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1 INTRODUCTION

1.1 The context of an information architect

Information architecture is, among others, defined by Morville and Rosenfeld as both "*the structural design of shared information environments* and *as an emerging discipline and community of practice focused on bringing principles of design and architecture to the digital landscape*" (Morville and Rosenfeld 2006: 4). This entails the ability to create effective and comprehensive flows of information by creating meaningful structures, navigation, styles and search possibilities.

Information architects therefore often face the challenge of designing, organising and structuring, what is invisible to most users. When I say invisible I refer more specifically to the 'layer' right beneath the user interface. This layer is important since it is here that i.e. information is structured, design is conceived, functions are determined and user groups are defined. This layer is what determines whether or not the users decode the communication, design, content and information in the way that is intended. All these aspects require an insight into an understanding of analysing, assessing, organising and designing information architectures and environments.

These are some of the challenges I have faced and worked with during my master's degree programme. The complex challenges have taught me to understand the needs of users and how to match these needs to the goals and wishes of an organisation. I see myself in the role of a mediator between users and organisations - my job is to create useful information systems within complex environments, and at the same time ensure that the users of the system comprehend the content and find the system useful and effective. I have furthermore gained competences in evaluating and benchmarking comparable information structures and am able to use these results in a design process. I have learned the importance of basing a design on user-driven innovation in order to discuss, plan and manage the entire design process to the intended target group in the most advantageous way.

I find it challenging to use the advantages of the digital media to enhance the communication of information. By understanding and using the three basic elements of information architecture: *context*, *content* and *user* as a framework, I am able to approach the needs and requirements that may exist for the settings of an information architecture in a balanced way (Morville and Rosenfeld

2006: 233). With this framework in mind I can structure and organise the content so that it will match the context and appeal to the users.

To me, one of the most interesting things about information architecture is the challenge of making better use of the technology at hand. The ICT technology provides us with a tool and it is my job to use this tool in a way, so that it makes the most sense to the users and in such a way that the information is managed and communicated in an optimal way. Another personal focus point is the aspect of creating a knowledge environment for the users. I find it interesting to combine the aspects of information architecture and learning – to investigate the role of information structures when taking advantages of learning opportunities and finding suitable ways to use the Internet as a medium for enhancing their learning potential. The evolution in social software has increased the opportunities for creating online knowledge environments and this is what I wish to examine closer in this thesis.

As a case in point, for this thesis, I have chosen online learning material for adolescents with diabetes.

1.2 Introduction to the case of diabetes

Type 1 diabetes is the most common serious chronic illness among adolescents and the incidence of children with diabetes in Denmark is increasing. It takes a great effort, regular lifestyle and continual measurements of the blood glucose to imitate the body's natural regulation of the blood glucose (Bruun-Jensen 2007: 5). Diabetic complications in kidneys, eyes and nerves are founded in early childhood and a high occurrence of diabetic complications is seen in youth. Good regulation of diabetes is necessary for a normal growth and development for children, and this can help prevent and limit complications and maybe even help to avoid them (Bruun-Jensen 2007: 6).

Being diabetic is a life long process of coping and learning since therapy continuously has to be adapted because of changes throughout life. Beside the learning process there are also various facts, which a diabetic has to know and practice. Since diabetes is such a complicated and challenging disease, it is crucial that children and adolescents achieve knowledge of their illness early after being diagnosed. Children and adolescents diagnosed with diabetes first learn to cope with the basic tasks of the disease by handling the basic tasks of diabetes management and parents are ideally there to support the adolescent in their everyday learning.

Currently various learning material is available for children and adolescents with diabetes in Denmark, most of which can be found in traditional media like books and booklets or on the Internet where different user generated or expert generated content of different quality and type can be found (i.e. blogs, forums, quizzes, websites) (Kanstrup 2008: 126). This material is mostly presented in either a very factual and medical way or in a context where sharing is the focus point. The problem with the existing online learning material, as I see it, is twofold: it does not afford motivating experiences compared to Facebook and other popular social media, and it does not offer a basic information structure, which allows the user to learn from visit to visit.

1.2.1 Technological possibilities

The recent technological development has led to an increase in the opportunity to use computers in academic contexts, where cooperation is present between i.e. a teacher and students. Distinct 'virtual teaching environments' where both audio and visual media is used will probably become more frequently used in the future. This also means that Internet based learning opportunities will have advantages compared to traditional institutionalised education. One of the advantages could be the fact that time and place is less important, since a greater extent of flexibility is achieved and the users are able to participate at times they prefer. Also geography will not be an issue and you will be able to reach a large amount of users over great distances (Illeris 2006: 236).

The new technologies provide new possibilities and advantages that could be used to learn adolescents with diabetes about their disease in a profitable way. But it also raises challenges since the learning material cannot only be transferred from analogue to digital form – therefore it is important to structure the material and content so that it fits the learning environment in an optimal way. By using the Internet in a learning context you provide the children and adolescents with the opportunity to gain control of learning at their own pace and in their own time, which is essential for adolescents with a chronic illness (Engvall 1994: 434).

1.2.2 The importance of self-care

As mentioned above having type 1 diabetes means that you have a daily on-going responsibility of self-care, which means that healthcare professionals mainly function as an extra support, with their consultations, in the daily coping. Therefore it is again essential to emphasise the importance for children and adolescents to continuously seek information individually about how to handle and treat their disease (Nordfeldt 2005: 68). This makes the term self-regulated learning a key issue for

diabetes patients. This is due to the fact that diabetics have some control over- and are responsible for, their own learning, across contexts, relationships and situations (Paris and Winograd 2001: 4).

Today's young adults are active users of different types of media and frequently use them to express themselves in a digital everyday life. Statistics show that almost 9 out of 10 Danish children between the ages of 9-16 use the Internet daily or almost daily for at least 30 minutes (Medierådet 2009: 44+53). This indicates that the Internet is an incorporated part of their everyday life and therefore also an important part of their social life and a potential way of reaching them in a learning context. Based on these statistics it is natural to include the Internet and its possibilities to reach this target group of adolescent diabetics in a learning context.

1.3 Problem statement

Through my education I have always primarily focused on how existing online environments could be improved. I find it interesting to use the advantages of the digital media to increase the communication of any given information and throughout the past semesters I have had an increased interest in the relation between information architecture and health, which is why I have chosen the issue of diabetes. Furthermore, through writing this thesis, I wish to gain an insight in how regular information websites, on which learning plays a part, can be optimised to match the different aspects of users' individual learning styles and how I as an information architect can help create the boundaries for a useful online learning environment.

I find it interesting to examine how information structures can support all the above-mentioned factors and how users can be kept on track toward the wanted learning outcome. All these above-mentioned considerations have led me to the following problem statement:

How can I as an information architect design information structures to support self-regulated learning online?

1.4 Demarcation

I will briefly mention some of the demarcations I have done in this thesis, to make sure that the framework and scope of this thesis is understood.

The target group, which I have chosen to be the point of departure, is adolescent diabetics between the age of 14-25 years old. For that reason I have not focused on other people related to the context of diabetes, such as parents, schools, friends and other family members.

Since my focus point is the point of view of the designer and developer I have not included adolescent users directly in my empirical study. I find this to have been more relevant if the purpose was to create and design a specific design proposal.

Even though the context is online learning, I will not concern myself with the aspects of e-learning systems, but solely focus on the traditional informative websites. For the same reason I have not included the aspects of games, since both is outside the scope of this thesis.

1.5 Case of diabetes

As previously mentioned type 1 diabetes incidences are increasing among adolescents in Denmark. When this was brought to my attention, I got to thinking about, how information architecture can play a larger role in the context of spreading information in the health sector. When diagnosed with a disease like diabetes, there is a lot of new information to take in and you continuously have to update this information as you get older, and your living situation changes. Apart from the learning material and information, which newly diagnosed diabetics receive from the hospital, these patients need to self-initiate search of new information in other contexts.

I chose to interview one of the diabetes nurses at the hospital in Aalborg, who has almost 40 years of experience in treating adolescents with diabetes. I did this in order to learn what information the adolescents receive when diagnosed with the disease and also in what form. I chose to interview the nurse because in Denmark this is the person whom the adolescents most often are in contact with from the health sector (DAWN Youth 2008: 129). I will elaborate on the interview later, but the interview supported the fact that I believe there is an increased need for spreading information about this chronic illness in other forms than books, booklets etc. I see a need to make the information more accessible to the adolescents under circumstances, which they can better relate to. Furthermore there is a need to increase the learning potential in the already existing information.

The information and learning material I have chosen to focus on is of course online. A Swedish study, performed by Dr. Sam Nordfeldt[1], in collaboration with three paediatricians, has outlined the attitude and experience with online search for information about diabetes among children and adolescents with type 1 diabetes. The study showed that, out of the 110 involved patients, 42% have searched for diabetes related information online and a total of 97% anticipates to use the Internet for this purpose in the future (Nordfeldt 2005: 70). 68% of the respondents furthermore indicated a need for more information in their mother tongue. I assume, that these results would be reasonably corresponding if the study was carried out in Denmark and therefore I find these numbers relevant to my thesis. Basically the study shows an interest in using the Internet to search for both general and specific diabetes related information among adolescents with type 1 diabetes, which indicates that a combination of human support as well as technical support could offer an improvement in the learning process for adolescents (Nordfeldt 2005: 72f). These facts indicate that the optimal place to reach the adolescents is online.

In my interview with the nurse she also emphasized the difficulty of reaching this specific target group, since they live in the moment and just wish to have a life similar to their friends (Appendix 1: 7 li.28f).

1.6 Ungdiabetes.dk

Ungdiabetes.dk is a website owned by Diabetesforeningen in Denmark. I found this website to be currently one of the most important websites in Denmark for adolescents with diabetes, since they are the exact target group of the site and since Diabetesforeningen is behind it. Diabetesforeningen is an organisation with the purpose of handling the interest of diabetics and ensure them of good living conditions in Denmark[2].

In the early stages of my thesis writing period the website was shut down and nothing indicated that it was merely under construction, so I chose to contact Diabetesforeningen to learn what the future of the website was. My first intention was to benchmark with the website along with other relevant websites. After a conversation with one of their web coordinators I learned that they had been planning to launch a community on the website, but have chosen not to implement it and

[1] Sam Nordfeldt is a professor at the Department of Molecular and Clinical Medicine and the Department of Health and Society at Linköping University, Sweden
[2] http://www.diabetes.dk/Diabetesforeningen/Foreningen/Formaal.aspx

now the website is offline and has been so since approximately March 2009. This is of course very relevant and interesting to me, so this is why I have chosen to examine their attempt to reach this specific target group of adolescents online. I find it very interesting to learn about their reasons for developing a community on the website and especially why they have chosen not to finalise their plan. The gathered information and statements from ungdiabetes.dk is from e-mail correspondence and telephone conversations.

2 METHOD

As previously mentioned this thesis will provide a dialogue between theory and the case of online learning material for adolescents with diabetes. I use the outcome from gathering empirical data to formulate a list of critical questions, which are discussed in the light of theory of learning, self-regulated learning and communities of practice and guidelines for developing information structures in a learning context is suggested.

Throughout this thesis the framework will be information architecture. That is why I have chosen to combine this section with a short introduction about the basic elements of information architecture. The field is of course too extensive for me to outline in this context, so this should only be viewed as a brief overview of the necessary concepts that are relevant for my perspective. This thesis will bear the mark of being based on mostly desk research, since I do not have a specific case as a point of departure. By combining my desk research with a small amount of case study I will attain an approach, which I believe will lead me to answering my problem and research question in a satisfactory way.

2.1 Information architecture framework

In my perspective I see and understand the information structure design space through a framework, where *context, content* and *user* form a necessary unity. These elements are what form the basics of information architecture and an understanding of these elements is essential when practicing effective information architecture design (Morville and Rosenfeld 2006: 24). Websites should be seen as dynamic organisms within a surrounding environment, which is why the concept of *user, content* and *context* is a good way of understanding the complex dependencies that exist. Morville and Rosenfeld visualise it like this:

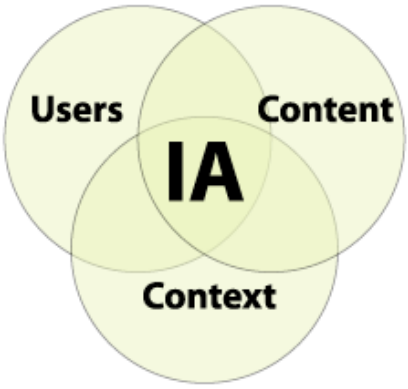

Figure 1: A balanced approach to research [3]

The figure helps to illustrate the relationship and interdependent nature of the three elements, that can should provide us with an overview of i.e. knowledge of the users and their information needs, details about the content of a website and information about the context in which the user is a part of (Morville and Rosenfeld 2006: 24f).

I will not go into detail about each concept, since this will be elaborated throughout this paper, but below is a description of each aspect and a brief summary of the relevance for my case in point.

2.1.1 Context

The context is defined as i.e. the goals, mission, strategy, procedures, budget, surroundings and culture of a business. It is important that the information architecture is matched to each unique context, since this will influence how users think about the service of a business, and it will effect the interaction with the users/customers because it provides them with a snapshot of your organisation. As an information architect it is my job to examine what makes a business unique and how to match the information architecture to the goals, strategy and culture of the business (Morville and Rosenfeld 2006: 26).

In this case the context is not based on a business per se, but rather the surroundings of the online learning material available for adolescents with diabetes. The context could therefore be defined as websites, where the purpose and goal is to learn and inform about diabetes to adolescents. In the chapter focusing on empirical material, I will provide a clearer understanding of the goals and details of this environment.

[3] http://www.louisrosenfeld.com/home/bloug_archive/images/010725b.gif

2.1.2 User

Every website has different users, audiences or customers, who all have different preferences and behaviours which should be taken into account. It is therefore important to learn about their information needs and information-seeking behaviour in the context of designing, structuring and developing a website. Questions to be asked in this process could be who is using your website, how should they use it, and what information do they want from your website? (Morville and Rosenfeld 2006: 28).

In my case I have two main user groups: the designer and the adolescents. Normally it would be the adolescents who would be in focus, since they are the primary users of the website, but in this case I am trying to view the development process from the designers' point of view, which is why I will consider them users as well.

In my research process I will use different methods to include the users. To get an understanding of the adolescents and their behaviours I will learn about their online behaviour, their learning preferences and their information needs and wishes – for this I will mainly use survey statistics and results, advice from an experienced diabetes nurse and theoretical material about learning. In order for me to get a designer's point of view I will carry out an interview with one of the webmasters of www.ungdiabetes.dk, which is a Danish website for adolescents with diabetes.

2.1.3 Content

The content of a website can include documents, applications, services, images, schema and metadata etc., which users should be provided with. The volume and nature of the content should also be considered as well as the fact that this material might need to change over time. The essential thing is to consider what you wish to communicate, in what form and at the same time remember the aspect of findability (Morville and Rosenfeld 2006: 27).

As previously mentioned the content, which is relevant for me is online learning material about diabetes. To learn more about what form is preferable and which information is essential or irrelevant I will perform a benchmark with existing websites with similar goals and target group. I will use this to make sure I have the needed knowledge of how the adolescents will be provided with the best possible learning material. Furthermore I will use the benchmarking method to get

inspiration for the designer's perspective on good and bad development and structuring of information.

In this thesis I will use these three elements to determine what *content* should be structured and organised to match the *context* and appeal to the relevant *users*, while also considering the designer's perspective.

3 THEORETICAL FOUNDATION

As the first step on the road to answering the question of '*How can I as an information architect design information structures to support self-regulated learning online?'* I find it relevant to account for the theories I have chosen to use in this thesis. This chapter will form the theoretical background for this thesis and will mainly deal with the aspects of *learning* and *communities of practice*. I will present my understanding of the learning aspect compared to the context of this thesis and try to combine and link the different theoretical principles in order to adapt them to my problem statement. This will include David Kolb[4] and his experiential learning theory in order for me to achieve a basic understanding of the individual learning process. This will be followed by an explanation of Knud Illeris'[5] three dimensions of learning to supplement Kolb's individual learning theory with a social learning aspect. To clarify the importance of the social learning in the context of my thesis I have chosen to include Etienne Wenger's[6] theory on *community of practice*. Finally I will mention self-regulated learning to add to the basic learning theory, the importance of the way learning is done online in the context of diabetes.

3.1 Experiential learning

David Kolb presented his experiential learning model in 1984. He was inspired by Kurt Lewin, John Dewey and Jean Piaget. Kolb's learning theory is among others based on Piaget's cognitive theory, which focuses on the fact that knowledge as realisation is a result of interaction between biological maturing and active, mental construction of a persons understanding of the outside world. According to Piaget knowledge must be assimilated in already existing cognitive structures, in order to be integrated and acquired as new knowledge. The new knowledge gained means, that the knowledge already gained is incorporated in the cognitive structures and can be seen in new connections, which means that the cognitive structures must be modified (accommodation)[7] (Illeris 2006: 66ff). This establishment of the fundamental characteristics of the realisation combined with Kurt Lewins theory on 'action research' and John Deweys idea of 'learning by doing' – is the

[4] David Kolb is a professor in Organizational Behaviour at Case Western Reserve University, Cleveland, Ohio.
[5] Knud Illeris is a professor in Lifelong Learning at the Danish School of Education at Aarhus University.
[6] Etienne Wenger has a Ph.D. in Information and Computer Science and works today as an independent researcher, consultant, author and speaker.
[7] www.learnfromexperience.com

understanding of learning which David Kolb continued to work with and on these grounds he constructed his own learning model (Kolb 1984: 12ff + Illeris 2006: 64ff).

According to Kolb learning is an active, dynamic, circular process, which depend on each individual's subjective experiences. This means that it is the individual learner's experiences that are the centre of the learning process. He defines learning as:

> *"Learning is the process whereby knowledge is created through the transforming of experience. Knowledge results from the combination of grasping experience and transforming it."*
> *(Kolb 1984: 41)*

Furthermore Kolb describes the experiential learning process as a four-staged cycle containing four adaptive learning modes: *concrete experience*, *reflective observation*, *abstract conceptualization* and *active experimentation*. Based on this four-stage cycle of learning, Kolb's learning theory also sets out four distinct learning styles or preferred ways to grasp and transform experience: *diverging*, *assimilating*, *converging* and *accommodating*.

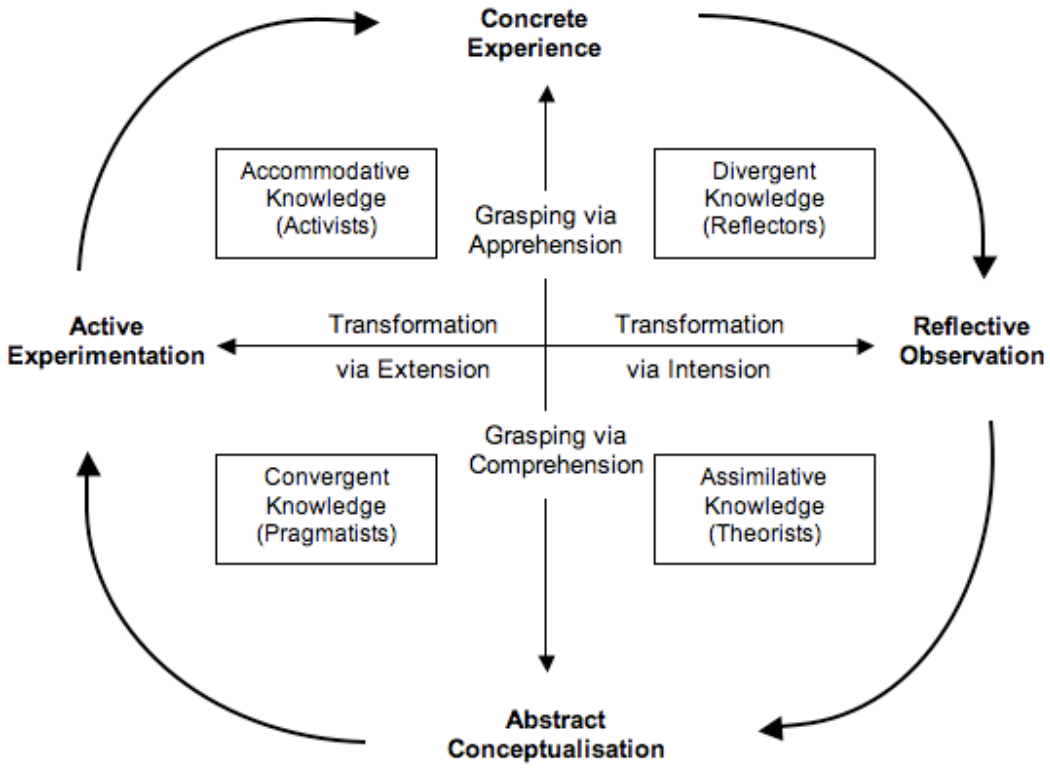

Figure 2: Kolb's learning cycle[8]

[8] www.businessballs.com/kolblearninstyles.htm

Learning styles is best described as the approach, which each individual prefers and find most natural in the learning process or the way each individual grasps and transforms experiences.

In this way Kolb's theory offers both an explanation of the cycle of experiential learning that applies to all humans and a way to understand individual people's various learning styles. Kolb includes the cycle of learning as a central principle for his experiential learning theory. The four stages supplement each other so that immediate or concrete experiences provide a basis for observations and reflections. These observations and reflections are assimilated and distilled into abstract conceptions producing new implications for action, which can be actively tested and subsequently create new experiences – these new experiences then again become the first part in the four stage learning cycle[9] (Kolb 1984: 39ff).

According to Kolb the ideal learning process is a process where the learner touches all four stages in the learning cycle. People can "enter" the learning cycle in different stages because of their different preferences of learning styles. Some people need abstract experiences to start their learning process, while other people might need concrete and practical experiences instead[10].

Kolb's model therefore works in two levels: A structural four-stage cycle: *Concrete Experience, Reflective Observation, Abstract Conceptualization, Active Experimentation*, and a four-type definition of learning styles or adaptions: *Diverging, Assimilating, Converging, Accommodating*[11] (Kolb 1984: 61ff).

The outer part of the cycle represent the four elements, which is included in the learning process, while the four boxes in the cycle are the definitions of learning styles. The axes in the middle represent the grasping process and the transformation process. Each axis is formed between what Kolb calls 'dialectically' related modes of grasping experiences and transforming experience. The north-south axis is one of prehension and represents two different and apposed processes of grasping experience, either to prefer symbolic representations and conceptual interpretations - Kolb refers to this process as comprehension - or preferring tangible, felt qualities of immediate experience – a process, which Kolb refers to as apprehension. According to Kolb the east-west axis is one of transforming and is also representing two opposed ways of transforming the grasped

[9] www.businessballs.com/kolblearningstyles.htm + www.learnfromexperience.com
[10] www.learnfromexperience.com
[11] www.businessballs.com/kolblearninstyles.htm

experiences. Either through internal reflection called intention or through active experimentation called extension[12] (Kolb 1984: 39ff).

Experience grasped via comprehension through abstract conceptualisation and transformed via intention through reflective observation results in *assimilated* knowledge. Experience grasped via apprehension through concrete experience and transformed via intention through reflective observation results in *divergent* knowledge. When experience is grasped via comprehension through abstract conceptualisation and transformed via extension through active experimentation the result is *convergent* knowledge and finally experience grasped via apprehension through concrete experience and transformed via extension through active experimentation results in *accommodative* knowledge. (Kolb 1984: 42)

As previously shown Kolb has, in the learning cycle, defined and described four different learning styles or ways to grasp and transform experiences:

- **Diverging (reflectors)** - People that prefer this learning style tend to watch rather than to do. They tend to gather information and solve problems by using imagination. They look at things from many different perspectives and often view concrete situations from several points of view. People with a diverging learning style work with idea generating like brainstorming and mind maps. They are interested in other people and prefer to work in groups, to listen with an open mind and receive personal feedback.
- **Assimilating (theorists) –** People that prefer this learning style solve problems with a concise and logical approach. They require a good logical explanation rather than a practical experience. People with an assimilating learning style are less focused on other people and more interested in theories, science and abstract concepts. People with this learning style prefer readings, lectures, analytical models and time to think – not to talk and discuss.
- **Converging (pragmatist) –** People with a converging learning style solve problems by finding solutions for practical issues, questions and problems. They will find practical use for ideas and theories. People with this learning style are attracted to technical tasks and problems and are not very interested in interpersonal aspects. They like to experiment with new ideas, to simulate and to work with practical applications.
- **Accommodating (activists)–** People with this learning style rely on intuition rather than logic. These people prefer to take a practical, experiential approach. They rely on other

[12] www.businessballs.com/kolblearning.htm

people's information and use them for their own analysis. People with accommodating learning styles like to carry out plans and like to take action and initiative. They prefer to work in teams and set targets trying different ways to solve a practical problem[13] (Kolb 1984: 61ff).

3.2 Learning in a social context

All learning is, according to Kolb, about grasping and transforming experiences. What is understood is transformed and embedded in the human mental structures. These understandings and transformation processes are according to Kolb internal processes and he does not operate with the aspect of the social context, which surrounds an individual, and the fact that this effects the learning process. The lack of this focus results in Kolb's learning theory being *"a severe rationalisation of the diversity of reality"*, says Knud Illeris. According to Illeris learning occurs in practice, not necessarily according to logical principles and is affected not only by each individual's internal mental structures, but also by external factors. Learning has therefore, according to Illeris, both an internal psychodynamic and cognitive dimension and an external social- and societal dimension (Illeris 2006: 64 ff).

Illeris' learning theory is based on the assumption, that learning includes two processes and three dimensions. His three-dimensional theory represents a holistic approach to learning, where the focus is on the individual learning process as well as the interaction with the outside world.

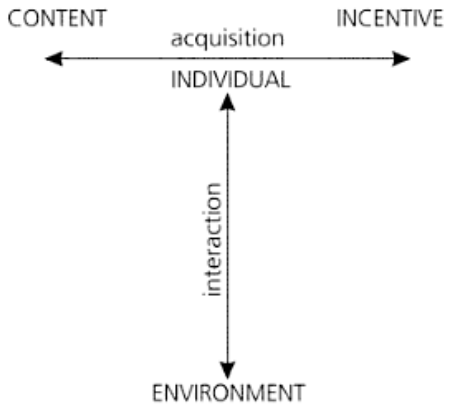

Figure 3: Knud Illeris' fundamental processes of learning[14]

[13] www.businessballs.com/kolblearningstyles.htm + www.learningfromexperience.com
[14] Illeris 2006: 36

In order for learning to occur both processes (the acquisition process and interaction process) and their mutual interaction have to be active. According to Illeris these two processes exist in- and are critical for all learning (Illeris 2006: 35). The content dimension and the incentive dimension form the acquisition process, which is the horizontal axis and this process is described as an internal psychological process and acquisition. The content dimension is the cognitive process that deals with what is learned. It is often this process, which is referred to, when talking about learning. It can be characterised by i.e. knowledge, understanding, meaning, attitude and insight. Through the content dimension the individual develops skills and establishment of meaning. It is important to state that, according to Illeris, learning always has both a subject and an object, since there is always some*one* learning some*thing*. The incentive dimension represents the psychodynamic process that holds the emotional part of the learning process i.e. motivation, feelings and will. This involves the mental energy, which is required by the learning situation. Illeris' horizontal axe can be compared to Kolb's transforming processes and Illeris acknowledges Kolb's two dimensions *grasping experience* and *transforming experience* and the four adaptive orientations *concrete experience, reflective observation, abstract conceptualisation* and *active experimentation.* Illeris also stresses that Kolb points out four elementary forms of realisation in his model: *diverging, assimilating, converging* and *accommodating*, which all are realisation forms that belong in Illeris' horizontal axis (Illeris 2006: 64ff).

Illeris´ horizontal axis furthermore enters into interaction with the outside world, which is marked by the vertical axis, which is found between the individual and its surroundings (Illeris 2006: 35). The content- and incentive dimensions are affected by the integrated contribution between the individual and the surroundings (Illeris 2006: 37ff). The social- and societal dimension is characterised by action, communication, and collaboration and it regards the individual's interaction with the social and material surroundings on two levels – on one hand the close social level where the interaction exists i.e. a group and on the other hand the overall level of society, which determines the interaction (Illeris 2006: 41f). Even though Kolb's learning theory contains elements like *concrete experience* and *active experimentation*, which could be considered as social activities, I do not believe that he considers the contexts in which the experiences take place or the people that surrounds the individual in the grasping or transforming process and the influence, which these people could have on the individual in the process.

As previously mentioned, Illeris´ three dimensions: *content*, *incentive* and *social*, form a holistic perspective on learning, where none of the parts can function separately. All three dimensions are

involved in a learning situation and should always be taken into consideration if an understanding or analysis of a learning situation or a learning process should be sufficient (Illeris 2006: 38).

3.2.1 Different degrees of activity

According to Illeris an individual can choose between limitless forms of interaction in relation to the outside world. These interactions cannot be defined in a certain typology and therefore his terms should only be seen as an attempt to achieve an overview. In these forms of interaction the individual participates in different degrees of activity. Illeris describes them as the following: *perception, transmission, experience, imitation, activity* and *participation*. The first three have in common the fact that they do not include a high involvement from the individual, since the activity mainly consists of receiving or absorbing information. The three last-mentioned involve a greater activity from the individual – *activity* covers a focused activity, where the individual is investigative according to interest, *imitation* is when a person copies or mimics in order to learn from others, *participation* is the most common and comprehensive form of interaction and is characterised when the individual is part of a focused activity together with others, where each individual has contributory influence – this is also what Etienne Wenger defines as 'community of practice', which I will elaborate on below (Illeris 2006: 111ff).

3.3 Community of practice

Albert Banduras[15] established the term *social learning* in his work with the close social connections to learning in the 1960s. Previously the focus had been on the cognitive process, which is the case with Piaget and Kolb, but now, as described in the above-mentioned, the attention was on the significance of and influence by the surrounding society on the individual and the fact that it was no longer sufficient to consider learning as an inner process, but on the other hand as part of a larger system (Illeris 2006: 114ff). This was the point of departure for Etienne Wenger and Jean Lave's[16] studies of apprenticeship. Wenger has developed a holistic social learning theory and introduced the term *community of practice* (Illeris 2006: 121f). In Wenger's development of the holistic theory about the interaction dimension he shares Illeris' perception that learning includes various dimensions and he focuses mostly on the social participation, which is why I have chosen to include his theory in this thesis (Illeris 2006: 122).

[15] Albert Banduras is a psychologist specialising in social cognitive theory and self-efficacy.
[16] Jean Lave is a social anthropologist and is currently a professor of Education and Geography at the University of California, Berkeley.

In connection with the term *situated learning* Wenger and Lave state that learning should always be related to specific contexts and that learning is *situated* means that "*…the learning situation does not only influence learning, but it is also a part of it*[17]" (Illeris 2006: 108). This means that the context cannot be separated from the learning and will therefore always influence the learning process.

According to Wenger communities of practice exist everywhere and we are all associated with them through i.e. work, school or our hobbies. We all belong to various numbers of communities of practice, even though some of them are so incorporated in our everyday life that we do not think further about it. We know they exist and who belongs to them, but it is not always mentioned explicitly and our level of participation varies according to each community of practice (Wenger 2002: 4f). Wenger defines communities of practice as:

> *"…groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis."*
> *(Wenger 2002: 4)*

In the communities of practice a mutual understanding is evolved based on the context concerning i.e. a common knowledge or approaches and the members discuss ideas, needs, problems etc. (Wenger 2002: 5).

Communities of practice can grow spontaneously while others do not develop because of i.e. lack of devotion (Wenger 2002: 13). The values of participating in a community of practice can be defined as i.e. short-termed or long-termed according to how each member chooses to use the community – do they need a quick answer to a problem, discuss something with peers over time, want to accumulate knowledge etc. Tangible values include getting results as i.e. standard manuals or improved skills and intangible values could be issues of trust, sense of belonging and building relationships (Wenger 2002: 15). According to Wenger communities can take different forms and styles; *small* or *big*, *long-lived* or *short-lived*, *collocated* or *distributed*, *homogeneous* or *heterogeneous*, *spontaneous* or *intentional*, *unrecognised* or *institutionalised*, but despite this they share a basic structure (Wenger 2002: 24ff). The three fundamental elements in a community of practice are: a *domain*, a *community* and a *practice*, which will be elaborated below.

[17] Freely translated by author

3.3.1 The structure of communities of practice

The *domain* is the knowledge of the community of practice, which creates the common identity, purpose and value to the members. When members realise that their knowledge is important and relevant to others it motivates them to contribute to the practice of the community. The *domain* can be defined as the identity and inspiration of the community, since the common ground is what joins the members and leads to learning (Wenger 2002: 27ff).

The *community* fosters interaction and relationships in order to enhance the social learning aspect. It involves a willingness to share, ask and listen and is based on mutual trust and respect (Wenger 2002: 28f). In regards of learning it is essential that the members will reach a sense of belonging and intellectual process. Interpersonal relationships and the fact that members know each other are meaningful aspects in a community. Interaction is key when building a community of practice – members have to continuously interact in order for the community to even exist. This way members will develop a shared understanding of the domain and at the same time develop trusting relationships that will hopefully grow into a sense of common identity over time. Each member of the community of practice has a unique identity, but it takes a great number of members to uphold the level of interaction within the community. The level of engagement is an individual matter and participation is voluntary, so the success of the community of practice depends on the self-generating aliveness of the community. Wenger states that openness in a community of practice is important for learning to take place – members should know that their contributions to the community will be in their own favour, as well as creating an atmosphere which matches the community and signals that it is a safe place to communicate. Trust is key (Wenger 2002: 34ff).

The *practice* consists of i.e. the mutual language, ideas, framework and tools shared between the members and where the *domain* accounts for the topic, the *practice* is the specific knowledge within the community – which over time is assumed to be known by all members – at least the basics (Wenger 2002: 29). This common foundation helps enable members to create new knowledge and prepare for future situations and functions as a mini-culture of knowledge sharing, certain behaviour patterns and thinking styles (Wenger 2002: 38f).

These three elements have the potential to form the ideal knowledge structure if they function optimally together (Wenger 2002: 29). They form a common language and are useful when trying to comprehend the various ways in which participation is meaningful to members of a community of practice. Furthermore the three elements help point to the areas to focus on, when developing a

community to ensure that you ask yourself the relevant questions and create a balance in the community elements (Wenger 2002: 40ff).

Domain	What topics and issues do we care about? What kind of influence do we want to have? What is in it for us?
Community	What roles are people going to play? How will members connect on an ongoing basis? What kind of activities will generate energy and develop trust? How will newcomers be introduced into the community?
Practice	What knowledge should be shared and in which form? What kinds of learning activities should be organised?

Figure 4: Questions for developing a balanced community

By asking questions like these in the development stage you achieve a better understanding of how to engage the community members, how to build relationships and ensure that they grow and make certain that the community functions as a knowledge resource from the very beginning (Wenger 2002: 45ff).

3.3.2 Communities in a learning context

As mentioned previously Wenger states that participation is an essential prerequisite for learning. Wenger has set up the following model of the different components concerning social theory of learning:

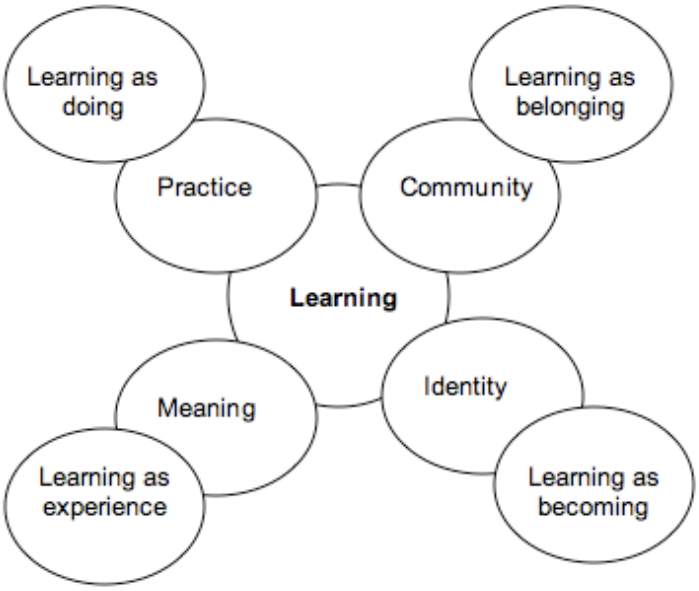

Figure 5: Components in a social theory of learning[18]

1. *Meaning:* a way of talking about our (changing) ability – individually and collectively – to experience our life and the world as meaningful.
2. *Practice:* a way of talking about the shared historical and social resources, frameworks, and perspectives that can sustain mutual engagement in action.
3. *Community:* a way of talking about the social configurations in which our enterprises are defined as worth pursuing and our participation is recognizable as competence.
4. *Identity:* a way of talking about how learning changes who we are and creates personal histories of becoming in the context of our communities (Illeris 2006: 123).

This model shows that learning is embedded between the four components: *meaning, practice, community* and *identity*. The four components can to some extent be compared to Illeris' three dimensions, where *meaning* corresponds to the content dimension, *practice* and *community* corresponds to the interaction dimension and *identity* is integrated in all three dimensions (Illeris 2006: 152). In his model Wenger prioritises the dimension, which Illeris refers to as the interaction dimension. Learning presupposes activity and participation, which is transformed into experience and growth – this is why the social dimension of learning creates meaning and identity through community and practice (Illeris 2006: 124).

[18] Illeris 2006: 123

3.3.3 Technology and barriers in communities of practice

Wenger does not prioritise the technology aspect in his theory on communities of practice, but his terms *collocated* and *distributed*[19] communities of practice state the awareness of the differences in whether or not the communication is face-to-face or Internet based (Wenger 2002: 25).

In order to build an online knowledge sharing system Wenger mentions the following aspects as important:

- The need for a home page to assert their existence and describe their domain and activities
- The need for a conversation space for online discussions
- The need for a repository for documents, manuals etc.
- The need for a good search engine to find things in a knowledge base
- The need for a directory of membership with some information about members' areas of expertise in the domain
- The need for, in some cases, a shared workspace for synchronous electronic collaboration
- A need for community management tools. I.e. about which documents need updating, who is participating actively, traffic data etc (Wenger 2002: 197f).

When relying on technology it is important to note that the community has to work harder in order to build up personal relationships, intimacy and trust between members. Furthermore it is important to note that members are more likely to participate if the system platform is well known and familiar to something they know beforehand (Wenger 2002: 198).

3.4 Summary

In this thesis I will for the most part focus on the part of the learning theory, with an emphasis on the social dimension, while of course keeping the other dimensions in mind by i.e. focusing on learning styles and the way on which the individual approaches a task. The reason for focusing on the social dimension is because it is highly relevant when dealing with learning in a social online context. Furthermore I will focus on three of Illeris' forms of interaction: *activity, imitation* and *participation* in order to adapt the advantages of the Internet as a media to the learning context. Wenger's aspects of *domain, community* and *practice* will strengthen my framework of information

[19] Wenger defines a distributed community as: "any community of practice that cannot rely on face-to-face meetings and interactions as its primary vehicle for connecting members" (Wenger 2002: 115).

architecture and will help me to achieve an understanding of a form that is ideal in the context of a knowledge and learning structure.

3.5 The context of self-regulated learning

In the previous chapters I have outlined the basic learning theory, but it is important to remember that the context I am concerned with is online learning environments and not concrete learning material in its physical shape. Therefore I have to think about learning in the context of it being self-regulated and social rather than it being individual. Self-regulated learning is furthermore relevant when the case is a disease like diabetes, where the adolescents are forced to continuously be updated with information about diabetes.

Given that the learning situation is online I have to assume that, mainly, the target group is already motivated when they search for information and learning material about diabetes. I have to assume that this is the motive, in order for me to avoid an extensive psychological approach, which is outside the scope of this thesis.

Schunk and Zimmerman define self-regulated learning as "*…self-generated operations that focus on individuals' acquisition of academically relevant knowledge and skills"* (Schunk and Zimmerman 2007: 78). Even though this definition sums up the essence of the term I find it to be very simple and too broad, which is why I have chosen to use the following definition in my thesis.

"…a process in which people organize and manage their capacities – that is, their thoughts (e.g., competency beliefs), emotions (e.g., interest), behaviours (e.g., engagement with learning activities), and social contextual surroundings (e.g., select a quiet, comfortable place to study) – in the service of attaining some desired future state."

(Reeve et al. 2007: 223)

The aspect of self-regulated learning is important and inevitable when it comes to diseases since self-regulated learning recognizes that individuals have some control over their own learning, which is exactly the case if you are diagnosed with an illness such as diabetes (Paris and Winograd 2001: 4). Self-regulated learning is characterised by awareness of thinking, use of strategies, and sustained motivation (Paris and Winograd 2001: 3), and it refers both to *what* learners are doing and *how* they are learning (Lens and Vansteenkiste 2007: 160). The *what* part is mostly interesting to

psychologists, so my focus will be on the *how*, which concern the specific skills and mechanisms that people use when wanting to achieve a certain goal or standard. The *how* theories are also concerned with questions like, how people successfully keep up the motivation to achieve their desired outcome (Reeve et al. 2007: 224).

3.5.1 Autonomous self-regulation

This term is defined as: *"The regulation of behaviour when people's interests and values are the reason for acting"* (Reeve et al. 2007: 224). This aspect is relevant to my thesis because the learning happens online so, and as mentioned above, I must assume that the adolescents mainly search for the information themselves and are motivated to learn when they enter i.e. a website. Autonomous self-regulation can be seen as the optimal motivation and has several advantages compared to controlled motivation. For instance studying out of choice and personal desires will give a person a certain amount of will to continue a search if met with adversity and the person would be engaged more in the activity because they are more likely to stay concentrated (Lens and Vansteenkiste 2007: 158). If the self-regulation is autonomous the, in this case, adolescents will also be self-initiating and determined when searching for information, because the act is not only important to themselves but also interesting (Reeve et al. 2007: 225). So the ideal situation would be for the adolescents to develop autonomous motivation in order to become self-regulated learners.

Seen in the context of self-regulated learning, online environments are suitable for learning, since the learners are able to manage their own time and control the amount of time they spend on their information search or learning activity. This could help increase the motivation and since self-regulation happens before, during and after learning, it indicates the importance of the aspect in the settings of an online learning environment (Schunk 2007: 246).

4 EMPIRICAL STUDY

In this chapter I will use the previously described information architecture framework and relevant theory as a point of departure of carrying out this empirical study. I have chosen my empirical methods based on the theoretical foundation. I will include the relevant theory ongoing to subsequently sum up, reflect and discuss the main points of the empirical results.

4.1 How does the experts consider the needs of the adolescents?

DAWN Youth is a web study, which includes replies from practitioners, parents and adolescents (18-25 years old) with diabetes. Novo Nordisk and IDF DAWN (Diabetes, Attitudes, Wishes and Needs) executed the study in 2001, which involved 835 people from Denmark. The main purpose of the study was: "*to identify new ways to overcome the psychosocial barriers, which can prevent a good health and a good life quality for people with diabetes (…)*[20]" (DAWN Youth slide 3). The study was meant to be inspiration for new initiatives in the treatment of adolescents with diabetes. According to the study, adolescents with diabetes are mostly in contact with a diabetes nurse, which is why I found it relevant to carry out an interview with an experienced nurse.

Hanne Vogt is a diabetes nurse at the hospital in Aalborg and she has worked with diabetes since 1973 and therefore has extensive experience in the field (Appendix 1: 1 li. 2f). Together with two colleagues Hanne follows 160 children and adolescents with diabetes (Appendix 1: 1 li. 12f). The nurses spend ¾ of their time on educating the adolescents, their parents and other close relations such as institutions and schools (Appendix 1: 1 li. 23f). The training deals with how you handle the disease – for instance high and low blood sugar, how to take insulin etc. (Appendix 1: 2 li. 7ff). The DAWN Youth study indicates that this education pays of, since 2/3 of the adolescents in Denmark believe, that they are good at handling their diabetes (DAWN Youth slide 36) and almost all Danish practitioners believe that adolescents are good at taking their prescribed medicine most of- or all the time (DAWN Youth slide 41).

The nurses have, together with a contact doctor, conversations with the adolescents every third month. Furthermore it is possible to refer the adolescents with difficulties to two clinical psychologists (Appendix 1: 1 li. 26ff). Besides the quarterly meetings the nurses have daily contact

[20] Freely translated by author

with newly diagnosed diabetics and others who have the need for support to control their blood sugar for a period of time. This close contact with the diabetes nurses is asserted on a national basis, where 71% of the adolescents are mainly attended by a diabetes nurse (DAWN Youth slide 129).

Since they are often dealing with adolescents and parents affected by the crises that comes with having a child who is diagnosed with a serious chronic illness the nurses have to take this into account in their teaching. This means that they need to start by informing about the more practical and manageable things and tasks and subsequently build up the amount of information (Appendix 1: 3 li. 4ff).

When the adolescents are 12 and 15-years-old, the nurses at the hospital in Aalborg arrange what they call 'Diabetes School', where all the children in this age group are gathered for an entire day at the hospital, where they repeat how to inject yourself, measure the blood sugar and learn about healthy dieting etc (Appendix 1: 4 li. 24ff). It is discussed what it is like to have a chronic illness and live with it and for the 15-year-olds the subject of parties and alcohol is brought up. Beside the diabetes nurses, there is a dietician and a psychologist attached to the 'Diabetes School' (Appendix 1: 5 li. 2ff). The group of 15-year-olds get a visit from another diabetic who is a bit older, who comes to share his or her experiences with being young and diabetic. Hanne Vogt mentions that this is an experience that means quite a lot for the adolescents (Appendix 1: 6 li. 10ff). She would like to have the opportunity to organise the 'Diabetes School' more often and for several age groups, but has to acknowledge the fact that they do not have the resources for it (Appendix 1: 5 li. 12ff).

She believes, however, that there could be benefited from digital media in this connection. This could be both in relation to teaching and informing about the disease, but also in connection with establishing a network to other adolescents with diabetes. She emphasizes regarding teaching and informing about diabetes, that the learning material should not consist of too much text and the text should not be too complicated (Appendix 1: 6 li. 32f). All newly diagnosed adolescents receive, as a rule, a book about diabetes. The book is written by a chief physician and Hanne Vogt believes that it is written in a language that can be too difficult for ordinary people to understand, since it contains a lot of technical terminology (Appendix 1: 2 li. 22ff). Furthermore she believes that learning material and an information website online could provide the opportunity for the adolescents to relate to their disease anonymously and in their own pace (Appendix 1: 9 li.11ff). In relation to networking with other like-minded adolescents, Hanne Vogt mentions that the Internet

could be used profitably because this form of contact does not oblige in the same way as i.e. a phone conversation or a meeting. You can e-mail or chat whenever it suites you. The DAWN Youth study states in this case that 40% of the adolescents and 60% of the parents believe that it is important to talk to others who have diabetes (DAWN Youth slide 193f). The Internet could, according to Hanne Vogt, also be used by the adolescents to teach their friends about their illness. *"The adolescents are a group, who are very difficult to reach, because they live in the moment and live like their friends"*, says Hanne Vogt (Appendix 1: 7 li. 28f). She has various suggestions as to how a website for adolescents with diabetes could be constructed. A short description of what happens in the body when you have diabetes and what this means in the everyday life of a diabetic combined with information for friends and family (Appendix 1: 7 li. 24ff).

4.2 The existing online learning information

In this empirical section I will carry out a benchmarking study, which will be based on the previously described information architecture framework while including some of the relevant theoretical aspects. The point of departure will therefore be the *user*, *content* and *context* with focus on the aspects of learning and sharing.

I will use benchmarking as a technical tool in order to determine what already exists of online learning material in similar contexts and to get inspiration about which features, elements and material could be useful to increase the learning aspect for this particular target group. Furthermore I will use the benchmarking to be inspired by the things and features that function well and learn how to utilise the online learning environment in an optimal way.

I have searched the Internet to find a number of different relevant websites, which somehow deal with providing information about diabetes online. Some of the websites will be looked at more carefully than others. Most of the websites are Danish, since this is the primary material, what Danish adolescents will come across when they are.

4.2.1 User and user needs

To begin with I will look at how the different websites match the various user needs that exist. According to Kolb you have to take into account the individual ways each person prefer to

approach a learning process and I find it interesting to examine whether the existing online learning material meets this thought.

In order to match the four learning styles that Kolb mentions, the websites have to provide the possibility to learn by reading, by thinking, by feeling, by watching, by doing and by solving. The websites that are available for adolescents in Denmark can basically be categorised as either focusing on *learning* or *sharing*. Examples of the ones focusing on learning are www.diabetes.dk, www.altomdiabetes.dk and www.patienterfaringer.dk[21]. Diabetes.dk is the most informative Danish website about diabetes and it addresses everybody who has diabetes or has an interest in learning about the disease. The website is entirely informative and does not provide the user with the possibility for active participation. To use Kolb's terminology the users can be reflective observing by simply reading the information and have the opportunity to be abstract conceptualising by reflecting and thinking about the given information available on the website and relate it to their own reality and their own knowledge and experience with the disease. A website of this type therefore appeals mainly to an assimilating learning style. The same is basically the case with altomdiabetes.dk, which is similar in the providing of textual information and guidance. Patienterfaringer.dk is an information website with a different approach since it mainly contains video clips of different people telling their own story about their experience with diabetes. This website therefore appeals to users who need a visual approach to learning instead of plain text and who prefer to approach learning with a diverging and assimilating learning style.

The websites where sharing is in focus, which I have included in my benchmarking are www.facebook.com, www.ungmidt.dk and www.diabeteschat.dk[22]. Ungmidt.dk is an informative website, which mainly focuses on describing what this community wishes to achieve. The website provides the opportunity to create a social network and establish contacts offline. The focus is clearly on the social aspect and on the importance of talking to others in a similar situation. Discussion is welcomed and many different themes are suggested – the important thing is to learn together with others and by others. This purpose fits to Illeris's theory on the advantages of learning in a social context. Although the website does not provide any online learning material, the website is relevant since it focuses on the importance of social contact in a learning context with other like-minded. Diabeteschat.dk is a website, which solely consist of a chat forum. The users create a login and get a profile, where they can note personal information and a picture. In the chat the users can exchange experiences, feelings, tips and knowledge about diabetes. The website is

[21] See appendix 2 for more detailed descriptions of the website purpose
[22] See appendix 2 for more detailed descriptions of the website purpose

divided into categorised debates related to diabetes. This website appeals to the diverging learning style and the accommodating learning style since the interest of other people is the motivating force – listening, giving and receiving feedback from others and depending on other people's experiences. This way the user attains the possibility for active experimentation, since the website is build on the users mutual interest and the need of other people's feedback and responses.

Facebook.com is relevant to benchmark with because of the groups that exists on the website. I found two Danish groups worth mentioning *'Ung med Type 1 diabetes'* and *'Diabetes (Type 1) DK'*. Both groups are fairly small and are respectively created by a young girl with diabetes and an adult man. The purpose of the groups is to find like-minded to talk to and exchange opinions and experiences. The groups both target their intended users well – adolescents mainly use the first group where they share feelings and experiences about Type 1 diabetes. They share relevant tips, links and ideas about the disease, which is done by posting wall messages on the group page. The other group has mainly adult members, either diabetics or parents of diabetics who post experiences, questions and comments on the group wall. You cannot say that learning is profoundly in focus, but through these exchanges learning occurs in a social context because the users rely on each other's feedback and share their knowledge. This exchange could, seen from Kolb's learning cycle, be a form of active experimentation, because the users act by sharing own experiences. This response can lead to what Kolb calls abstract conceptualisation, which can lead to users adding new posts on the group wall. Members who do not directly take part of this exchange and sharing can watch and thereby be reflective observing. As mentioned the users have the possibility to be active as well as passive members, since you can either follow the correspondence between members on the wall without having to actively participate in the discussions. In other words this provides opportunities for people with different learning styles. Users can communicate and receive feedback and share experiences and thoughts with others (diverging), they can share links about theoretical knowledge which they have acquired, read about other peoples knowledge and participate in discussions (assimilating), suggest options and advise to others in the group or use suggestions from others (converging) and use the advantages of the community and the shared 'spirit' (accommodating).

Most of the websites mentioned above are not exactly directed at adolescents. Most of the websites have a broad group of users and the information provided is characterised by this. The information websites are very text heavy and factual and do therefore clearly does not consider the various types of learning styles. The websites focusing on the social and sharing aspect fit the adolescents better, but still lack in the learning aspect for this specific group. In the following I will elaborate

more on the aspects of content and context and will then subsequently conclude on the benchmarking.

4.2.2 Content and context

The next step is to look at the content – which learning material is available online for adolescents with diabetes? In this section I will also have a closer look at the social learning aspect, which Illeris mentions as being an important factor in a learning process. Illeris also states the importance of the possibility for interacting in a learning context. With his forms of interaction in mind I will examine if there is a possibility for *participation*, *imitation* and *action*.

According to Illeris both the acquisition process and the interaction process and their mutual interaction have to be active in order for learning to take place. The acquisition process refers to what is actually being learned, in this case about diabetes, but also the internal psychological process, which is impossible for me to measure. What I will examine instead is whether or not anything is done to start an inner reflection, which will help support the learning process.

Another part of the acquisition process is the psychodynamic process, which refers to the emotional aspects such as motivation, feelings and will. This can be related to the previous mentioned aspect of self-regulated learning. As previously explained I have to presume that the adolescents are already motivated when entering a website, so what I will examine is what possibility there is for the online environment to keep up the level of motivation in the adolescents. Since self-regulated learning also happens before and after the learning situation I find it important, as mentioned above, to examine whether or not the learning material and environment prepares for reflection.

The websites, which focus on learning and informing about diabetes, are very limited in the aspect of participation. Both diabetes.dk and altomdiabetes.dk provide users with the possibility to ask questions to experts, which is practically the only action the users can take in relation to learning. Other actions on diabetes.dk are signing up for a newsletter, buying from the online shop, ordering brochures or giving a contribution to the organisation – not activities that relate to learning. Altomdiabetes.dk however has a test feature, where users can test their risk of getting Type 2 diabetes or their general knowledge about diabetes. The test about diabetes is very general and is mainly about Danish facts and overall information about diabetes. Since the websites are very text heavy and descriptive, they do not produce much reflection from the users. I will discuss this aspect further in the following chapter.

On the websites where the social aspect is more in focus you see a higher level of participation. The users are able to take action in different ways – on ungmidt.dk participation is encouraged, but it is not executed online but offline through various events and meetings. In an online context diabeteschat.dk provides users with the possibility to debate and chat about diabetes relevant topics. When users sign up, they get a personal profile, an inbox, a blog (if they choose) and a guestbook (if they choose). Together with the main purpose of the website, which is to participate in the debates in the forum the users will furthermore have an individual universe, which indicates that the sender wishes to create a community for the users. However in this case the activity level of the website could be better, but still the members have a willingness to share, listen, ask and help, which all indicates that it is a good place for users to get help and answers.

Facebook.com is a community of practice in another level. First of all, the following of this website is phenomenal and the users have several options and can choose to participate in the way they prefer. The point is that users use the website's possibilities to exchange text, images, videos and links, which you can post either on your own personal profile, friends' profile or in the groups you choose to join. Users are able to post comments on other users' activities, which encourages the communication. Furthermore Facebook applies various applications such as quizzes, games, tests, reviews etc., which can be shared with friends in order to i.e. compare results, compete and learn more about each other. Another function worth mentioning is the online chat, which gives users the opportunity to communicate in yet another way.

Seen in a learning context Facebook provides the possibility to organise and target the learning information to all of Kolb's learning styles as mentioned in the previous section about users, because the users have the possibility to share their own experiences, listen to others', share feelings, give and receive response as well as be passive and observing. By including the social dimension i.e. in a community such as Facebook users have the possibility to share experiences and information and participate in, and be part of a community, which enhances the learning potential according to Illeris. The social aspects and high level of participation also effect the motivation in the users.

One of the downsides to Facebook is the difficulty of controlling the credibility and professional competence of the information material. In the groups I have benchmarked with all of the content is posted by users of different age, sex and profession, which makes it difficult for other users to sort in the accessible knowledge that is shared.

4.2.3 Summary

As mentioned earlier learning occurs when the social dimension interacts with the psychodynamic and cognitive dimension, according to Illeris. I believe my benchmarking results support this statement. None of the websites seem to provide users with the possibility to learn and share knowledge under optimal circumstances. I will argue that these abovementioned websites have a focus on individual learning and most of the learning material is as such very useful and informative, but it lacks the social aspect, which Illeris and Wenger search for and recommend in an optimal learning context.

I believe that this benchmarking indicates that social websites have advantages in a learning context compared to regular informative websites, since the social websites seems to provide the users with better opportunities to reflect on the learning material, discuss with like-minded, participate actively in a learning process and contribute to the content of the website.

Although the learning material is online and the user is part of a social context, it does not necessarily mean that the users have a direct social contact with others, but the social websites provide users with various learning styles to access and reflect on the necessary information in the way they prefer. In a community of practice the willingness to share, ask and listen occurs and the communication is often based on mutual respect and a common sense of belonging, which are all aspects that influence the learning situation in a profitable way as well as motivate the users to participate, contribute and return to the website.

As previously mentioned the information websites with much text does not seem to be very catchy for the target group of adolescents and does not take the different learning styles into account. The websites with focus on sharing and social interactions achieve this to a greater extent, since the adolescents are able to participate actively and can choose to be so in the way each individual prefers. I do not believe that any of the above mentioned websites are able to reach the adolescents in an optimal way in a learning context and combine the aspects of learning and sharing. This is one of the things I wish to reflect upon in the following chapter as well as other relevant issues, which should lead me, closer to finding an answer to my problem statement of this thesis.

4.3 The case of ungdiabetes.dk

In this section I will take a closer look at the closed website www.ungdiabetes.dk. My first intention was to benchmark with this website as well as the others, but during my thesis semester it has been 'under construction', which is why I have not been able to access the website at all. I found this website to be the most important Danish website to benchmark with, which is why I chose to contact Diabetesforeningen, who is responsible for the website. As previously mentioned I learned that they had been planning to launch a new community on the website, but have chosen not to implement, which have led the website to be currently offline.

Initially one of Diabetesforeningen's web coordinators was available for answering my questions and they were very interested in sharing information with me, but unfortunately this communication failed before I could get a clear picture of their thoughts and design strategies. I have chosen to include the little information I received, which is outlined in the following paragraph, but ultimately I would have preferred to have a more detailed outlook of their design process, development strategies and perspective, but will have to settle for this following bit of information.

4.3.1 Design brief

By making a design brief you can gather information that are important for a design process, for the designer as well as the client. I will use the design brief, not in preparation for creating a design, but to achieve an overview of the design process, which Diabetesforeningen has gone through, when they chose to create a community for their website www.ungdiabetes.dk. This design brief should provide me with information about their expectations for the outcome of the design they wanted. I will use these details and information in my attempt to clarify how an online environment should be created in order to achieve a learning potential that is suited for adolescents.

Company profile

In order to achieve an understanding of the design project and process it is important to know more about the client. Diabetesforeningen has existed since 1940. The members are diabetics, relatives of diabetics, practitioners and other people who wish to support a good cause. Diabetesforeningen's purpose is to improve the conditions for treating diabetes in Denmark and bring into focus the lives and conditions of diabetics in society. Diabetesforeningen wishes to teach

and inform people about the disease and the association therefore develops teaching- and information material and arranges seminars and lectures. They hold yearly campaigns to help increase the focus on diabetes and raise money for the ongoing work of the association. Ungdiabetes is part of Diabetesforeningen and is directed primarily at adolescents with diabetes (www.diabetes.dk).

Goal and aims

In order for me to understand their strategy I need to know, what the overall goals and aims for the project were. To clarify their ideas I asked questions about the purpose of the new design, their choices and reasons for redesigning as well as the general details on how they wish to differ themselves from other similar websites.

For ungdiabetes.dk it was due to various aspects. Partly they wished to move the more health related articles and text to the main website (www.diabetes.dk) and furthermore the young volunteers of the association wished that ungdiabetes.dk should function more as a community. In collaboration with two representatives from the youth committee a solution was designed, with a range of social possibilities such as individual profiles, picture galleries, forums etc. Ungdiabetes.dk was originally meant to be a website directed especially at adolescent diabetics and that is why the designers wanted a more modern and youthful expression. Diabetesforeningen has a youth committee and a number of youth groups around the country and these groups were represented on ungdiabetes.dk. The website was meant to provide health related information specifically addressed at adolescents and furthermore function as a help for the youth groups to present themselves and inform about events etc.

Diabetesforeningen, however, chose to move all of the text heavy health related material to the main website www.diabetes.dk and instead focus on creating a Facebook group, which should function as a community environment. At the time of writing no Facebook group is available yet. The new ungdiabetes.dk did not meet the quality demands, which Diabetesforeningen has set for information platforms, and when the development costs got too high for developing a proper solution compared to the number of potential users and other opportunities of using social websites came along, Diabetesforeningen chose to entirely close ungdiabetes.dk.

4.3.2 Unanswered questions

As previously mentioned I unfortunately have not been able to get as much information from ungdiabetes.dk as I had hoped for. By learning more about their intentions, visions and plans of

action I could have created advice and strategy suggestions directed specifically to their situation, goals and aims, which would have been an educational opportunity for me. I would have liked to learn more about their specific strategy of their choice of using Facebook and see how they would use the features and functions in Facebook to inform about diabetes.

I would furthermore have liked to carry out a more extensive interview with the web coordinator, where a walk-through would show how he as a designer, sees the potentials in using Facebook, by letting him guide me through possible scenarios that the users could use the website/group in. This way I could learn more about the intentions he has as a designer and let the visions shine through when he elaborated on what he thinks the users would do. I would furthermore have liked to have a closer look at the information structure of the Facebook group in order for me to evaluate and examine if any changes could be profitably done, with the media, purpose, context and target group in mind. Being able to access the developed Facebook group would therefore have given me the opportunity to evaluate this strategic change from ungdiabetes.dk and give advice specifically on the advantages and disadvantages of using this social media website in the context of informing and learning adolescents with diabetes about this disease.

4.3.3 Summary

From the interview with the diabetes nurse I learned about the basic information needs for the adolescents with diabetes. This was the point of departure for my theoretical desk research and the foundation for my benchmarking choices. From the benchmarking results I have been able to evaluate that the existing available online information and learning material does not combine the aspects of sharing and learning in a way, which is considered optimal for the adolescents in this context. This is based on considerations of both information architecture perspectives as well as theory based on social learning, individual learning styles and the advantages of communities of practice.

5 REFLECTION AND DISCUSSION

In this section I will reflect on the previous gathered empirical data, discuss the results and use this as a foundation for reflecting on the possibilities of information architects to construct websites in a learning context. This will be followed be more specific suggestions and advise for designing and developing in a learning context were I will take point of departure in the case of ungdiabetes.dk

5.1 Considering the complexity of the context

I will begin by discussing why learning theory is relevant and important for designers, developers and information architects. As previously mentioned the basic element of information architecture is the consideration of *user*, *content* and *context*. I have during my research and work with this thesis learned the importance of the *context*, which I believe should have more attention in a development process that I believe is the case for many developers, designers etc. The user automatically receives attention, because for several years now there has been great focus on user-friendliness, user-driven innovation etc. and the content is an area that cannot be ignored, since this automatically is included in the process of developing a website. Of course it can be discussed whether this content is then adapted to the users and context, since there still is examples of bad functioning websites where even the most basic user friendliness guidelines has not been considered. My point is that the context is more changeable and harder to define by the use of guidelines. Of course you can learn to always remember to consider the context – is it a corporate website, an online presentation website, a dating website, a game website, a service website etc. But considering the culture, goals and strategy of the sender is not enough – the most important thing, in my opinion, is to be able to unite the three aspects in information architecture *user*, *content*, *context* instead of dealing with them individually. That is why I chose to include learning theory in this thesis, since it is such a significant part of the context I have worked with.

As the empirical study results also reflect it is exactly the context, which is often forgotten to be considered carefully enough. To *inform* is not the same as to *learn* the users something. It is not until the users can apply the information that it becomes learning. This is why it is interesting for me as an information architect to learn how to not just create an online information environment, but an online knowledge sharing- and learning environment and thereby use the potential of the technology at hand and finding suitable ways to use the Internet as a medium for enhancing the learning potential of regular informative websites.

5.2 How to apply and adapt to an online environment

In order for me to determine the needs for the adolescents with diabetes I consulted a diabetes nurse and the information I received from her composed the point of departure, as well as the theoretical research, for a benchmarking. The essence of the interview was the fact that I realised that the online learning material should only function as a support to the information, which the nurses teach at the hospital. The adolescents are provided with very good information from the nurses, so the online learning material should be based on this and support this, only in a different environment. As the nurse mentioned they do not have the resources they wish, which means that there is not enough time to focus on the emotional part of being diagnosed with diabetes. I will therefore argue for the importance of an online existing community where adolescents can share experiences, talk to peers or experts in the pace that suits them and at a time they themselves can control. I will elaborate on the advantages of communities of practices later in this section.

As mentioned previously the context in this case is not only learning, but also self-regulated learning. The adolescents search for learning material online and therefore I have to assume to some extent that the self-regulation is autonomous. This development of autonomous motivation, I believe, begins at the hospital where the nurses have the possibility to effect the adolescents' motivation and willingness to learn. An aspect worth remembering is that the websites then need to sustain the level of motivation in the adolescents.

The main problem with the existing online learning material is that none of the available Danish websites connect the aspects of learning and sharing and at the same time consider all of the various learning styles described by Kolb. In order to match the four learning styles that Kolb mentions, the websites have to provide the possibility to learn by reading, thinking feeling, watching, doing and solving.

5.2.1 Features that support the context

Some of the features on the websites I benchmarked with are worth mentioning as useful.
A test feature such as the one on altomdiabetes.dk influences the user to reflect on the subject of diabetes, which is optimal in a learning process, but the test itself could be improved to match more of the learning styles. The feature in itself is a good idea, but it needs to encourage the user to do something with what they learn in order to be real useful in a learning context.

An other example is the chat function on diabeteschat.dk is helpful in letting the adolescents exchange experiences, feelings, tips, knowledge etc. and appeals to the diverging and accommodating learning styles. The possibility to chat with peers is a motivating force since users are able to listen, give and receive feedback from other peoples' experiences. Since such a website is build on the users mutual interest and need of other people's feedback and response it provides the possibility for a type of active experimentation. The same is the case with facebook.com where users are able to post on walls, ask questions, debate, share links and ideas and comment on activities, which allow learning to occur through these exchanges in a social context because the users rely on each others feedback and knowledge sharing. This could lead to what Kolb calls abstract conceptualisation, since the users i.e. have to relate to the information before being able to give feedback. This will lead the users to add new post or comments etc. and by doing so they become active participants, which is another important aspect in Kolb's learning cycle. If the users do not wish to take action, most websites allow them to be reflective observing by watching the online exchange of information. This is one of the advantages of a community because it is capable of reaching several learning styles. By providing communication tools and feedback functions and the possibility of sharing experiences and thoughts with others the diverging learning style is considered. The assimilating learning style is met by enabling the sharing of links and theoretical knowledge, which users may have acquired as well as being able to read other peoples knowledge and participate in discussions. By being able to suggest options and advice to others in the group and by using suggestions from others the converging learning style is included and by offering all the advantages of a community and the shared 'spirit' that follows the accommodating learning style is considered.

5.2.2 Disadvantages of social media in a learning context

One of the downsides to i.e. Facebook and other social websites is the fact that the content is mainly user generated by users with very different backgrounds and relations to diabetes, which makes it difficult for other users to sort in the accessible knowledge that is shared. When dealing with information about a disease such as diabetes, it is vital that the users will not be misled and wrongly informed about important issues. Therefore you can argue that it is important for a Facebook group, or a community in general, to have more controlled settings, where experts (doctors, nurses etc.) observe the online exchanges of information and experiences and correct and guide users in the right directions to avoid misunderstandings and to help ensure that the users get correct information.

5.2.3 What facilitates learning?

Most of the existing websites are text heavy and descriptive websites and they do not produce inner reflection for all learning styles - of course it is possible that users will reflect on what they read and learn, but I do not believe that it is the intended effect or a deliberate choice from the sender. Of course you can argue that informative and descriptive texts are good and optimal for some learning styles, but still the websites need to consider all learning styles and provide the possibility for communication, sharing and discussion with others. Furthermore you can argue that if the users do reflect on the information they cannot use it and develop it further on the website. Nothing provides them with the possibility to move forward in the learning process. Reflection is, according to Kolb, an important aspect in the learning process, which is why I believe an emphasis should be put on this aspect in a development process. To make the users reflect on the information provided it is necessary to give them the possibility to develop and use the information further by i.e. being able to give feedback to others, answer questions, participate in quizzes, ask questions and receive response – all according to the preferred learning style.

5.2.4 Possible guidelines for improvements

I believe that In order for a website to have potential for the adolescents to learn in a social context it should provide learning material of factual character about diabetes and at the same time provide possibilities of sharing experiences etc. with others. When developing a community with Kolb's learning cycle in mind, in is important to remember that the user has a point of departure in his or hers own experience with diabetes. The website should then give the possibility for reflective observation by means of the factual texts written by professionals and the possibility to read about other adolescents' experiences with the disease. Through this reflective observation the website will create the opportunity for abstract conceptualisation when each individual process the received information. Of course I cannot measure this process, but since the users will have the possibility to respond in some way it initiates the abstractive conceptualisation, which is shown in the form of users own response to other users' input. The users is then led to the possibility of active experimentation through this possibility of responding and sharing own experiences and react to other users' postings.

A common action, which I find missing on all of the websites I have benchmarked with, is i.e. games, quizzes or tests that provide the users with the possibility to try out and test their own knowledge. The 'action' and active experimentation that exists on these websites happens primarily in the communication when the users have the possibility to react on other users'

postings and by making their own. The informative websites with many facts and texts appeal to the assimilating learning style and the websites that provide the possibility for social contact, emotional sharing and knowledge sharing appeal both to the diverging and accommodating learning style. This indicates that there is a need for more practical tasks, problem solving, imitation and experimenting for users who prefer a converging learning style.

5.3 An information architecture's perspective

By using the Internet in a learning context you provide the adolescents with the opportunity to gain control of learning at their own pace and in their own time, which is essential for adolescents with a chronic illness. Furthermore it is evident to provide the possibility for user-generated content, since most research results indicate that this sharing- and social aspect increases the learning potential. Various communication tools help to create relations between many different users and supports the social interaction between users online. This allows social software to function as platform and link between users who share the same interest and thereby provides them with the possibility to share information, knowledge and mental support, so the learning context will reach a level similar to a learning context in real life.

Communities of practice make it possible to share and learn at the same time and in the same environment. The common identity of diabetes helps support the adolescents in their learning process and the settings provide them with many opportunities of interaction. In this case there should be focus on both the tangible and intangible values – in some cases the adolescents might just need a quick answer to a medical question or need to learn more about a specific diabetes related topic, but the intangible values are equally important, because the adolescents will benefit from interacting with peers. These opportunities for creating various social dimensions and interaction with the outside world is, according to Illeris, essential for the learning process. Communities of practice provide the users with the possibility to choose between the various forms of interaction (i.e. activity, participation, imitation), which Illeris points out as important in the social learning dimension. The settings of a community also encourage inviting members to physical meetings, which help strenghten the community feeling and help the adolescents to establish connections with other adolescents in another context, which will then affect the level of mutual trust within the community. In general I will argue that the less controlled environment of an online community is preferred and motivating for most adolescents, who are mainly used to

learning under more forced settings like in school or at the hospital, where the learning does not occur on their terms.

5.4 Guidelines for a development process

During this thesis I have included ungdiabetes.dk as a benchmark example, since they address the exact target group that I have worked with. It has been useful to take a point of departure in their existence and strategic choice of closing their website. If collaboration between ungdiabetes.dk and me had taken place I would have liked to discuss with them how I believe they should reach the Danish adolescents online. Instead it is only possible for me to describe and discuss what I think about their strategy, without really having the needed background information. Nevertheless this is what I will do to sum up my theoretical research, empiric results and reflections.

As mentioned previously ungdiabetes.dk and Diabetesforeningen chose to close down the website after working on launching an online community. They based this decision on the fact that they believed other social media such as Facebook would be too much of a competition to their community. Furthermore there were economical reasons to why they then decided it would not be profitable to launch the website. Ungdiabetes.dk then decided to move all the health related information to the main website at diabetes.dk and instead try to reach the adolescents on Facebook by creating a group in this forum.

First of all, I understand the choices ungdiabetes.dk has made. I believe Facebook would be a competitor for the adolescents' attention, along with other online social websites. But seen from my perspective, which is a learning point of view, Facebook is not adequate to meet this purpose in this context – maybe it is enough to achieve their goal, but in a learning context I do not believe that Facebook has the right settings for a well-established learning environment. As previously mentioned Facebook does have several advantages and useful features in a learning context, but I believe that it is a problem that most of the content is user-generated. When dealing with learning material regarding a disease I do not believe that the less-controlled environment of Facebook is optimal. The expert-generated content should be, in my opinion, the most important, given that the purpose is for the adolescents to learn something, which is why they should have the best possible information available to build on. All of the social aspects as well as the web 2.0 possibilities in Facebook are clearly usable but inadequate in the other existing online available websites.

I know that learning was probably not mainly ungdiabetes.dk' context, but seen from a learning point of view, I believe that there could be a need for more online learning material for adolescents to help support the information provided by the hospitals. You could easily use the advantages of the Internet, the social websites and digital tools to help foster self-regulated learning and motivate and educate the adolescents.

From an information architecture framework, I believe that ungdiabetes.dk has considered the aspect of their users and target group well. They involved them in the development process of the community that was unfortunately never launched and this way learned about the online patterns of the target group. They believe that there is a higher possibility of reaching them on Facebook and since the adolescents seem to spend so much time there, it would be an obvious place to make a notice of themselves. I assume that the idea is then to get the adolescents to enter diabetes.dk – the main diabetes information website, but then what? In a learning context this does not seem to help the adolescents to learn much more than they could read in a book. My advice is that they consider all of the possibilities of social websites, online tools, and communities and create a universe for adolescents – all economic difficulties aside this would be the optimal solution.

6 CONCLUSION

My initial thought and motivation for writing this thesis was the wish to examine how to create a knowledge environment by combining the aspects of information architecture and learning. My goal was to find suitable ways to use the advantages of the Internet for learning potentials in traditional informative websites. This motivation originated from an idea that the existing available online learning material for adolescents with diabetes did not afford motivating experiences, and did not offer innovating or inspiring material from visit to visit, but was merely information transferred from analogue to digital form without considering the context properly. My mindset was based on the assumption that the advantages of the Internet could improve the existing online learning conditions for adolescents with diabetes.

In order to answer my problem statement, which was: *How can I as an information architect design information structures to support self-regulated learning online?* I carried out an empirical study and was confirmed in the fact that none of the existing websites seemed to provide users with the possibility to learn and share knowledge under optimal circumstances. By carrying out the empirical study from the point of view of Kolb's learning cycle, Illeris' dimensions and Wenger's communities of practice, I have learned the importance of understanding especially the context in a developing process. I have stated that the context cannot be separated from the learning process and that learning presupposes participation, motivation, atmosphere and sharing in an online learning environment, which is why the social dimension of learning creates meaning through communities of practice. Furthermore communities provide the optimal online settings for adapting the learning material to all types of individual learning styles and provide users with various learning styles to access and reflect on the necessary information in the way they prefer. This allows social media to function as a platform and link between users, who share the same interest and thereby provides them with the possibility to share information, knowledge and mental support, so the learning context will reach a level similar to a learning context in real life.

My research led me to the understanding of being able to unite the three aspects in information architecture *user*, *content* and *context* instead of dealing with them individually. The complexity of the context is, in my opinion, one of the most important factors in a development process. Another important aspect to consider when designing and developing learning environments is to remember that to *inform* is not the same as to *learn* the users something. The users should be provided with the possibility to reflect on the information on the website in order to use it and develop it further. This is crucial to providing them with the possibility to move forward in the

learning process. Therefore I will argue that the settings of a community of practice, where the settings can be controlled, will form an ideal environment for providing learning material of factual character about diabetes and at the same time provide possibilities of sharing experiences etc. with others.

As an information architect I have learned that I am able to help create the boundaries for a useful online learning environment, due to my understanding of- and knowledge about the importance of the user, content and context. My job, and any developer's job, is to create useful information systems within complex environments, and at the same time ensure that the users of the system comprehend the content and find the system useful and effective. This understanding lies in the ability to define the problems, the needs, and expectations of an environment, as well as the purpose, visions and solutions. The art of being an information architect is, in my opinion, to be able to design, make a better use of the technology at hand, understanding the user and creating environments that match the given context and knowing that sometimes it is even necessary to think outside the box of the information architectural framework if needed, which is something I will be prepared for in my future carrier as an information architect.

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7.4 Illustrations

8 APPENDIX

Appendix 1: Transcription of interview with Hanne Vogt

Appendix 2: Descriptions of websites used in benchmarking