints determined the level of flexibility for the rest of the faculties. In the case of organization 3 this program was a program that trains students to become teachers. This program had a lot of content requirements set by accreditation. This illustrates one of the interaction elements in figure 5. The second reason for choosing a simple major-minor structure was cost related. The interviewee stated that the development of different minors was costly and therefore constrained by budget. The third reason was the fact that the organization noticed that only a small amount of students actually desired a high level of curriculum flexibility. For those students that did, this was usually later into the program.

On individual faculty level some flexibility remained through for example a small number of electable courses, this however was delegated to the different faculties without enforcing a single type of format. The educational model in organization 3 is schematically shown in figure 11. The minor is shown as green, indicating students are able to choose from different minors. On an organizational level no application changes had to be made and most of the relevant educational standards had been implemented before. The introduction of this form of DBL was therefore only a moderate organizational change. The interviewee stressed however that setting up a good business case had been important.

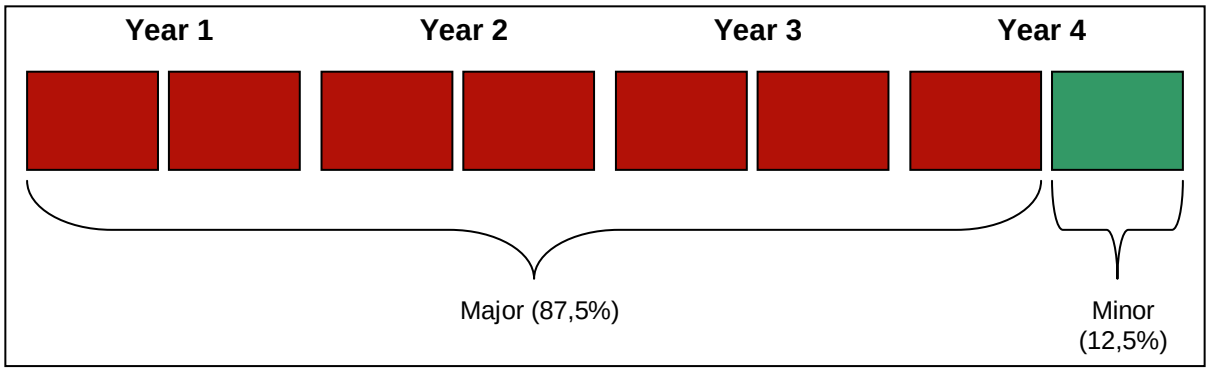


*Figure 11: Educational model in organization 3*

## 7.2 Problems

The main results of the interviews are defined through a set of core problems for which each of the interviewed organizations has stated that they were the most dominant problems encountered before, during and after implementing DBL. For every organization these main problems are shortly summarized in a small table. This table also indicates the areas in the assessment model where statements are made concerning this problem.

### 7.2.1 Issues: Organization 1

Problems mentioned by organization 1 emphasized organizational culture and change. The organization initially overlooked the magnitude of the change regarding the organization and its culture. It proved difficult to bring different faculties together and have them work on a single purpose, namely the individual student. DBL involved 'sharing' of students over different faculties and this was something that was very different from the traditional situation. While it initially seemed desirable to offer a considerable part (25%) of the teaching program through flexible content, the organization later considered reducing this degree of freedom. This had two main reasons, first of all the organizational recourses required to offer this level of flexibility were high. The total number of possible unique teaching programs numbered over two hundred which greatly decreased maintainability. Second, the organization questioned whether this level of flexibility was actually desired by students. The main reason for this was that students who initially enroll in a program have only moderate knowledge about specific domains within that program. This forced the organization to re-assess the model and question whether the costs weighed up against the realized benefits. The cultural change also became apparent in the changing roles of professional teaching staff. These professionals previously focused on knowledge transfer. In the new situation part of their time was also spent on guiding, supporting and counseling students. For more traditional individuals this was a considerable change.

| Problem area | Assessment model |
|---|---|
| Impact on organizational culture | **Culture & People – C2, C3** |
| Level of flexibility versus cost effectiveness | **Organization – O1** |
| Assessment of student demands | **Organization – O1, O6** |
| Impact of change on roles and functions | **Culture & People – C4** |

### 7.2.2 Issues: Organization 2

Problems mentioned by organization 2 were mostly concerned with what this organization regarded as the first phase into facilitating DBL. This means aligning the faculties and standards to allow flexibility to be introduced more easily at later stages. The emphasis in this initial phase seemed to lay with the applications which would be used to facilitate this. Problems mentioned by this organization were therefore also more IT related than in the other organizations, for example the lack of a professional IT department. Interviewees also stated the organization lacked project management experience. These two problem areas could be attributed to the organization's relatively moderate size. Budgetary constraints may not allow for a full fledged IT department and staff, such as in larger organizations. Cultural issues were mentioned by this organization as well; the interviewees indicated that organization 2 maintained a highly informal structure with many decisions made at lower levels in the organization. While this provided the organization with advantages in the past, it also made the organizational change more difficult to initiate and control. The assessment model has included measures that assess culture and more specifically the ways through which mechanisms organizations can make decisions (informal versus formal). Where informal decision-making is embedded in the organizational culture, extra measures should be taken which improve control.

| Problem area | Assessment model |
|---|---|
| Impact on organizational culture | **Culture & People – C2, C3** |
| Autonomy of faculties, control structure | **Culture & People – C3** |
| Lack of IT recourses (know-how) | **Culture & People – C2** |
| Establishing functional application requirements | **Technology & Infrastructure – T2** |
| Lack of project management experience | **Culture & People – C2, O5** |

### 7.2.3 Issues: Organization 3

Organization 3 initially overestimated the degree to which students require flexibility in their programs. Their findings were that students do not require more freedom in the first years of their program, mainly because they lack domain knowledge required to judge what courses fit well within their individual program. Another observation was that in the few years there was also not really a desire from students to make changes in their program.

Another issue concerned the level of standardization. Organization 3 went relatively far in putting up the different educational standards through the organization. The organization later realized that faculties needed more freedom to respond to local demands. The organization is currently in the process of giving some freedom back its faculties and programs.

| Problem area | Assessment model |
|---|---|
| Level of standards | **Organization – O2** |
| Assessment of student demands | **Organization – O1, O6** |

## 7.3 Workshop

The workshop session aimed to set the first steps creating a holistic advisory product on the topic of flexibility in education and demand-based learning. Further workshops may carry less significance for this thesis as they will also try to incorporate various costing aspects of demand-based learning. Various elements from the assessment model presented in chapter 6 were used as a basis to form a model which also includes a time element. By including the sequence of decision-making at the different levels during DBL projects KPMG aims to improve its advisory knowledge on this topic.

### 7.3.1 Setting

The workshop was held at a KPMG office in Zwolle. Before the session all attendants had reviewed the assessment tool described in chapter 6. The session was aimed to be explorative and different materials were used to write down our ideas. During the entire session the attendants tried to take the viewpoint of an educational institution, looking to implement DBL. The goal was to determine a general sequence of steps required for an organization to implement DBL. This sequence of steps was important, because KPMG advisors are often not called in on a project directly from the start. A structured sequence of steps allows advisors to look back into what has already been done in an organization. It also allows them to see areas where an organization might have skipped certain important steps. Various elements from the assessment model proved to be relevant and were included within this sequence.

### 7.3.2 Findings

The attendants agreed that implementing DBL starts with vision forming. This was named step 1. An important question posed here was: 'How will the student flow through our organization'. This vision is used to set-up a business model which is step 2. Specific examples of business models were given during the workshop, including the model used at the University of Twente and the model used at Hogeschool InHolland. These two examples were especially interesting because these organizations use an educational model which is fairly progressive considering the offered level of flexibility. A schematic representation of these models has been included under Appendix C. These examples served as a reference for different issues that were discussed during the rest of the workshop. The assessment model in this thesis posed that the business model should also be assessed on cost effectiveness. Attendants of the workshop argued whether this should actually be a business case aspect or that this should indeed be considered as soon as step 2, setting up the business model.

Step 3 involved organizational and educational standards. These standards are also mentioned in the assessment model. The business model determines what flow of students is allowed throughout the organization. The business model has to be determined before organizations can assess the different types of standards that are required to implement their vision on DBL. If an organization only offers limited levels of flexibility, the requirements on standards will also be lower. Attendants agreed on this.

Step 4 involved the link to processes. This started out on a high level, using most of the processes listed in figure 7 of this thesis. The attendants agreed that focus for each supporting process varied along with the type of business model that was chosen by the organization. Specific examples of this were given and provided valuable insights. One such example is provided: Organizations using simple major-minor structures will require less attention on educational support than organizations which allow every student to individualize a certain percentage of their courses. For every student an individual judgment has to be given on

choices regarding courses to attend. This process may also be periodical and therefore require significant time resources. While in the first case individual judgment is less time consuming, educational program development requires more time to define and assess the different minors. These steps are schematically shown in figure 12.

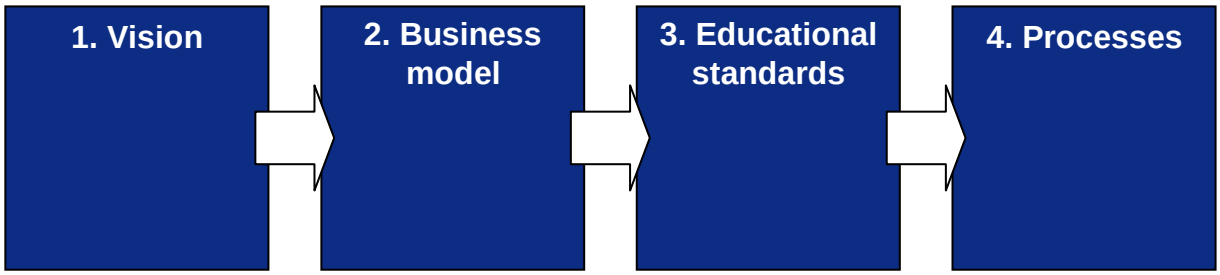


*Figure 12: First steps towards implementing demand-based learning*

Further topics discussed were the use of applications and how some organizations still viewed the implementation of demand-based learning and educational standards purely as information systems change. The reason for this was that the implementation of organizational and educational standards often required the alignment of systems and applications. In most cases this was accompanied by a newly introduced, over-arching student support application. Because the introduction of standards is the first step where actual changes are implemented in the organization, certain focus is also placed on this step. This may cause employees to believe that the introduction of demand-based learning is merely an IT change while it is actually not.

Another topic discussed was the different business models that had been seen in practice. Two of these models were presented in figures 10 and 11. Models from other organizations have been also been reviewed, however due to planning constraints from different parties no interviews with these organizations were arranged. Figures 10 and 11 were included in Appendix C, along with two other educational models.

## 7.4 Discussion

Much of the problems mentioned by the interviewees are also included in the model. One of the issues that were mentioned by all interviewed parties was the tension between professionals and supporting personnel. This tension is inherent to education and can also be seen in health care. However this tension makes it hard to align the organization and its departments into a single organizational direction. The fact that often faculties possess some level of autonomy makes this process of alignment even harder. Different approaches were seen that tried to counter this problem. Organization 2 used a bottom-up approach while organization 1 mostly applied a top-down approach.

The interviews also showed certain aspects can be overdone. Organization 1 introduced a high level of flexibility. Students only moderately used this level of flexibility but the recourses required to maintain this structure were significant. Organization 3 introduced organizational standards but realized that some degree of freedom should have remained with the faculties. These examples show that organizations are still experimenting with the concept of DBL. The educational models in organizations 1 and 3 also show a lot of differences. In terms of successfulness, both educational models work for their respective organizations.

The model looks at flexibility over multiple dimensions. Flexibility in study location was not mentioned by any of the three organizations as being on their educational agenda. This was not expected. Flexibility within study pace was mentioned but was not deemed as problematic by the interviewees. All interviewees were concerned with some form of flexibility in curriculum. In these three cases this type of flexibility was most important.

The workshop session showed the relevance of most of the organizational elements mentioned under chapter 6.2. The session showed that implementing DBL involves a set of choices. For each answered set a set of implications is addressed and a new set of choices arises. In a way this process can be seen as a funnel, where with each iteration of decision-making the organizations narrows down the possible set of new decisions. At the same time this process can also be seen as a pyramid, with high level decisions made on the top which have implications for increasing amounts of (tactical and operational) decisions at the lower levels in the organization.

The validity of the assessment model seems satisfactorily. A lot of elements mentioned in the interviews and workshop session were also included in the model. No elements were found that did not receive attention within the model. However different elements carry different weight depending on the respective organization. For example a small organization may be more organic than a large organization and thus more open to change; however the same small organization may lack the required IT expertise compared to the larger organization. This point of self-assessment is important but has not been included in the model.

# Part V: Practice

Part V finishes the overall report by providing conclusions, limitations and recommendations for future research. This chapter also looks back on the research approach using Hevner's criteria for design science.

**Contents:**

# 8. Evaluation and reflection

This chapter starts with an evaluation of the research approach. After this the conclusion is presented. The chapter finishes with limitations and recommendations for future research.\

## 8.1 Evaluating the research approach

According to Hevner et al. (2004) design science seeks to create innovations that define the ideas, practices, technical capabilities and products through which the analysis, design, implementation, and use of information systems can be effectively and efficiently accomplished. While the introduction of DBL into an organization is certainly not a pure information systems change, information systems do carry an important role. As the main deliverable of this research is an assessment model based on certain ideas and practices, this research can certainly be classified as design science.

Hevner et al. (2004) have setup seven guidelines that are aimed to improve design science research. These guidelines have been summarized in table 5. Because this can certainly be marked a design science, evaluating the approach that was used using the seven guidelines will give an indication of the quality of this approach.

| | |
|---|---|
| Guideline 1: Design as an Artifact | Design-science research must produce a viable artifact in the form of a construct, a model, a method, or an instantiation. |
| Guideline 2: Problem Relevance | The objective of design-science research is to develop technology-based solutions to important and relevant business problems. |
| Guideline 3: Design Evaluation | The utility, quality, and efficacy of a design artifact must be rigorously demonstrated via well-executed evaluation methods. |
| Guideline 4: Research Contributions | Effective design-science research must provide clear and verifiable contributions in the areas of the design artifact, design foundations, and/or design methodologies. |
| Guideline 5: Research Rigor | Design-science research relies upon the application of rigorous methods in both the construction and evaluation of the design artifact. |
| Guideline 6: Design as a Search Process | The search for an effective artifact requires utilizing available means to reach desired ends while satisfying laws in the problem environment. |
| Guideline 7: Communication of Research | Design-science research must be presented effectively both to technology-oriented as well as management-oriented audiences. |

*Table 5: Design-Science Research Guidelines*

### 8.1.1 Guideline 1: Design as an Artifact

The main deliverable of this research is an assessment model. This clearly shows the applicability of guideline 1 where Hevner et al. (2004) state that design research must produce a viable artifact.

### 8.1.2 Guideline 2: Problem Relevance

The introduction of this chapter already stated that the introduction of DBL is not a pure information systems change. However without technology a manageable DBL solution will be difficult to develop. DBL is a response to educational institutions looking to offer more individualized teaching. Therefore it can be stated that the assessment model tries to address a business problem by applying a solution that is accompanied by the use of technology.

### 8.1.3 Guideline 3: Design Evaluation

A start was made to evaluate the assessment model by conducting interviews and by using the model in a workshop session. Guideline 3 states that the evaluation should at least include integration of the artifact within the infrastructure of the business environment. Different elements of the assessment model were taken into the interviews. There, local experts provided their views upon these elements and how these elements were resembled in their organizations.

### 8.1.4 Guideline 4: Research Contributions

The fourth guideline concerns novelty. Novelty applies because the literature review showed a deficit in this type of research. The research tries to provide new information in this area.

### 8.1.5 Guideline 5: Research Rigor

Design-science research relies upon the application of rigorous methods in both the construction and evaluation of the design artifact. In this research DBL can be seen as the design artifact. The definitions on this concept that were given as an answer to sub-question 1 were later used to see how organizations are affected. The construction and evaluation of this concept were presented in chapters 3 and 4. The approach that was used here including the formal review process by Webster & Watson (2002) have added to this use of rigorous methods.

### 8.1.6 Guideline 6: Design as a Search Process

The author feels most of the available sources were used in the research. The iterative cycle which marks design science was also present. This can for example be seen during the phase where theory was taken to domain experts to conduct interviews, the phase where the model was taken to local experts and the phase where this information was again reviewed and used by domain experts in a workshop session.

### 8.1.7 Guideline 7: Communication of Research

The research contains elements that are relevant for both technology- as well as management-oriented audiences. As the research remains fairly high level, the content is understandable to both types of audiences and thus meets the criteria for guideline 7.

All seven guidelines have at least been accounted for in this research. This means that at least a certain level of quality can be attributed to the research approach according to Hevner's guidelines.

## 8.2 Conclusions

This research started out with three research questions that aimed to contribute to the goal of this research which was to setup an assessment model that could be used by KPMG and educational institutions to implement DBL. Within this research the scope that was chosen was limited to higher educational institutions.

The first question was what demand-based learning really is. Demand-based learning empowers the students by giving them more freedom to choose how their education is organized. This aims to increase the perceived educational quality by students and potential employers and decrease student drop-out rates. The research showed that the most important dimension in this is flexibility in student curriculum. Interviews further showed that flexibility in study pace also plays a role, but to a lesser extent. Flexibility in study location was hardly mentioned as a concern on an organizational level. In chapter 4 the definition of what DBL entitles was presented: *DBL is concerned with delivering a level of flexibility in study curriculum and study pace on an organizational level, such that student's learning requirements are optimally fulfilled*. This also seems to fit well with what was found later on in the interviews.

The second question addressed how demand-based learning affects higher educational institutions. The impacts of DBL on the organization mainly reside with interoperability. Depending on the offered level of flexibility, educational and organizational standards are a requirement to facilitate the flow of students between different faculties. Applications are also affected by the requirements for organizational and educational standards, as they are embedded in most organizational administration processes. Freedom to choose also implies responsibility on students. The capability and desire to handle such responsibility differs per student, and this means extra attention and support is required from professionals. Curriculum flexibility introduces a flow of students between different faculties. Faculties no longer 'own' students and they are now required to work together to a common goal; student education. Together with the autonomous nature of professionals in an educational setting, these factors have considerable effects on organizational culture.

Interviews showed that cultural issues arose in all three of the reviewed cases. Such issues were resolved through different approaches. Interviews also showed that determining the desired level of flexibility by both the organization and the student is highly important. Bringing this element into the business case for demand-based learning will decrease chances of later realizing that that which is offered does not match that what is desired by students.

The third question tried to rally all the relevant elements of DBL into an organizational assessment model. The assessment model includes statements and indicators for all of the issues mentioned above. This model was not intended to prescribe how demand-based learning should look. Moreover the model shows where different elements interact with each other and what elements should be considered when implementing demand-based learning. An important decision here is how the educational model will look. This model should be the result of the vision an organization has on DBL and further affects areas such as standards and processes.

As will become apparent from the limitations section, this model cannot be applied blindly and requires an interpretation of different elements. Emphasis on these different elements will

vary per organization. Some may not be relevant at all because organizations may have addressed these elements in earlier projects.

## 8.3 Limitations

Several limitations can be found. First of all, looking at the size of the organizational change, the model only touched briefly upon some critical areas such as change management. Here organizations will not be able to depend blindly on the model. Expertise will still be required to translate the specifics within the model to strategic, tactical and operational business plans. In that sense the model mainly serves as an organizational checklist.

Second, organizations differ widely in size, structure, financial recourses and culture. For that reason different areas within the assessment model are more and less relevant for different organizations. Organizations that wish to use the assessment model should also look at the relevance of the statements for their organization. An organization which is by nature highly innovative may have already incorporated a high level of organizational and educational standards. For such organizations the cultural change towards demand-orientation may be much more relevant. Here too the model cannot be blindly followed.

The number of cases (three) that was reviewed during the thesis project was limited. This was mainly due to planning constraints. The author believes however that problem areas encountered by different organizations that implement DBL will overlap. This shows from the overlap of some of the problems discussed in chapter 7. Further quantitative research is however required. Reviewing additional cases may allow researchers to link specific types of problems to some of the specific types of DBL-related educational models.

One of the interviewees raised an interesting point on the control structure within universities compared to HBO institutions. In universities a relatively high level of authority remains with faculties compared with HBO institutions. This means that in universities changes to the educational model may be harder to realize than in HBO institutions. Differences in decision structure have been accounted for in the model, which means different statements in the model may carry more weight for universities. Unfortunately due to time- and organizational limitations no universities were included in the set of interview organizations, and this is clearly a limitation of the research.

Finally, the research area is complex and the author may have oversimplified certain aspects. This is one of the risks of not narrowing down the research topic. However as was stated in chapter 1, the interaction between different areas in DBL requires a holistic view on organizational aspects. Considering the limited formal literature available on the topic, the author still believes that this thesis can still provide valuable insights for further research areas.

## 8.4 Future research

Demand-based learning is still very much in an experimental phase and the concept is on the agendas of several Dutch educational institutions. Not much literature has been written on the topic however. As the literature review showed, most literature focused on e-learning and technology driven learning approaches, mostly from a classroom perspective. Flexibility in education was also shown to be of importance in DBL. Only few authors reviewed this concept however. Concerning the literature, a lot of work can still be done.

One area where future research can add value is the categorization of different DBL models. The workshop session that was held during this project already touched upon this briefly. The idea is that general applications of DBL can be distinguished. An example of such an application is the use of electable, pre-defined course modules. Another application is the use of fixed (mandatory) and electable courses. Further research could categorize these approaches by conducting quantitative studies at higher educational institutions. This could yield a list of possible DBL configurations. For each of these configurations a set of concrete action points could then be set-up. Organizations looking to implement DBL would start out by taking their vision and matching this with the general configurations. A choice could then be made for any of these configurations, and the list of concrete actions points belonging to the respective configuration could be used to determine further steps.

The model presented in this work takes an organizational perspective. This makes the nature of the model somewhat generic, and certain aspects may not have received the attention they should have. Further research could go into more detail for each of the four general areas in the model. An interesting question could be in which cases planning should be leading in setting an overall student schedule, and when learning demand should be leading.

Finally, DBL may just be a trend and the question remains what the extent of benefits will be of introducing highly flexible programs. Questions like ‘to what extent are students capable of making choices regarding education?’ and ‘to what extent do students wish to deviate from standard programs?’ remain to be answered. It appears strange that such benefits have not been documented in scientific studies. In several cases the desired benefits of DBL did not seem clear or were not documented at all. As with many trends however, those that do not follow, face the fear of getting left behind.

# 9. References

Akkoyunlu, B., & Yılmaz-Soylu, M. (2007). Development of a scale on learners' views on blended learning and its implementation process. *Internet and Higher Education*, Vol. 11, pp. 26–32.

Alonso, F., López, G., Manrique, D., & Viñes, J.M. (2005). An instructional model for web-based e-learning education with a blended learning process approach. *British Journal of Educational Technology*, Vol. 36, No. 2, pp. 217–235.

Boer, J. de (2008). *Onderwijs en logistiek, een gedwongen huwelijk; Chaotische individualisering of beheersbare flexibiliteit* [PowerPoint slides]. Retrieved from KPMG intranet.

Bouhnik, D., & Marcus, T. (2006). Interaction in Distance-Learning Courses. *Journal of the American Society for Information Science and Technology*, Vol. 57, No. 3, pp. 299-305.

Burbules, N.C., & Callister, T.A. (2000). Universities in transition: The promise and the challenge of new technologies. *Teachers College Record*, Vol. 102, No. 2, pp. 271-293.

Carchiolo, V., Longheu, A., Malgeri, M., & Mangioni, G. (2007). A model for a web-based learning system. *Information Systems Frontiers*, Vol. 9, pp. 267–282.

Cartwright, J.C., & Menkens, R. (2002). Student Perspectives on Transitioning to New Technologies for Distance Learning. *Computers, Informatics, Nursing*, Vol. 20, No. 4, pp. 143-149

Chan, J.K.Y., & Law, K.C.K. (2008). Structured Blended Learning Implementation for an Open Learning Environment. In Leung, H. (ed.) et al., *Lecture Notes in Computer Science* (pp. 630-640). Berlin: Springer.

Clarke, M., Butler, C., Schmidt-Hansen, P., & Somerville, M. (2004). Quality assurance for distance learning: a case study at Brunel University. *British Journal of Educational Technology,* Vol 35, No. 1, pp. 5–11.

Collis, B., & Moonen, J. (2004). *Flexible Learning in a Digital World* (2nd ed.). Oxon: RoutledgeFalmer.

Daft, R.L. (2004). *Organization Theory and Design* (8th ed.). Mason: Thomson South-Western.

Davis, H.C., & Fill, K. (2007). Embedding blended learning in a university's teaching culture: Experiences and reflections. *British Journal of Educational Technology*, Vol. 38, No. 5, pp. 817–828.

Dearnley, C. (2003). Student Support in Open Learning: Sustaining the process. *International Review of Research in Open and Distance Learning*, Vol. 4, No. 1, pp. 1-15.

Derntl, M., & Motschnig-Pitrik, R. (2005). The role of structure, patterns, and people in blended learning. *Internet and Higher Education*, Vol. 8, pp. 111–130.

Dorrian, J., & Wache, D. (2009). Introduction of an online approach to flexible learning for on-campus and distance education students: Lessons learned and ways forward. *Nurse Education Today*, Vol. 29, pp. 157–167.

Eynon, R. (2008). The use of the World Wide Web in learning and teaching in higher education: reality and rhetoric. *Innovations in Education and Teaching International*, Vol. 45, No. 1, pp. 15–23.

Faulhaber, C.B. (1996). Distance Learning and Digital Libraries: Two Sides of a Single Coin. *Journal of the American Society for Information Science*, Vol. 47, No. 11, pp 854-856.

Forman, D., Nyatanga, L., & Rich, T. (2002). E-learning and educational diversity. *Nurse Education Today,* Vol. 22, pp. 76-82.

Frijns, M., & van de Hurk, J. (2007). *Flexibel leren; hoe een leerorganisatie leert organiseren* [PowerPoint slides]. Retrieved from ROC-I partners website: http://www.roc-i-partners.nl/folder/roci/conferenties/Apeldoorn/Presentatie%20workshop%20Flexibel%20leren%20en%20onderwijslogistiek%20door%20Kennisnet.ppt

Gannon Cook, R., Ley, K., Crawford, C., & Warner, A. (2009). Motivators and Inhibitors for University Faculty in Distance and e-learning. *British Journal of Educational Technology*, Vol. 40, No. 1, pp.149–163.

Garrison, D.R., & Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *Internet and Higher Education*, Vol. 7, pp. 95–105.

Grantmaker recources - glossary of terms (n.d), retrieved May 29, 2009, from Philantropic Foundations Canada, http://www.pfc.ca/cms_en/page1112.cfm

Green, J. (2005). Replacing Lectures in Conventional University Courses by Text-based Flexible Learning Can Be a Rewarding Experience for the Lecturer and Students. *Biochemistry and Molecular Biology Education*, Vol. 33, No. 3, pp. 205–207.

Hayes, M.N., & Jamrozik, M.L. (2000). Internet Distance Learning: The Problems, the Pitfalls, and the Future. *Journal of VLSI Signal Processing,* Vol. 29, pp. 63–69.

Heilesen, S.B., & Josephsen, J. (2007). E-learning: Between augmentation and disruption? *Computers & Education*, Vol. 50, pp. 525–534.

Henrich, A., & Sieber, S. (2009). Blended learning and pure e-learning concepts for information retrieval: experiences and future directions. *Information Retrieval*, Vol. 12, No. 2, pp. 117–147.

Hevner, A.R., March, S.T., Park, J., & Ram, S. (2004). Design Science in Information Systems Research. *MIS Quarterly*, Vol. 28, No. 1, pp. 75-105.

Hill, J. (2005). Flexible Learning Environments: Leveraging the Affordances of Flexible Delivery and Flexible Learning. *Innovative Higher Education*, Vol. 31, pp. 187-197.

Hodgins, W. (2007). Distance Education But Beyond: ''meLearning''—What If the Impossible Isn't? *Journal of Veterinary Medical Education*, Vol. 34, No. 3, pp. 325-329.

Hofland, D., Manschot, K., Hoogstra, J., & Smit, M.C. (2009, Januari/March). Succesfactoren van pakketselectie en –implementatie. *Compact*, Vol. 36, No. 1, pp. 35-45.

Hopp, W.J., & Spearman, M.L. (2000). *Factory Physics* (2nd ed.). New York: McGraw-Hill Higher Education.

Jonsson, B. (2004). A case study of successful e-learning: A web-based distance course in medical physics held for school teachers of the upper secondary level. *Medical Engineering & Physics*, Vol. 27, pp. 571–581.

Katz, Y.J. (2002). Attitudes affecting college students' preferences for distance learning. *Journal of Computer Assisted Learning*, Vol. 18, pp. 2-9.

Kirkwood, A., & Price, L. (2005). Learners and learning in the twenty-first century: what do we know about students' attitudes towards and experiences of information and communication technologies that will help us design courses? *Studies in Higher Education*, Vol. 30, No. 3, pp. 257–274.

Mahdizadeh, H., Biemans, H., & Mulder, M. (2008). Determining factors of the use of e-learning environments by university teachers. *Computers & Education*, Vol. 51, pp. 142–154.

Marshall, S., & Mitchel, G. (2005). *E-learning process maturity in the New Zealand tertiary sector*. Paper presented the 22th Annual Conference of the Australian Society for Computers in Learning in Tertiary Education, Ballarat, Victoria, Australia.

Martin, D., & Treves, R. (2007). Embedding e-learning in geographical practice. *British Journal of Educational Technology*, Vol. 38, No. 5, pp. 773–783.

Moody, D. (2008). *Information Systems Research* [PowerPoint slides]. Retrieved from Information Systems Research course page.

Moore, M.G. (1989). Three types of interaction. *The American Journal of Distance Education*, Vol. 3, No. 2, pp. 1–6.

Moore, M. (1990). "Introduction", in Moore, M. (Ed.), *Background and Overview of Contemporary American Distance Education, Contemporary Issues in American Distance Education* (pp. 1-7). New York: Pergamon Press.

Mor, Y., & Winters, N. (2007). Self-Regulated Learning in Technology-Enhanced Learning Environments: lessons of a European peer review. *European Journal of Education*, Vol. 41, No. 3-4, pp 353-379.

Müller, R. (2009). *Project Governance*. Aldershot: Gower Publishing.

Normand, C., Littlejohn, A., & Falconer, I. (2008). A model for effective implementation of flexible programme delivery. *Innovations in Education and Teaching International*, Vol. 45, No. 1, pp. 25–36.

Noordam, P., Derksen, B., & van der Vlist, A. (2004). *Trends in IT 2004-2005, Op tijd investeren in de juiste technologie*. Sdu Uitgevers.

Oakland, J.S., & Tanner, S.J. (2007). Successful change management. *Total Quality Management and Business Excellence*, Vol. 18, No.1-2, pp.1-19.

Passerini, K., & Granger, M.J. (1999). A developmental model for distance learning using the Internet. *Computers & Education*, Vol. 34, pp. 1-15.

Rovai, A.P., Ponton, M.K., & Baker, J.D. (2008). *Distance learning in higher education: a programmatic approach to planning, design, instruction, evaluation and accreditation*. New York: Teachers College Press.

Sadler-Smith, E., & Smith, P.J. (2004). Strategies for accommodating individuals' styles and preferences in flexible learning programmes. *British Journal of Educational Technology*, Vol. 35, No. 4, pp. 395–412.

Selim, H.M. (2007). Critical success factors for e-learning acceptance: Confirmatory factor models. *Computers & Education*, Vol. 49, pp. 396–413.

Stubbs, M., Martin, I., & Endlar, L. (2006). The structuration of blended learning: putting holistic design principles into practice. *British Journal of Educational Technology*, Vol. 37, No. 2, pp. 163–175.

Taylor, J. (2001). *Fifth generation distance education.* Paper presented at the 19th ICDE World Conference on Open Learning and Distance education, Vienna, Austria.

Vencatesan, J. (2006). Recent initiatives in distance education. *Current Science*, Vol. 91, No. 7, pp. 891-893.

Van Heffen, O., & Kerkhoff, A.H.M. (1997). *Beleidsvoering in de algemene gezondheidszorg*. Assen: Van Gorcum & Comp B.V.

Wade, V.P., & Ashman, H. (2007). Evolving the Infrastructure for Technology-Enhanced Distance Learning. *IEEE Internet Computing*, Vol. 11, No. 3, pp. 16-18.

Webster, J., & Hackley, P. (1997). Teaching Effectiveness in Technology-mediated Distance Learning. *The Academy of Management Journal*, Vol. 40, No. 6, pp. 1282-1309.

Webster, J., & Watson R. (2002). Analyzing the Past to Prepare for the Future: Writing a Literature Review. *MIS Quarterly*, Vol. 26, No. 2, pp. 13-23.

White, S. (2007). Critical success factors for e-learning and institutional change—some organisational perspectives on campus-wide e-learning. *British Journal of Educational Technology*, Vol. 38, No. 5, pp. 840–850.

Williams, P., Nicholas, D., & Gunter, B. (2004). E-learning: what the literature tells us about distance education. *Aslib Proceedings*, Vol. 57, No. 2, pp. 109-122.

Yong, J. (2006). *Internet-Based E-Learning Workflow Process*. In W. Shen (ed) et al., Lecture Notes in Computer Science, Vol. 3865 (pp. 516–524). Berlin: Springer.

Zhang, D., & Nunamaker, J.F. (2003). Powering e-Learning in the new millennium: An overview of e-Learning and enabling technology. *Information Systems Frontiers*, Vol. 5, No. 2, pp. 207–218.

# Part VI: Appendices

The appendices are aimed at providing extra information on areas which could be interesting to the reader but do not necessarily belong in the actual report. References to these appendices can be found throughout the report itself.

**Contents:**

# Appendix A: Contact information internal experts

Contact information of persons interviewed:

*Name: Edward Veen*
Organization: KPMG ITA
Function: Manager
Telephone: +31 38 467 4757
Email: veen.edward@kpmg.nl

*Name: Erik Rutkens*
Organization: KPMG ITA
Function: Senior Manager
Telephone: +31 50 5 222147
Email: rutkens.erik@kpmg.nl

*Name: Ramon Hendriks*
Organization: KPMG ITA
Function: Advisor
Telephone: +31 53 4 832589
Email: hendriks.ramon@kpmg.nl

*Name: Matthijs Elfers*
Organization: KPMG ITA
Function: Advisor
Telephone: +31 50 5 222106
Email: elfers.matthijs@kpmg.nl

# Appendix B: Interview format external experts

This interview format serves as a reference for the author of this. It also provides the reader insight into how the interviews were conducted.

## B.1 Interview goals

- To gain insight into how the respective organization interprets demand-based learning
- To gain insight into how the respective organization has implemented demand-based learning
- To elicitate problems that occurred during the implementation of demand-based learning

## B.2 Interview methodology

### B.2.1 Setup and processing results

All interviews were scheduled to take around one hour. Beforehand each of the interviewees was sent a short description of the interview goals. All interviews were recorded and later processed to a text format.

### B.2.2 Selection of interviewees

All interviewed institutions had previously been in contact with KPMG through projects except one. All of the interviewed organizations had recently been involved in the implementation of demand-based learning. Contact information for the individuals that were interviewed was gained from different employees at KPMG. Their selection was mostly based on the status of the respective organization concerning demand-based learning.

## B.3 Interview approach

The interviews sessions follow an unstructured format. This means that a small basis of questions is used which provides the main line during the sessions. For each question the interviewer carefully listens and asks follow-up questions based on the answers given by the interviewee.

The reason for this approach was that a structured problem elicitation seemed very hard to prepare beforehand. It was realized that each of the interviewed organizations would have different ideas on how to implement demand-based learning. This means they could also have run across very different problems. Setting up problem areas and ask questions about these areas could become a fruitless effort as some areas as not relevant to all forms through which DBL can be implemented.

## B.4 Interview questions

1. How does your organization view demand-based learning?
2. How has your organization implemented this view?
3. What were the major problem areas that you encountered before the implementation?
4. What were the major problem areas that you encountered during the implementation?
5. What were the major problem areas that you encountered after the implementation?
6. For problems you found most hard to solve, what was your solution?

## B.5 Details of interviewees

This section contains (contact) information for the different interviewees.

*Name: Arjan Vethman*
Organization: InHolland
Function: Hoofd Inbeheer Dienst Onderwijs, Kwaliteit, Research & Development (OKR)
Telephone: 06-21115513
Email: Arjan.Vethman@inholland.nl

*Name: Hans Outhuis*
Organization: Saxion Hogeschool
Function: CIO
Telephone: 057-0663121
Email: j.g.a.outhuis@saxion.nl

*Name: Andre Abrahamse*
Organization: Noordelijke Hogeschool Leeuwarden
Function: Senior Project Manager
Telephone: 06-17948900
Email: a.abrahamse@nhl.nl

# Appendix C: Educational Models

Appendix C shows some of the educational models that were studied during the course of this thesis project. The figures shown here are designed as a schematic. This means that the location of the different components within the curricula may vary from their location within the figures. Another side note is that the organizations use different rules and guidelines for the use of these educational models. While a simple major-minor structure may be the same for two organizations, differences can occur what types of minors the student is allowed to chose.

## C1. Simple major-minor structure

This structure is used by Saxion Hogeschool (HBO). The minor is a standardized module for every program. Its planning within the major program curriculum is the same for every program. The minors are predefined selectable course modules. Minors are designed to have either a specialization or a differentiation purpose.

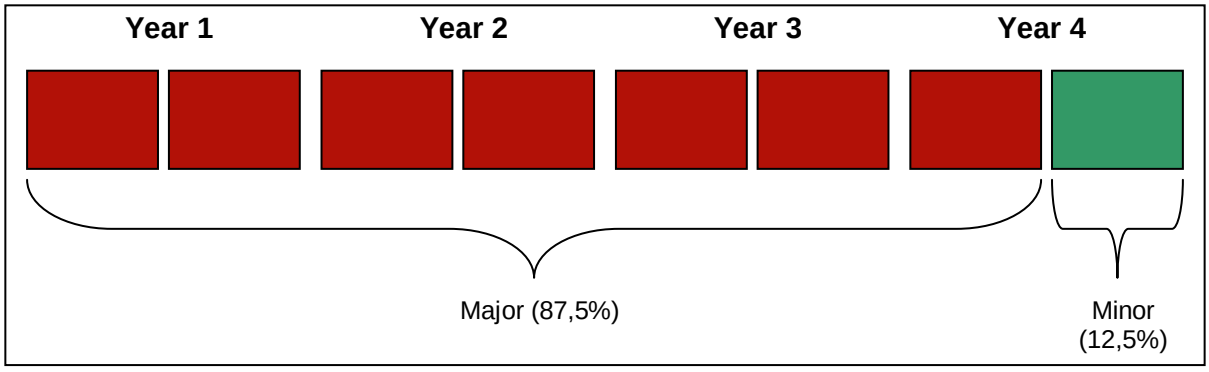


*Figure 13: Simple major-minor structure*

## C2. Complex major-minor structure

This structure is used at InHolland (HBO). Differentiation minors are created for every individual student, in discussion with a study councilor. The main requirement for this differentiation minors is that the selection of courses within the minor itself is in some way coherent.

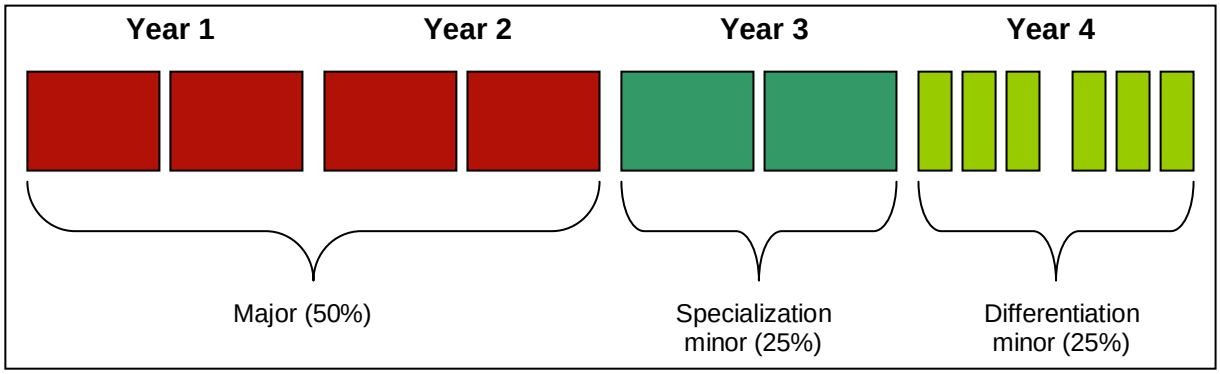


*Figure 14: Complex major-minor structure*

## C3. Major-minor structure, multiple minors

This structure is used at Windesheim (HBO) in Zwolle. The minors form a significant part of the programs. Choices for minors are made in discussion with a study councilor.

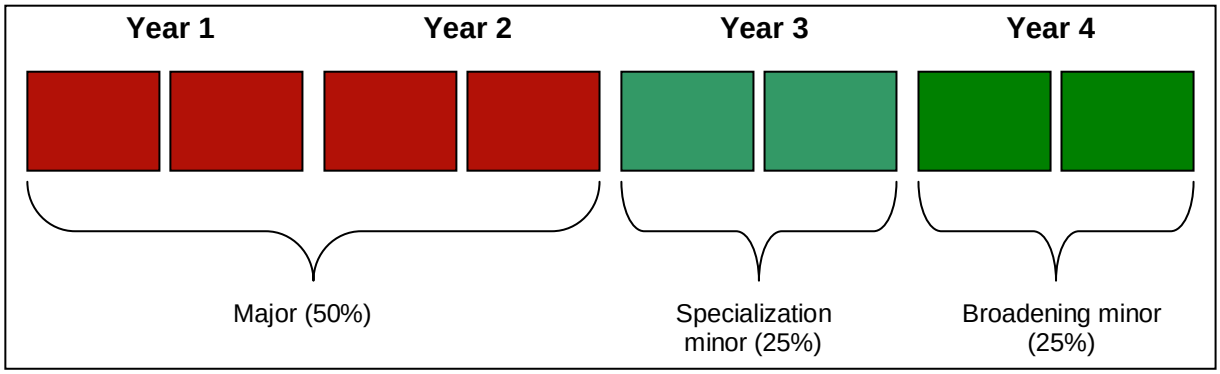


*Figure 15: Major-minor structure, multiple minors*

## C4. Major-minor bachelor, master with flexible courses

This structure is used in the University of Twente for the bachelor program of Technische Bedrijfskunde and the master program Industrial Engineering & Management. Within the master track a set of interchangeable courses can be used to swap certain courses with other master courses at IE&M related masters such as Engineering and Computer Science. Selection of these courses and the match with the IE&M master track takes places in discussion with the respective IE&M track coordinators.

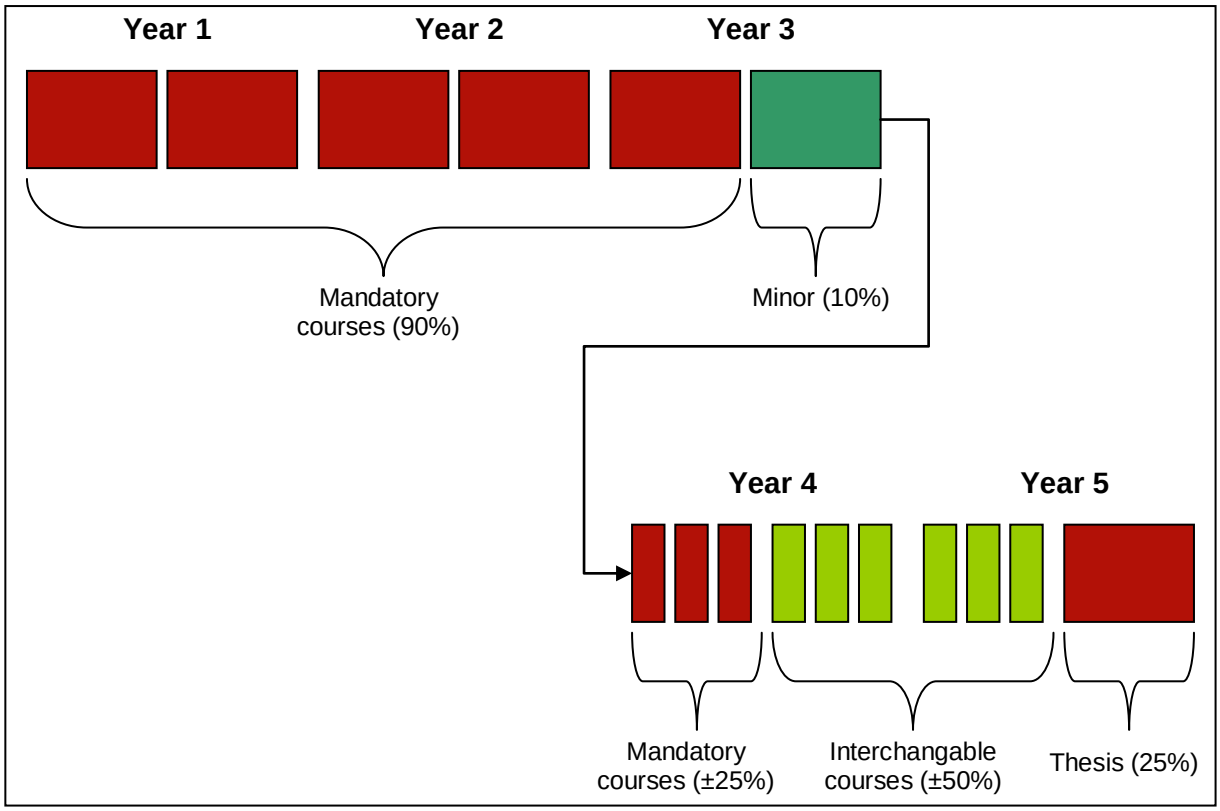


*Figure 16: Major-minor bachelor, master with flexible courses*

# Appendix D: Non-scientific sources

Table 6 shows a list of non-scientific material that was used during the project. This material originates from different sources and therefore may not be public accessible to the reader. Parts of this appendix may also be *classified* for public reading.

| Title | Year | Authors | Type |
|---|---|---|---|
| Processmodel University of Amsterdam | 2003 | Smit, A. & Aartsen, P.J. | Project document |
| Onderwijs en logistiek, een gedwongen huwelijk Chaotische individualisering of beheersbare flexibiliteit | 2008 | Koorn, R.F. & De Boer, J. | Conference presentation |
| Onderwijslogistiek in het beroepsonderwijs van de toekomst | 2007 | ROC de Leijgraaf | Conference presentation |
| Onderwijslogistiek & vraagsturing: Succes- en faalfactoren doorvoeren vernieuwing in het HBO | 2008 | Koorn, R.F. | KPMG presentation |
| Flexibel Leren: Hoe een leerorganisatie leert organiseren | 2007 | Frijs, M. & van den Hurk, J. | Public presentation |
| Het SIS-domein: van beheer naar support | 2007 | van ’t Riet, P. | Conference presentation |
| Standaardisatie van de onderwijslogistiek en de nieuwe generatie onderwijsinformatiesystemen | 2008 | van ’t Riet, P. | Conference presentation |
| Vraagsturing in het Onderwijs: Belangrijke thema’s bij het implementeren van Vraagsturing in het Onderwijs | 2008 | Hendriks, R. | KPMG presentation |
| Vraagsturing in het onderwijs | 2009 | De Boer, J. & Hendriks, R. | KPMG presentation |
| Windeshiem onderwijsstandaarden en onderwijslogistiek | 2007 | van ’t Riet, P. | Public presentation |
| Evaluatie project Vraagsturing | 2009 | Koorn, R.F. | Project document |
| Het inrichten van de onderwijslogistiek in het HO met behulp van Educator | 2009 | Koorn, R.F. & De Boer, J. | Project document |

*Table 6: List of non-scientific material used during the project*

# Appendix E: Journals

Table 7 shows a list of journals in which different articles used in the literature review were used. The second column in the table shows the number of articles found in the respective journal. This list could be useful for researchers who wish to conduct research in similar areas.

| Name of Journal | No. |
|---|---|
| British Journal of Educational Technology | 7 |
| Computers & Education | 4 |
| Internet and Higher Education | 3 |
| Information Systems Frontiers | 2 |
| Innovations in Education and Teaching International | 2 |
| Journal of the American Society for Information Science and Technology | 2 |
| American Journal of Distance Education | 1 |
| Biochemistry and Molecular Biology Education | 1 |
| Computers, Informatics, Nursing | 1 |
| Current Science | 1 |
| European Journal of Education | 1 |
| Flexible Learning in a Digital World | 1 |
| IEEE Computer Society | 1 |
| Information Retrieval | 1 |
| Innovative Higher Education | 1 |
| International Review of Research in Open and Distance Learning | 1 |
| Journal of Computer Assisted Learning | 1 |
| Journal of VLSI Signal Processing | 1 |
| New Information Perspectives | 1 |
| Nurse Education Today | 1 |
| Studies in Higher Education | 1 |
| Teachers College Record | 1 |
| The Academy of Management Journal | 1 |
| Total Quality Management and Business Excellence | 1 |

*Table 7: Journals used*