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Learnability in the iOS and WinPhone Guidelines for Mobile Applications Developers

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Thesis

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OPINNÄYTETYÖN ARVIOINTILOMAKE

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Arvioinnin kohteet	Arvosana (0 - 5)
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2. Tietoperusta eli viitekehys	5
3. Menetelmät	4,5
4. Tulokset	3
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Opinnäytetyön arvosana 5

Arviointilausunto

Aihe on hyvin ajankohtainen ja rajattu onnistuneesti. Tavoitteena oli selvittää, miten älylaitteiden ohjelmointioppaat (guideline) eroavat toisistaan. Erojen seurauksilla voi olla kauaskantoisia vaikutuksia sovellusten käytettävyyteen ja erityisesti opittavuuden parantamiseen.
Tietoperusta kohdentuu aiheen kannalta vahvasti opittavuuden teoriaan ja käyttökokemukseen ja se on todella ansiokkaasti koottu. Lähteet ovat aiheen kannalta olennaisia ja niitä on kattavasti. Lähteitä on rinnastettu toisiinsa ja niiden avulla on kehitetty konstruktio, jota työssä käytetään analyysityökaluna. Lähdeviittaus- ja merkintätapa ovat johdonmukaiset.
Menelmät sopivat asetetun tavoitteen ratkaisemiseen hyvin ja niiden valinta on perusteltu. Aineisto on valittu tarkoituksenmukaisesti ja koottu laadittuun konstruktioon. Aineiston analysointi on jäänyt kesken, eivätkä johtopäätökset nouse vakuuttavasti esiin. Tulos saavuttaisi saman tason kuin tietoperusta, jos kootun aineiston rinnalle olisi lisätty ratkaisuehdotukset. Raportoitu tulos on kaikesta huolimatta tärkeä älysovellusten ohjelmistokehittäjälle.
Työn rakenne ja kieluasu ovat kaikin puolin kunnossa. Yhteenveto on reflektiivinen. Työ noudattaa hyvää tutkimustapaa. Työn aikataulutus oli onnistunut edellyttäen tekijältään aika-ajoin paljon niin pohdintoja kuin asioiden kyseenalaistamista. Työssä yhdistyvat kaksi tieteenalaa: kasvatustiede ja tietojenkäsittely.

Hyväksytty kypsyysnäyte on kirjoitettu suomen kielellä

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Nykyään moni omistaa älypuhelimen. Nämä älypuhelimet ovat käytännössä pieniä tietokoneita, ja niitä käytetään moneen muuhunkin asiaan kuin puheluihin. Älypuhelimien sovellukset ovatkin käyttökelpoisia monissa tilanteissa.

Käytettävyys on aihe, joka on ollut kovasti pinnalla keskustelussa älypuhelimien ominaisuuksista viime aikoina. Tässä opinnäytetyössä käytettävyys on rajattu opittavuuteen. Selkeän määritelmän puutteessa muodostimme pedagogisia oppimisteorioita apuna käyttäen konstruktion eli analyysityökalun, jolla lähdimme mittaamaan opittavuutta.

Materiaalin, johon sovellamme analyysityökalua, rajasimme kahteen yleisessä käytössä olevaan sovelluskehitysaineistoon: Applen ja Microsoftin internetissä tarjoamaan älypuhelinsovellusten kehittämisessä avuksi käytettävään guideline-materiaaliin.

Lopputuloksena syntyi raportti tämänhetkisestä tilanteesta sovelluskehityksen ohjeistamisessa. Toivottavasti tämä opinnäytetyö kulkeutuu ohjelmistokehittäjien käsiin. Hyvät ja käytettävät sovellukset rikastuttavat älypuhelimien ekosysteemejä, ja tuovat merkittävää lisäarvoa kyseisille laitteille.

Avainsanat

Opittavuus, käytettävyys, älypuhelin, ihmisen ja tietokoneen kanssakäyminen, sovelluskehitys, älypuhelinsovellukset

Abstract

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Tietojenkäsittelyn koulutusohjelma

Author Mikael Kawamura	**Group or year of entry** 2010
Title of report Learnability in the iOS and WinPhone guidelines for mobile application developers	**Number of pages and appendices** 35 + 2
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The purpose of this thesis was to investigate the learnability in the developer guidelines for mobile device applications. The developer guidelines that were looked into were those of iOS's and WinPhone's.

A topic that is extensively discussed, in respect of smartphone application development, is usability. In this thesis, usability is restricted to one feature: learnability. Because there is no precise definition to what learnability in software development is, various learning theories were used to form a construct that was used as a measuring tool of learnability.

The application developer guidelines to which the measuring tool was used, were restricted to those of the two major smartphone operating systems manufacturers', Apple's and Microsoft'. These guidelines are provided on the companies' websites.

The results of the thesis reflected the current situation in which the application developers are. Hopefully this thesis contributes to the guidelines for application developers thus enriching the device ecosystems even further with more learnable applications.

Keywords

Learnability, usability, smartphone, human-computer interaction, guidelines, applications

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1 Subject Matter

Why is it sometimes so hard to understand how to use new software or a new application? As a student of Information Technology, I am interested in this topic. You, the reader, probably have used software that has been difficult, and this problem affects you as well. It is therefore in our best interest to study the reasons behind these issues. One source we could take a look to find out what kind of support is provided to application developers is the guidelines Apple and Microsoft publish online for their iPhone and Windows Phone application developers.

Computers and software create an interface between human and technology. In this juxtaposition we are the active agent and technology is a passive agent. We use technology and the technology becomes an extension of our mind. We search and develop usability in order to create technology that function as smoothly as possible in a manner we need it to.

Usability by Jacob Nielsen's definition is how well the users can use the functionality of the system. He divides the concept of usability into five sub features: learnability, efficiency, easy to remember, subjectively pleasing, and minimizing the errors. In my opinion learnability is the key feature. There are many definitions of learnability from many authorities. However, it would be problematic to use these definitions as the basis of a model to analyse the guidelines, as the definitions are empirical in nature. To deepen the theory base of the learnability model, we will incorporate basic learning theories and elements from cognitive sciences in the construction of the analysis tool.

1.1 Objective of the Thesis

Because learnability is such a broad concept, it is not possible for us to cover all the aspects in this thesis. We are using guidelines that both Apple and Microsoft are providing online for two operating systems used in smartphones to restrict the concept: iOS and Windows Phone.

This study will first define learnability within smartphone applications into measurable parameters and contrast the guidelines provided online to the learnability model formed in this thesis. In addition, using the constructed learnability model, we will define how the guidelines provide solutions for application developers to write learnable applications.

1.2 Smartphone Users

The subject of this thesis is how different traits of learnability are presented in the guidelines provided to smartphone application developers. However, in order to understand what kind of learnability traits we are looking for we must take a look at the users of these smartphones.

According to the Official Statistics of Finland (2012, 2) in spring 2011 one third of 16-74 year-olds used the internet outside home, office, or school. The number has doubled in last four years. In addition, in 2011 almost 50 % of the people in the same age group owned a smartphone, while a year earlier the number was closer to 25 %. The increased ownership of a smartphone and the increased usage of the internet outside home, adds to the fact that smartphones is one reason behind increased usage of online services 'on the move'.

According to Lane and Manner (2011, 22) in 2010 slightly more males than females owned a smartphone in the United States. Official Statistics of Finland (2012) showed similar findings in Finland. In 2011 49 % of men and 35 % women owned a smartphone in Finland. The age group that owned a smartphone match as well; in both countries the majority of smartphone owners were 25 – 44 year-olds. In short, our basic users are adult males.

Blom and Monk (2003, 202) found that many used personalisation of their mobile phones as a way to express themselves. For example changing a ring tone or logo on the screen is a way to personalise the device. This has naturally changed in the passed nine years, and phones have evolved very much since 2003: the iPhone was introduced in 2007 and the Nokia Lumia series in 2011. Changing a ring tone or the background picture is a basic feature for these smart phones. The form factor has evolved from candy bars to touchscreens and smartphones are used for many more things than merely communication. The value of the study from Blom and Monk is that it reveals that people were expressing themselves using mobile phones as early as in 2003 and this fact has remained the same in 2012.

Wall Street Journal writes in September 29, 2011 that Nokia is going to add smart phone functionalities in their low-end devices. As more and more devices are able to access the internet the amount of users of mobile applications increases. According to Official Statistics of Finland (2012, 9) one particular group increasing the use of mobile applications are the elderly people. As the elderly are not in the main focus group of the smart phone users, the low-end devices could be one channel for the elderly to reach online services.

Smartphones are more or less, in my opinion, extensions of our person. Usability of the applications that we use in these devices is a matter we should investigate. In order to the applications to be usable, we must be able to learn how to use them. In the best-case scenario we would not be forced to take time to learn how to use them; rather the applications should function in a way for our intuition to guide our actions.

Usability and learnability are regarded as a part of Human-Computer Interaction sciences. Depending on the point of view, Human-Computer Interaction can be seen as a part of Cognitive Psychology or Design Sciences. Let us take a look at how the science came to be, and how it has developed in the last 70 years.

2 The History of Human-Computer Interaction

There are different ways to define Human-Computer Interaction (HCI) as a science. A broad definition by Gary and Judith Olson (2003, 492) sets HCI to cover psychology, social sciences, sociology, anthropology, communication, management, operations research and ergonomics.

John Carroll (1997, 515) places HCI under Design Sciences, while Pertti Saariluoma (2004, 11) relates it to study of ergonomics and Antti Oulasvirta (2010, 18) emphasises that HCI is a multidiscipline science.

According to Oulasvirta (2011, 15) HCI is a field of study which covers the design, evaluation, and execution of interactive computer systems and the phenomena that are related to them. The objective of the science is to recognise problematic features from user's perspective in information technology and how they are considered in the design of hardware and software. The science produces analysis for the structure of Human-Computer interaction and suggests how to develop the technology. In short, Human-Computer Interaction is the where we begin to discover the definition of learnability.

2.1 Ergonomics and Human Engineering

Both Saariluoma (2004, 10) and Oulasvirta (2011, 18-20) set the earliest studies of Human-Computer Interaction to the development of ergonomics in the Second World War. As the allies Fighter-bombers were so complex that the pilots were having difficulties operating them, psychologists were asked to take part in the production of these planes to make them more ergonomic. This led to the birth of Anglo-American scientific community called Human Factors Society. The community developed further to Computer Systems Technical Group, which in 1972 parted as a separate community.

The subjects studied in these groups were readability of visual screens, sound stimuli, control user interfaces and different ways to instruct in the usage of a computer. Cognitive psychology was often applied in the studies.

2.2 Computer Science

By 1970s computers had evolved technically, and companies and organizations used them in their business more than before. Users were specialists in three different roles: operators, programmers and managers. Operators had the main responsibility of the usage of the computers, and performed such tasks as maintenance, loading, program running, printing, and information feed and information search.

The introduction of operating systems made it possible to assign tasks performed by operators to a normal employee. This enabled the usage of the mainframe to be much more effective. Operating systems removed the operators from bottle necking the pipeline. Introduction of operating systems led to a demand of studies in which the productivity of computers was evaluated. A popular study of the 1970s was the relationship between work organizations and computerization. (Oulasvirta 2011, 20-22.)

2.3 Human-Computer Interaction

Human-Computer Interaction was developed in 1980s to serve software houses, computer companies and telephone operators, which were struggling to keep up with the evolving commercialisation of information technology. The perspective in research shifted from computerisation to study the user as an actor with a computer from ergonomic usability problems, computerisation of major companies and organizations. This is the tipping point, when the user is seen as a subject of study instead of the machine.

Oulasvirta (2011, 25) mentions the GOMS-model (Goals, Operators, Methods and Selection rules), which is a simulation model of human cognition, introduced in Stuart Cards book The Psychology of Human-Computer Interaction. It is a model of a structured process that will determine the most efficient method to reach the goal. If there are multiple methods to reach the goal, the method is chosen using selection rules. The method is comprised of different low-level operators. The GOMS-model is used to define the cost of the steps in information technology process in relation to the time used. The model brought to light the concept of affordance, which means the possibilities that a user finds in the elements in the interface and mental models, which means the understanding the user has of the logic behind the device or the software. The perspective shifted from a mechanical concept to a broader idea of the users cognitive processes.

2.4 Computer-Mediated Communication

In late 1980s interest in studying email and other information technologies started to take ground as more and more companies began using information technology as a tool in making business. Information technology brought changes in work communities, and this sparked a new field of research in ethnographic workplace studies. The perspective broadened from one user to many users. With the rise of the social media applications, computer-mediated communication has found new fields to study.

Computer-mediated communication alongside with social media study is a research field, which concentrates on communication. For example one study indicates that computer-based communication tends to be antisocial and stimulates unconstrained behaviour in social media services such as Facebook. (Oulasvirta 2011, 28-29.)

2.5 Interaction Design

In design the designer have an understanding of a feasible set of solutions that will lead to the desired goal. The design of a software application is a process that concretizes creative thinking. In this process a wide group of interconnected ideas are being sought after. In many cases technical, ethical as well as esthetical factors are the main points in compromises that are being made in the process.

Although the basic principle in HCI is good design, many designers started to take part in research only after 1990s after the technologies used in user interface had evolved. This created a new field of research called Interaction Design (IxD). According to Swedish researcher Daniel Fallman Interaction Design covers everything from concept to materials used in the final product. Main fields of research are Design Practises, Design Research and Design Exploration. (Oulasvirta 2011, 29-30.)

2.6 Direct Manipulation and Touch Screen

The interface in smartphones has shifted from keyboard to touch screens. The definition of tablet computer according to Oxford Dictionaries (2012) is: "a small portable computer that accepts input directly on to its screen rather than via a keyboard or mouse." We can suggest that modern tablet computers would not exist without touch screens.

From the usability point of view the touch-based interface is intuitive. Shneiderman (2010, 192) introduced term Direct Manipulation in 1983 within the context of desktop metaphor. The idea is that we have form the concept of the task easier through representation of everyday objects such as the desktop or a folder and receive immediate feedback from the objects we manipulate on the screen. According to Shneiderman this appeals novice users, is easy to remember for intermittent users and can be a rapid interface for frequent users. Touch-based interface enables the direct manipulation of objects and the user experiences direct control of the objects on screen.

Donald Norman and Jacob Nielsen (2010), remind us that touch-based user interface is still rather undeveloped. They called for the developers to introduce intuitive gestures as consistent standards in the interface design.

According to the guidelines that Apple (2012) provides to application developers Direct Manipulation enhance the interface we, the users, are experiencing. When the keyboard and the mouse are removed from the interface, we experience a heightened sense of control over the objects on screen. "For example, instead of tapping zoom controls, people can use the pinch gesture to directly expand or contract an area of content" (Apple 2012, 18).

In Microsoft's (2012) guideline direct manipulation is considered as a feature of the touch gesture. It is used in event descriptions as a verb:

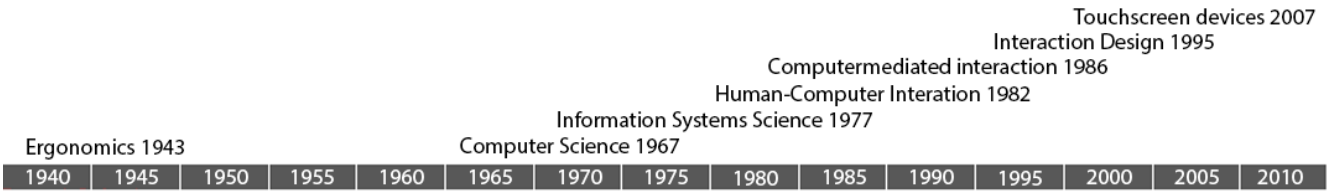
- "This event occurs when the user starts a **direct manipulation** by placing their finger or fingers on the screen."

- "Content can be moved through **direct manipulation**. It will stick and follow the movement of the finger."

There is a difference in the way Apple and Microsoft guidelines approach the subject. Microsoft focuses on the device and the content. The content is controlled using direct manipulation; it is a method to work the device. Apple focuses on the user. Apple considers direct manipulation as a subjective sensation: "The Multi-Touch interface gives people a sense of immediate connection with their devices and enhances their sense of direct manipulation of onscreen objects" (Apple 2012, 12).

2.7 The History of HCI in a Timeline

There is a gap in the introduction of the fields of study of HCI after the war. Along with the technological development a new field of HCI was discovered. Ergonomics were brought to design of weapons to increase the efficiency of the usage. The development of computers and the introduction of them to businesses created a study of Computer Science. In graph 1 below we can see that after the computer was subjected to a study combining human and computer, a whole chain of new fields of study was introduced.



Graph 1: HCI timeline

3 Learning and Cognition

To deepen the construct of the analysis tool finding the traits of learnability in the guidelines, we need to have an understanding of theory of how people learn. Sinkkonen et al. (2006, 193) define learning to be a relative change in our knowledge and our behaviour. The change is caused by experience of interaction with the environment. Learning is relative because change can occur in us after it has ended. Learning is not necessarily permanent and we may not necessarily realise it immediately after the interaction. It is important for us to be able to accept the change that the situation requires, which leads to learning.

Learning can also be described as a process, in which we form a mental model or picture of the subject or skill and begin to apply it in practise. According to Sinkkonen et al. (2006, 193) learning can be memorising the knowledge, developing a skill, increasing experience level, changing an attitude, or understanding a new concept. Learning can occur by realisation, conditioning i.e. avoiding negative outcomes, improving or acquiring skills, or by observing. In essence, learning is an aspect of cognition.

3.1 Cognition

"Cogito ergo sum," said Descartes; to think is to be, and to think is to know. To know requires a facility to produce the knowledge. The action of knowing that we exist is proof that we exist. The action of knowing is part of cognition. Maturana (1980, 13) says that living systems are cognitive systems that act and behave in their realm of interactions.

According to Maturana (1980, 13) and later Varela and Maturana (1987), cognition is the nature of all living systems, a biological phenomenon. Living systems, including us humans, are autonomous, self-referring, and self-constructing closed systems – autopoietic systems as they call it. As a biological phenomenon cognition is not entailed to beings with nervous systems only. Cognition is acting and existing in the realm the living system is able to interact in, the realm of interaction.

A living system without nervous system entering a cognitive interaction is limited to its realm of interaction, which is chemical or physical in nature. Maturana (1980, 13) uses examples of photosynthesis and enzymatic process to describe this kind of interaction. A living system with nervous system has a larger realm of interaction as it enables it to make interactions with pure relations. Maturana (1980, 13) simplifies this with an analogy of an observer watching a cat seeing a bird. Sensors of the cat are modified by light, and the cat is modified by a visible entity, the bird. The sensors change through physical interactions: the absorption of light; the cat is modified through its interactions with the relations between the activated senses.

Nervous system in itself does not create cognition. It is subservient to autopoiesis, the self-construction of the living system. Living systems with nervous systems have subjected the acting and interacting in the realm of pure relations to the process of evolution. According to Maturana (1980, 13) this has produced a situation, where organisms are capable to include as a subset of their possible interactions, interactions with their own internal states as if these were independent entities, creating a paradox of including a cognitive realm within a cognitive realm. We resolve this paradox by abstract thinking, and it is an expansion of cognitive realm.

The expansion of the cognitive realm, in a situation where we are able to interact non-physically, produces the basis of communication. Maturana (1980, 14) describes this as orienting behaviour that is representation of the interaction toward which it orients, and a unity of interactions in its own terms. This creates a paradox as we generate representations of our own interactions by specifying entities with which we interact as if these belonged to an independent realm. According to Kamppinen, Jokinen & Saarimaa (2001, 173-174) information that is reflected from the environment is called a representation, as this information represents the environment. In short, our representations of our interactions map only our own interactions.

Maturana (1980, 14) explains that we solve this paradox in two ways, by becoming observers and becoming self-conscious. Through recursively generating representations of our own interactions and interacting with several representations simultaneously we generate relations with the representations. This way we can remain in a realm of interactions always larger than the realm of representations. We set ourselves outside the realm of representations. When we become self-conscious, we make descriptions of ourselves, and by interacting with these descriptions we can describe ourselves describing ourselves in an endless recursive process.

In my opinion, because cognition is a biological process rather than a set of our senses, it is in our nature to learn. Varela and Maturana (1987, 27) say, “All doing is knowing and all knowing is doing”.

3.2 Learning Theories

To further understand how we learn, we will take a short look at four basic approaches to learning. The theories are behavioural, cognitive, constructivist, and humanistic views of learning.

Weibell (2011) defines behavioural learning theory as the application of behavioural psychology to learning. In behavioural psychology principles of behaviour are identified through experimental study. According to Sinkkonen et al. (2006, 194) the behaviouristic learning theory suggests that learning is bound to the feedback from environment. We favour operations that produce positive outcomes, and avoid those that produce negative outcomes. Experience works as a catalyst that strengthens our learning. In behaviouristic teaching there is an absolute truth that the teacher shares with the students using the "carrot and stick" approach.

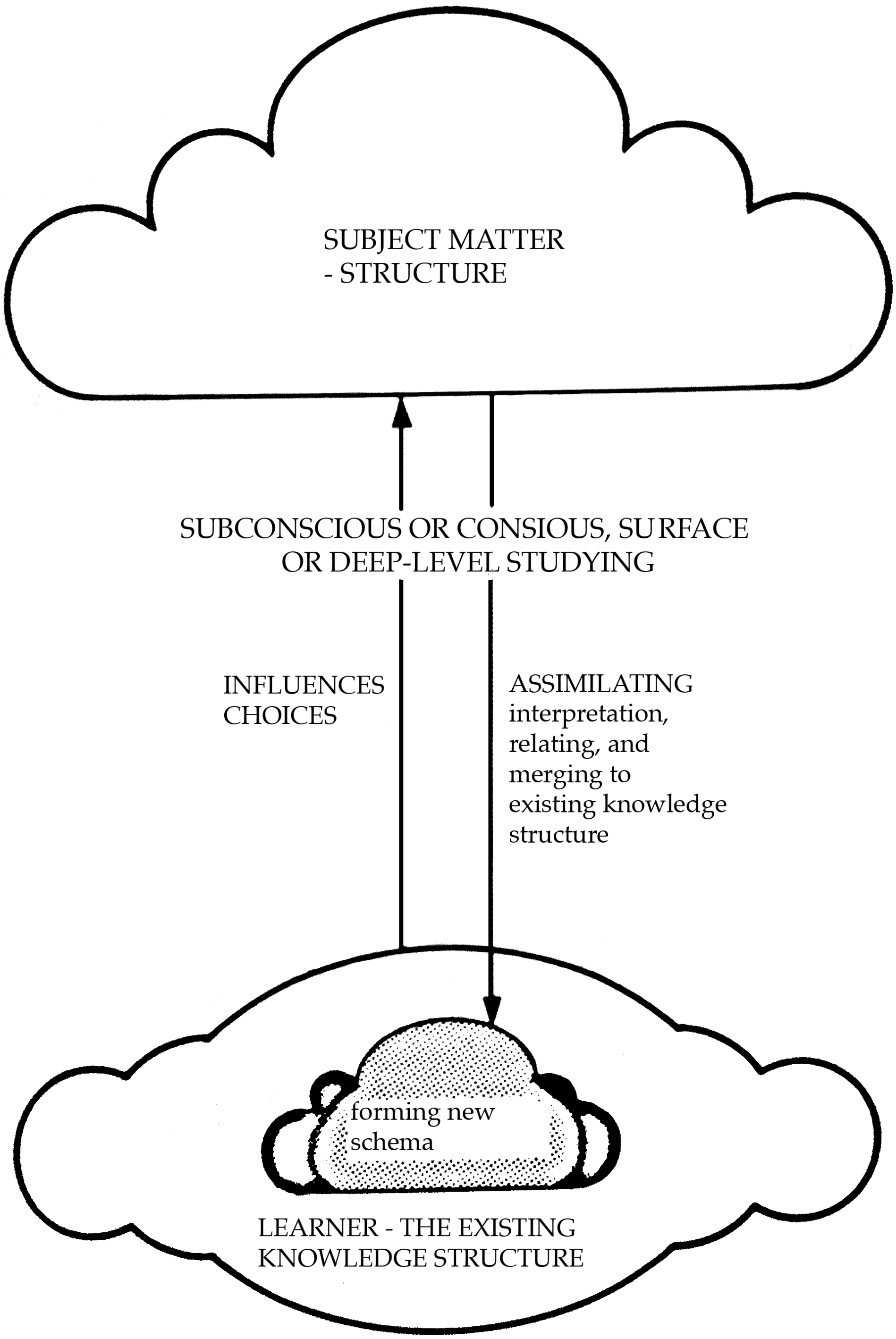
We are able to work out and to understand the subjects we study and the relations between them. Thoughts and emotions of surroundings can be a learning experience in itself. Weibell (2011) suggests that cognitive approach to learning began in the mid 1900s as a reaction against behaviourism. It was driven by linguistics and computer science. According to Sinkkonen et al. (2006, 195) In cognitive learning theory deliberation and understanding with reorganising information is in key position. The focus is on how we attach the knowledge to our existing knowledge base, or how acquired knowledge is organised and how it is received.

According to Sinkkonen et al. (2006, 195) Constructivist learning theory is based on cognitivism and focuses on us as learners in the learning process. The learners' comprehension of the subject matter is based on factual knowledge of the subject. In order for the structure to function as a basis for the handling of the subject matter, the structure of the subject should be as clearly comprehensible as possible. The learner is aware and actively forms a structured comprehension of the subject matter. According to Weibell (2011) in individual constructivism, the learner constructs knowledge from experience rather than by memorizing facts. In essence, prior knowledge helps the learner to make sense of the newly acquired information.

Learning is growth as a person and is tied to self-actualisation. According to Weibell (2011) in the human approach learning is promoted by understanding the whole person, motives, and goals. In humanistic learning theory it is acknowledged that a learner has an individual way of learning. The learner is thinking and feeling agent, who has reasons to engage learning or not. In addition, motivation is a major component.

What a person learns is kept in the memory as skill and knowledge, which Sinkkonen et al. (2006, 196) calls schemata. Engeström (1982, 20) claims that learning depends on our existing knowledge structure of the subject matter: If the knowledge structure of the studied matter is solid, learning is easy and expands the schemata. If not, learning can become time consuming or demands many repetitions. When we assimilate new knowledge the outcome depends on our existing knowledge structures. In the assimilation process we create meaningful connections between existing and new ideas thus expanding the schemata.

Engeström (1982, 19) expresses that learning is mental activity. In short, it is expansive. It is much more complex than mere receiving and storing of information. We build an image of the world and form schemata to explain different phenomena taking place in it. We acquire information and interpret it. The information is assimilated to the existing knowledge structure. Our functions and existing knowledge direct our choices and interpretations of the acquired information, it also affects our existing knowledge structures. Expansive learning extends humanistic learning theory, and brings elements of cognitivism and constructivism to it. In the picture 1 below, the idea of expansive learning is presented. The existing knowledge structure influences learner's choice of the subject matter, and studied subject matter is assimilated to the existing knowledge structure.



Picture 1: Model of learning (Engeström 1982, 27) translation: Mikael Kawamura

As knowledge is manifested by actions, low-level knowledge appears as simple associations, naming of phenomena, comparisons or classifications. Higher-level knowledge is expressed as comprehension of structures and patterns, recognition of relevant elements, as ability to synthetize, apply and produce inspirations.

The actions manifesting knowledge can be carried out on both material and mental level. On material level we comprehend concepts through handling of tangible material or phenomena. But when we transform actions from material to mental level, we internalise the acquired information using language to recognise the subject matter as abstract phenomena. We begin to perform actions through abstract knowledge.

3.3 Emotions: We Feel, Therefore We Learn

According to Immordino-Yang and Damasio (2007, 4) learning stems from basic motivators that are interwoven in our nature. Immordino-Yang & Damasio state that the motivations behind our everyday actions are based on the original purpose of our brain: management of our physiology, optimising our survival and allowing us to flourish.

Immordino-Yang & Damasio (2007, 4) suggest that as the evolution of human societies has produced a complex social and cultural context and the survival and flourishing within this context means that our decisions and actions occur inside our socially and culturally constructed reality, the reasons behind our actions may vary from intrinsic pleasure of finding a solution to a mathematic problem or simply avoiding a punishment; the emotional component is present. The emotion may relate to pleasurable sensation or survival within our culture.

> A set of neurochemical responses rushes from the lower part of the frontal lobe through the blood circulation and through neurons. The responses transforms into molecules in the bloodstream and start to affect cell receptors all over the body. Responses affect electrochemically neurons, muscle fibres and organs. The body is experiencing an emotion and is adapting itself accordingly. As we become aware of the change in our physique we start to call the phenomenon a feeling.

The emotional response connected to motivation points that there is a link between body and mind, in this regard. We are fundamentally social creatures and our neurobiological systems that support our social interactions and relationships are recruited for the decision-making that underlines much of our thought. Immordino-Yang & Damasio (2007, 4) say that learning is not a rational or disembodied process.

3.4 Motivation

Emotion defines the relation to the situation being faced. Depending on the valence of the emotion the fulfilling or avoiding outcome is a basic need stitched in our existence. This need produces motivation to function. Saariluoma (2004, 103) says that motivation is a multileveled psychic function, which consists of emotion and cognition. There is always an emotion and cognition behind the motivation. According to Engeström (1982, 82) there are three different motivations that affect learning: situational motivation, indirect motivation, and intrinsic motivation.

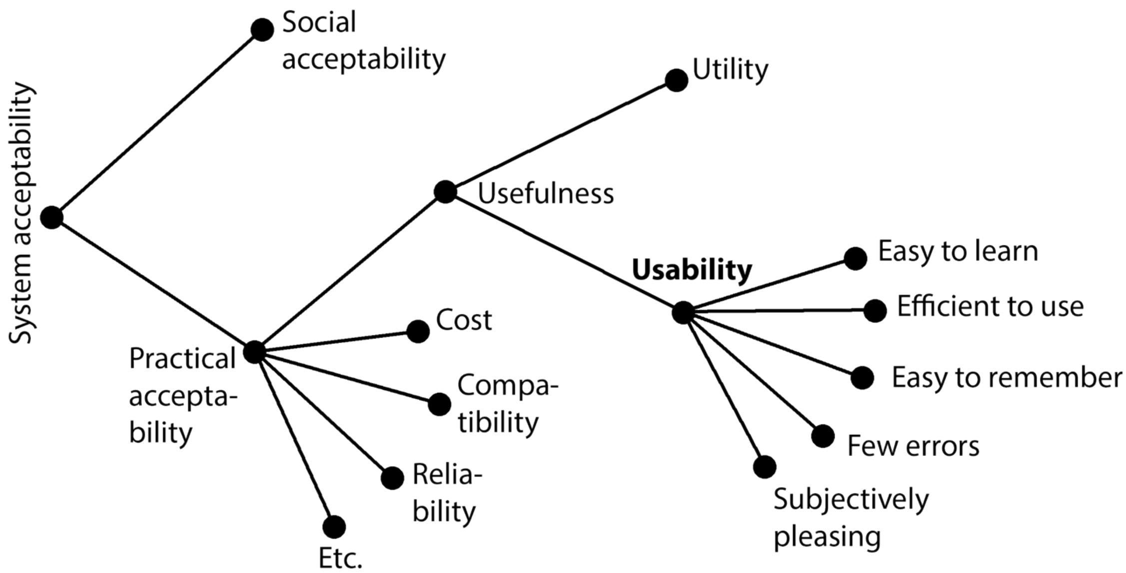
Superficial factors such as tricks to grasp our interest, or that the subject is new to us and therefore interesting, spark the situational motivation. Engeström (1982, 29) points out that Situational motivation tends not to last long and is focused on secondary objectives.

When we are striving for a reward, or trying to avoid failure or punishment, we are driven by indirect motivation. Saariluoma (2004, 104) explains this kind of motivation through the valences of emotion. If the valence of the emotion is negative, the situation is experienced as punishing, positive valence is experienced as rewarding. We tend to distance ourselves from punishment and strive for reward. Engeström (1982, 29) says that indirect motivation leads to uncritical learning, as subject matter is quickly learned and quickly forgotten. Our interest in the studies is focused on the outcome instead of the subject matter itself.

When we are not able to complete a task because of the lack of knowledge or skills, we are in a conflict by ourselves. We are facing a situation where we have to critically assess already existing knowledge. By solving the conflict we form a model, a basis of learning, which applies to the subject matter. We use this model to solve new problems. This kind of active learning strengthens motivation and develops one's own interest in the subject matter. Intrinsic motivation stems from understanding of one's lack of knowledge or skills and the need to resolve the conflict the situation has brought forth. Engeström (1982, 33) mentions that in certain phase for us to structure the acquired knowledge, we should be led to realization that we manage and are able to apply the acquired skills and knowledge. With intrinsic motivation we have a solid base for continuous learning.

4 Usability

Jacob Nielsen (1993, 26) divides usability into five features: learnability, efficiency, memorability, errors and satisfaction. Nielsen approaches the concept from a broad context seen in picture 2. The context is based on systems researched and intended for large companies.



Picture 2: Usability according to Nielsen (1993, 23).

Nielsen starts to define usability from the concept of System acceptability, which he divides into two categories: Social acceptability and Practical acceptability. Social acceptability means that the system satisfies the needs and requirements of users and other potential stakeholders such as clients and managers. Practical acceptability on the other hand answers to such questions as is the system cost affective, how it is compatible with existing systems, or is the system reliable. Nielsen places usefulness under Practical acceptability, and divides it to Utility and Usability. Utility means how functional the system is for the task intended. Usability means how well the users can use the functionality of the system. Learnability (Easy to learn) is a feature of Usability.

4.1 User Psychology

According to Saariluoma (2012), Tom Moran originally introduced the term user psychology in 1981, but it was rarely used since. In early 2000 Saariluoma began to think that to support the use of psychological knowledge in design decisions, it made sense to introduce the idea of explanatory design to it, improving the metascientific foundations of human technology research and the way psychology was applied to it.

Based on common psychology we can state that emotions are crucial when the concept, theory, and empirical base of the usability of a device are developed. Feelings and cognition are constantly working together as our every function has both cognitive and emotional side.

Saariluoma (2004, 103) says that developing the technical properties of the device is naturally essential in the usability of the product, but it is the feeling and emotion that makes the difference. The experience of the technology is a part of emotional experience but only one part of it. It is important to find new ways to create emotional significances and emotional experiences of the product.

4.2 Learnability

Grossman, Fitzmaurice and Attar (2009) made a survey about how to define, measure, and evaluate learnability. As a source material they used 88 articles published in different papers between years 1982 and 2008. They found that there is no universal consensus on the matter. In the survey they divided learnability into three categories: initial learning, extended learning, and learning as a function of experience.

The point in the definition based on Initial Learning is that measuring learnability is based on what it takes to get to a level proficient enough to start using the system productively. In this definition there are two ways to measure learnability: the time it takes to be able to work the system and the amount of effort to be able to work the system.

Grossman et al. (2009, 650) found that Jacob Nielsen defines usability using time as a measure: to allow users to reach a reasonable level of proficiency in a short time: "users to reach a reasonable level of usage proficiency in a short time." According to Grossman et al. (2009, 650) Shneiderman uses time as well: "the time it takes members of the user community to learn how to use the commands relevant to a set of tasks." As does Holzinger: "allowing the users to rapidly begin to work with the system" (Grossman et al. 2009, 650).

Grossman et al. (2009, 650) point out that Santos and Badre measure the effort it takes for the user to reach a certain level: "the effort required for a typical user to be able to perform a set of tasks using an interactive system with a predefined level of proficiency."

Learnability and the efficiency of use of the system are according to Nielsen in contradiction. If the system is designed to be efficient, it is difficult to learn and a system that is easy to learn will not be as efficient to use. In the figure 1 below we see two learning curves by Nielsen (1993, 29). The contradiction between learnability and efficiency is evident.

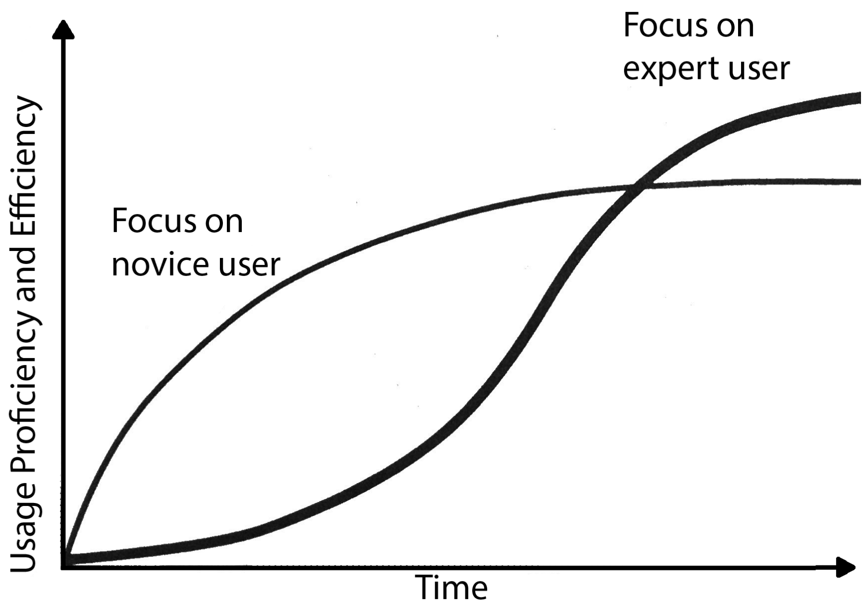


Figure 1: Learning curve (Nielsen 1993, 29)

According to Grossman et al. (2009, 650) Initial Learning focuses on how we get to know the system, Extended Learning considers learnability to cover the mastering of the system. It is not only measured in the time we use or the effort we put into learning the system, but also how much training or instructions we need to be able use the system.

Grossman et al. (2009, 650) say that Dix et al. define learnability to be measured in effort to start using the system and achieving maximum performance: "ease at which new users can begin effective interaction and achieve maximal performance". Berand and Mcleod simply define it to be the "quality of use for users over time". Butler adds the training aspect in his definition by mentioning one measuring point to be based on self-instruction: "Initial user performance based on self instruction" … "allowing experienced users to select an alternate model that involved fewer screens or keystrokes". Rieman takes this as well though combining the non-formal training measure to the effort aspect: "Minimally useful with no formal training, and should be possible to master the software".

In initial learning and expansive learning the researchers focused on how to use the system. Grossman et al. (2009, 650) found that Davis and Wiedenbeck introduce a different point of view. The user has been categorized as novice user, a member of the user community, a typical user or experienced user, Davis et al. recognise a user who is a novice to the specific new system, but is experienced with a similar system. This kind of user has the required knowledge and general understanding of what tools and functions are available. They call this subsequent learning.

In addition to this Nielsen (1993, 28-29) mentions transferring of skills, but the context he is referring to is different. Nielsen means upgrading the software rather than using a new but similar system.

4.3 Knowledge in the world, Knowledge in the head

In his book The Design of Everyday Things Donald Norman (2000) writes about concept of Knowledge in the world. The idea is that if environment is designed correctly we are able to function in it intuitively, i.e. we behave in a precise manner. The knowledge is distributed partly in our head, partly in the world, the environment, and partly in the constraints of the world. In table 1 below we see how the knowledge in the world is compared to knowledge in the mind from three different perspectives.

Table 1: Comparing knowledge in the world and knowledge in the head

	Knowledge is in the world	Knowledge is in the mind
Learning	Learning is not needed. Interpretation of the application instead of learning. The ease of learning depends on how well the application supports natural models and restrictions.	Requires learning. Learning is easier if the application structure is logical, or if user has a clear mental model of the application.
Efficiency of use of the application	Slow, because user has to take time to interpret models and restrictions.	Possibly efficient.
Ease of use of the application at first time	Easy	Difficult

According to Norman (2000, 55) precise behaviour emerges if following four conditions are met:

1. Information is in the world
2. Great precision is not required
3. Natural constraints are present
4. Cultural constraints are present

Information Is In the World

Norman (2000, 54) explains the idea of Information in the world is that we function with two kinds of knowledge: knowledge of and knowledge how. In psychology knowledge of is called declarative knowledge. It is something that is easy to write down, it is fact based. Declarative knowledge can be described with such rules as 'stop at red lights'. Knowledge how is called in psychology procedural knowledge. It is largely subconscious, sometimes impossible to write down, as it is knowledge of for example how to perform music or return a serve in tennis. Procedural knowledge is knowledge that is usually learned through practice.

Great Precision Is Not Required

According to Norman (2000, 59) our memory works in such way that we store only sufficiently precise representations in there. In everyday life it is not relevant to be able to tell the exact diameter of 20-cent coin, it is sufficient enough to be able to tell that is a copper-coloured coin that is smaller than 50-cent coin and bigger than 10-cent coin. We remember only descriptions that are precise enough to work at the time something is learned. So if precision is needed for us to work something, we might be required to study it before we are able to work with it productively.

Natural and Cultural Constraints Are Present

Nature restricts us in many ways Norman (2000,60) continues, gravity keeps us grounded and restricts our behaviour so that we are not able to lift heavy objects or jump directly to third floor. With restrictions our behaviour is directed to the desired path. These constraints are not necessarily physical, but social or cultural as well. Our behaviour is restricted to socially acceptable norms as well.

Is precise behaviour interpreted as something that is easy to understand or to learn? Is it something that is regarded as intuitive to us? We can see association between conditioning and Knowledge in the world, i.e. if there are restrictions such as a button that is in passive state the choice to push it is not an option. This directs our behaviour within the application. When we use a new application or a device, there are certain features in the design that makes it intuitive for us to use. This adds in the learnability of the product.

5 Methods

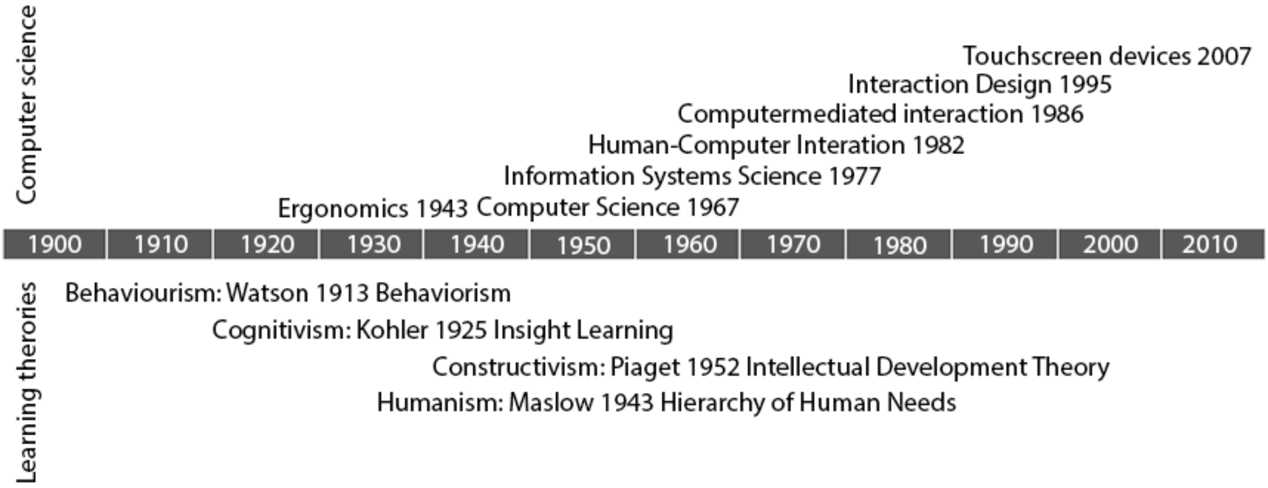
We have established that learnability is something that consists of many elements. As Grossman et al. (2009, 649) found out there is no precise definition for it, and the definitions are not suitable for the development of applications used in the case we are interested in; the users, the design of the device, and our attitude towards the device are the main elements we are basing our analysis tool on.

As we learn in many different ways, described in the learning theories, these are a natural component to base our model of learnability on. The data we use to gather traits of learnability is the guidelines both Apple and Microsoft provide online for application developers. The data is qualitative in nature, and our approach to analyse it is qualitative: the model we construct is based on learning theories. We abstract the theories into categories and illustrate it by representative expressions gathered from the data and present it in a table.

The approach is deductive although in forming the abstractions the source material influenced the formation of the abstraction subclass. To introduce the abstraction to fit in the terminology of the source data, expressions from the source data was used to help the formation of the abstraction subclass. The analysis matrix constructed will allow us to reflect on the data in both qualitative and quantitative way, as we are able to compare sources in both nature and number of expressions we find from the data. The irrelevant data will be ignored in this thesis.

The content analysis tool we construct will be restricted to what we have recognised to be the primary learning theories in our case. It is not able to tell which source is able to produce better applications in terms of usability. The skills of the application developers are the deciding factor regarding the usability of the end products, not the guidelines the authorities provide. The constructed tool will analyse and summarise expressions we find from the data, and provide us a table with which we can base our analyses on.

In graph 2 below we can see the technological development and the learning theories placed together on the timeline. The learning theories are recognised by Weibell (2011) and dated according to influential theories in which they are linked to.



Graph 2: Completed timeline with human perspective

We are going to make abstractions from the learning theories applying the perspective of learnability so that we can use them to cover the guidelines to gather expressions that correspond to them.

Behaviourism

As behaviouristic learning theory is based on conditioning, and the focus is on the situation, it forms a clear learning event in a usage situation:

- *Conditioning as a basis of learning: system offer feedback*

We recognised conditioning in theory of knowledge in the world. In application design we can simplify this to limiting choices to minimum:

- *Knowledge in the world: limiting the options*

Cognitivism

In cognitivist learning theory the deliberation and understanding the information acquired is in key position, we name the result of the deliberation simply realisation:

- *Realisation as a basis of learning: user learns through reasoning facts*
- *Realisation as a basis of learning: user learns by combining information*

Constructivism

The learner has existing knowledge base of the subject matter, and it functions as a basis of the handling of new information. In our case, the existing knowledge is understood as earlier experience in similarly behaving systems or real world equivalent of the functionality of the application. Therefore, we see the learning process as transfer of skills:

- *Transferring skills as a basis of learning: user applies knowledge of similarly behaving applications*
- *Transferring skills as a basis of learning: The application is based on standard user interface design, which enables expanding and applying the existing knowledge.*
- *Transferring skills as a basis of learning: The application mimics true world objects.*

Humanism

As humanistic learning theory expresses the individual learning way of learning and the effort the user faces in the learning situation, we will derive motivational aspects from the theory instead of learnability traits. Engeström (1982, 32) says that through intrinsic motivation we reach deep-level learning as the need to understand and acquire skills required in the situation becomes evident.

- *Intrinsic motivation: user has understanding of the skills needed to master the usage of the application, and is motivated to gain these skills*

Considering the emotional aspect in humanistic approach, deriving learning traits based on users emotions is justified:

- *Feelings as a basis of learning: finding techniques evoking positive feelings.*

Situational Motivation

As situational motivation does not tend to last long, it is used in situations that require little time, i.e. to spark motivation to try out a new application is achieved by successful situational motivation. As it is characterised by superficial factors, and focuses on secondary objectives, a trick or exceptional graphics may be used as a motivator.

- *Situational motivation: captivating application icon*
- *Situational motivation: application has an interesting name*
- *Situational motivation: tricks, such as motion, sounds, or exceptional graphical design*

Indirect Motivation

The outcome, avoiding a punishment or receiving a reward is the driving force, is what describes the indirect motivation. To know that after a certain time period the application changes, or opens more features for the user, could be a motivational factor that keeps the interest in user.

- *The application is rewarding to use*

Intrinsic Motivation

Although according to Engeström (1982, 32), the intrinsic motivation is the best way to reach deep-level learning, it is demanding task to form abstraction from the complex idea of intrinsic motivation, and is therefore not in the reach of this thesis.

5.1 The analysis matrix

Learning theories

To form the analysis matrix used in the content analysis we will gather the abovementioned abstractions to a table seen below. The hierarchy runs from left to right starting from the learning theory and the perspective applied in the content analysis finishing to the expressions found in the source material in the cells to the right as seen in table 2 below. The idea is to arrange the content without losing the information. When the content is gathered in a table it will be formed into a tangible form enabling us to make deductions and conclusions. The finished table is seen in attachment 1.

Table 2: The analysis matrix

Learning theory	Abstraction	Abstraction subclass	IOS (Apple)	WP (Microsoft)
Behaviourism	Conditioning	System offers feedback		
		Limiting options in order to guide users behaviour		
Cognitivism	Realisation	Reasoning		
		Combining information		
Constructivism	Transfer of skills	Applying knowledge of similarly behaving application(s)		
		Consistent design		
		The application is based on true life		
Humanism	Feelings	Techniques evoking positive feelings		

Motivational perspective

Because motivation is not a direct approach to learning in form of a learning theory, we gather the motivational aspects to a separate table. The logic is the same as in table 2; in the column to the left we name the nature of motivation and in the next column to left the abstraction of the motivation. The last two columns we reserve to the expressions emerging from the data, as seen in table 3 below. Exploring motivational aspects of the guidelines is my suggestion for follow-up of this study. Suggestion for the motivational table is seen in attachment 2.

Table 3: The motivational perspective

Motivation	Abstract	IOS (Apple)	WinPhone (Microsoft)
Situational	The application is captivating		
Indirect	Reward		
Intrinsic	User understands lack of skills to master the application		

6 Guidelines for Application Developers

In the guidelines Apple and Microsoft approach the usability of the operating system and the device very differently. As we have already noticed Microsoft concentrates on the device and Apple on the user. Apples documentation states “A great user interface follow human interface design principles that are based on the way people – users – think and work, not on the capabilities of the device.” Microsoft takes an opposite position: “Windows Phone provides an exciting opportunity to build applications that are available wherever the user is.” though the user is mentioned again later: “Spend time up front thinking about end users and how they navigate through the user interface of your application.”

Microsoft and Apple produce high-class software and hardware for smartphone users. In my own experience there is a great difference between the end products. The two companies have a long history behind them, and the culture of how things are done has been evolved under these years. In the Steve Jobs biography by Walter Isaacson (2012) the difference is expressed in the basic philosophies of Bill Gates and Steve Jobs: Apple produces devices where hard- and software is integrated in one package, and Microsoft provides standardised software to run on hardware produced by others.

IOS Guideline

In iOS guideline usability stems from how the user thinks and works. The message is to maintain focus on the primary content. Badre & Santos and Dix et al. use effort as one measuring tool for learnability. In the guidelines (Apple 2012, 47) it is suggested to minimise the effort to input information.

Windows Phone Guideline

In Windows phone guidelines usability is achieved with the features of the device. To ease designing the prototype of the application guidelines introduce a checklist that consists of review questions of hardware features of the device. The application usability is good if the application is making full use of the platform and OS. For example hints, such as that 'motion hides slow performance'.

7 Results of This Study

We limited the data in this thesis to two sources, and as a result, the information gathered in the analysis matrix is very constrained. Because the data is qualitative in nature, delving into the data with more iteration could produce more findings. Conducting an iterative study with broader data such as including Android developers guidelines could be a follow-up study. Given, that Apple and Microsoft have totally different perspectives of the subject matter, both have similar elements they emphasise. From the four approaches to learning we recognised elements that are indeed used as guidelines for developers. The findings can be found in the table in attachment 1.

Behaviourism

Feedback in iOS acknowledges the action and assures users that app is processing. It is used in many ways to communicate status, alert user and give warnings, although the warnings are to be soft and shown only if necessary. Feedback in Windows Phone is based on users behaviour. It can be passive to surface new information that the user may be interested in. It is used to communicate user that device is responding to action. Much more closer to behaviourism than feedback is the limiting action to guide user's behaviour. Apple provided an approach that uses limiting technique to make the application more understandable.

Cognitivism

Two different ways to wake realisation in the apps emerged from the guidelines: Reasoning the functions and combining information. IOS guidelines based on realisation (cognitivism) using clearly labelled elements so that users realise instantly what their function is. Apple guides the developers to use correct terminology, and that way combining the information (knowledge base) of i. e. professional vocabulary, the application is clearer that with incorrect terminology. Windows Phone emphasises that the applications should be intuitive, and the users should learn the use by playing around the app. The apps should also be more practical than realistic. As if the controls are designed to be practical, chances increase that the users realise how the app works. We recognise using motion to instruct the user how things work in the app to be a way to combine information.

A major difference between Apple and Microsoft is that Microsoft does not encourage developers to mimic real life objects. Apple on the other hand does. The idea in basing applications on real life objects is that learning to operate the application would be natural and users could learn the application quickly. We recognise this as constructive learning, as the skills acquired in real life is serving as a base to learning. Microsoft considers practical operation to serve more purpose than realism. Instead of recreating a knob or a dial, a slider control can be more practical on a touchscreen.

Constructivism

Both Apple and Microsoft remind that the consistency of the application control in the user interface is relevant in the process of learning how to use a new application. We see consistency as a part of transfer of skills, which is placed under constructivism in our system. Two ways to transfer skills emerged from the guidelines: the transfer of skills of similarly behaving applications and designing the application on consistent UI elements. Microsoft emphasised the transfer of skills of similarly behaving applications, but did mention that the very reason the guidelines exists is that design has to be consistent. Apple approaches the subject from both perspectives and adds guidelines that they are supposed to be based on the consistency of the overall design of the application.

Controls and gestures should work in same way across all applications, and Microsoft suggests that when developer encounters a usability issue, they should refer to other applications in Win Phone Marketplace to see how other applications have solved similar problems.

Humanism

Taking humanistic approach into account in the guidelines depends very much on the interpretation. As the emotions affect learning, we take the emotional aspect into account. We recognised one case from both Apple and Microsoft. Apple considers the users to value more an application that is developed for the operating system, if not people might value it less. Microsoft ties the feelings of the user to motion, as the motion is said to delight the user. Microsoft believes that delighting user leads to endearing the device to the user.

8 Conclusions

Realising an idea such as defining learnability and applying the definition as an analysis tool to evaluate how learnability is taken into account in the guidelines Apple and Microsoft provide to the application developers was a lengthy process. The conclusions of the study are naturally based on my own subjective interpretations. Although I am not sure if I have accomplished my primary goal, which is to find out if there is anything we can do to produce applications that are easier to learn, we have found something as a result of this study.

The guidelines for the developers concentrate in graphical interface and upholding a consistent logic in the system. Microsoft's guidelines are engineer-driven set of hints as to where to place a button or a scrollbar, whereas Apple take much more broad-minded approach, a humanistic stance even, in their guidelines.

One interesting polarisation was that Microsoft suggests favouring practicality over realism and Apple encourages the developers to mimic real life and valuable materials such as high-class leather in calendar application. Although Apples guidelines state that there are situations when a realistic approach become hindrance instead of enhancement to user experience. A balance between UI customisation and clarity of purpose and ease of use is achieved through reasoning. The content and the purpose of the app is the deciding factor whether or not to customise the controls. In Microsoft the principle is that applications should not have custom controls that mimic real life.

About the definition of the user, Grossman et al. are not taking a stand on the definition of the user in their study. When we consider a modern user who has grown up using information technology, in a sense everyone who has used a smartphone or an application is a subsequent user. That is Smartphones and computers share certain usability features that enable the user to quickly grasp the usage logic of the interface of the device. It is highly probable that a user from our time period would consider the user interface to be graphical and desktop-based or the touch-based tablet-computer user interface. Grossman et al. introduces us Shneiderman's definition of learnability, which is measured how much time it takes for a user to learn the commands relevant to a set of tasks. This has nothing to do with today's user interfaces.

In order to justify the fact that I have picked learnability to be a key feature in usability, during the making of this study I have come to a conclusion that a highly learnable application sparks an intrinsic motivation in the user. The user experiences the application to be pleasant, and that adds to the usability of the application. I believe, that when we find that we are able to navigate in the application without effort intuitively, we feel more at easy with the application.

9 Summary

Writing a thesis is a process. In my case it started from an observation: in early 2011 it was obvious that Nokia was not able to provide a device with powerful enough user experience to compete with the iPhone. They began collaboration with Microsoft to produce a Nokia device with a Windows Phone operating system. Could it be that simple: To just take an operating system and plant it in a device to produce a great user experience? I wanted to understand the facts behind the difference in the user experience between different operating systems and devices.

I am convinced that learning to use a device or software is the key element in usability, and usability serving as a gate to a meaningful user experience. In addition, I am fascinated by the psychology of how to create devices and software that do not require studying the manual to start operating. How to create interface that is intuitive?

Initially, I was prepared to conduct a user test on Nokia Lumia 800 and iPhone 4S. The test would have been based on Nielsen's definition of usability. I was not quite satisfied with the definition of learnability, and while gathering data I noticed the literary review by Grossman et al. in which they state that there is no clear definition of learnability in the world of human-computer interaction. I had stumbled to a dead end unless I formed my own definition.

The testing of Nokia and iPhone required a model in which the learnability traits would be presented. The idea of a construct sparked from merging the learnability traits that were essential when measuring the learnability features of smartphones with the model. The guidelines became primary, and in the end, the only data by surprise. I found that it was convenient to apply the analysis tool to guidelines, as the guidelines provided basis to applications and thus served my intentions better than a test of my own.

The most challenging part conducting this thesis was forming the construct and familiarising myself with the learning theories well enough to be able to deduce abstractions to apply in the analysis. Combining two or more sciences and cross referencing the data leads to new findings.

Lastly, I would like to mention that studying learning has been a great learning experience. It has given me skills to modify, observe, and interpret my own learning. Even more, while studying cognition Maturana and Varela made a profound impression on me with explaining that the fact that while I am in the universe, the whole universe is in my mind. Scito te ipsum- know thyself, for it is in our nature to learn.

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11 Attachments

Attachment 1. The analysis matrix of learnability

Learning theory	Abstraction	Abstraction subclass	IOS	Windows Phone
Behaviourism	Conditioning	System offers feedback	Feedback acknowledges people's actions and assures them that process is occurring (Apple 2012, 20).	Make sure motion serves a purpose in your application. The best Windows Phone apps use motion to bring the UI into life. Motion should strive to: 1. Give feedback based on the user's behaviour. (Microsoft 2012.)
			User feedback should be subtle, but clear. iOS apps often use precise, fluid animations to show the results of user actions. iOS apps can also use the activity indicator and the progress view to show status, and the alert to give users warnings or other critical information. (Apple 2012, 25.)	Motion adds elegance. Animations can be used to let the user know that the phone is processing, not frozen, and it can passively surface new information that the user may be interested in. (Microsoft 2012.)
			Animation is a great way to communicate effectively, as long as it doesn't get in the way of user's tasks or slow them down. Subtle and appropriate animation can: - Communicate status. - Provide useful	Be sure to provide proper feedback to users when they tap a touch target. Design visual states for custom controls that show them in different stages of operation or activation. Users should

			feedback. - Help people visualise the results of their actions. (Apple 2012, 69.)	know when a button has been pressed or a control has been toggled. (Microsoft 2012.)
			Never quit an iOS app programmatically because people tend to interpret this as a crash. However, if external circumstances prevent your app fro functioning as intended, you need to tell your users about the situation and explain what they can do about it. Depending on how severe the app malfunction is, you have two choices: - Display an attractive screen that describes the problem and suggests a correction. - If only some of your app's features are unavailable, display either a screen or an alert when people use the feature. (Apple 2012, 73.)	
		Limiting options in order to guide behaviour	Strive to make your app instantly understandable to people, because you can't assume that they have the time (or can spare the attention) to figure out how it works. Make the main function of	

			your app immediately apparent. You can make it so by: 1. Minimizing the number of controls from which people have to choose. (Apple 2012, 54-55.)	
Cognitivism	Realisation	User learns by reasoning	Strive to make your app instantly understandable to people, because you can't assume that they have the time (or can spare the attention) to figure out how it works. Make the main function of your app immediately apparent. You can make it so by: 2. Labelling controls clearly so that people understand exactly what they do. (Apple 2012, 54-55.)	Making your win phone app intuitive to use is extremely important. Phone apps should require little or no training to be used. Users should be able to figure out how to use all of your applications features easily by just playing around with it. (Microsoft 2012.)
				Beauty is integral in mobile applications, where it is synonymous with intuitive operation. In Windows Phone, the visual elements of your Start Tile, splash screens, icons, controls, and navigation should draw attention to relevant tasks, priorities, or operations inside your application, and present information in novel, eye-catching

				ways. (Microsoft 2012.)
				Generally speaking, applications should not have custom controls that seek to mimic real life. For example, the FM Radio feature in the pre-loaded Zune application does not use a dial, knob, or series of buttons to control the choice of station. Instead, it uses a slider control to adjust the frequency, a Play/Pause button to toggle the radio on and off, and a Favourites button to save pre-set stations. (Microsoft 2012.)
		User learns by combining information	As you consider the terminology to use, strive to match your audience's expertise withe subject. For example, even though your audience might not be made of expert chefs, you're fairly confident that they appreciate seeing the proper terms for ingredients and techniques. (Ap-	Make sure motion serves a purpose in your application. The best Windows Phone apps use motion to bring the UI into life. Motion should strive to: 2. Teach the user how to interact with touch targets. 3. Indicate how to navigate to previous or succeeding

			ple 2012, 24.)	views. (Microsoft 2012.)
			In all your text-based communication with users, use terminology you're sure that your users understand. In particular avoid technical jargon in the user interface. Use what you know about your users to determine whether the words and phrases you plan to use are appropriate. (Apple 2012, 55.)	
Constructivism	Transfer of skills	User applies knowledge of similarly behaving application(s)	Consistency in the interface allows people to transfer their knowledge and skills from one app to another (Apple 2012, 19.)	Consistency is vital to your innovations; it makes your application easy to learn and obvious to operate. If you encounter a usability challenge, look at how other applications in Win Phone Marketplace have solved similar problems, or consult the Win Phone Forums in the Dev Center. (Microsoft 2012.)

			Strive to make your app instantly understandable to people, because you can't assume that they have the time (or can spare the attention) to figure out how it works. Make the main function of your app immediately apparent. You can make it so by: 3. Using standard controls and gestures appropriately and consistently so that they behave the way people expect. (Apple 2012, 54-55.)	Motion adds consistency. Transitions can help users learn how to operate new applications by drawing analogies to tasks that the user is already familiar with. (Microsoft 2012.)
			Use UI elements consistently. People expect standard views and controls to look and behave consistently across apps. Follow the recommended usages for standard user interface elements. In this way, users can depend on their prior experience to help them as they learn to use your app. You also make it easy for your app to look up-to-date and work correctly if iOS changes the look or behaviour of these standard views or controls. (Apple 2012, 61.)	To provide a consistent experience throughout the Windows Phone platform, it's important to follow a common structure while placing buttons. Doing so will provide a consistent and simple structure for users to navigate through. (Microsoft 2012.)

				If you use multiple Tile images, they should be visually consistent with each other and have a recognisable the or style (Microsoft 2012.)
		The application is based on consistent design	A consistent app is not a slavish copy of other apps. Rather, it is an app that takes advantage of the standards and paradigms people are comfortable with. (Apple 2012, 19.)	One reason for Microsoft corporation having a guide like this is to put forth the standard for how user interaction is to be accomplished on the Win Phone. For overall phone experience to be pleasant, the manner of interaction needs to be consistent within and across applications. Make your application consistent in how users interact with it for things like navigating, changing settings... ...and other interactions. (Microsoft 2012.)
			To avoid confusing people, never use the standard buttons and icons to mean something else. Be sure you understand the documented meaning of a standard button or icon; don't rely on your interpretation of its appearance. (Apple 2012, 62.)	

			Avoid associating different actions with the standard gestures users know. Avoid creating custom gestures to invoke the actions users already associate with the standard gestures. In general, avoid defining new gestures. When you introduce new gestures, users must make an effort to discover and remember them. (Apple 2012, 69-70.)	
		The application is based on true life objects	When appropriate, add realistic, physical dimension to your app. Often, the more true to life your app looks and behaves, the easier it is for people to understand how it works and the more they enjoy using it. (Apple 2012, 63.)	
Humanism	Feelings	Techniques evoking positive feelings	You know what your app does and who its audience is; now you need to make sure that your app looks and feels like it was designed for an iOS-based device. This is crucial because people have high expectations for the apps they choose to install on their devices. If your	Motion delights the user. Animations and other visual feedback create moments of surprise and intuition. Delights also endear the device and app to the user. (Microsoft 2012.)

			app feels like it was designed for a different device, or for the web, people are less likely to value it. (Apple 2012, 24.)	

Attachment 2. The analysis matrix of motivation

Motivation	Abstract	IOS	Winp
Situational	The application is captivating	People often use iOS-based devices while they're on the go, and in environments filled with distractions. Part of your job is to create a responsive, compelling experience that pulls people in, gets them quickly to the content they care about, and maintains focus on that content. (Apple 2012, 30.)	Motion delights the user. Animations and other visual feedback create moments of surprise and intuition. Delights also endear the device and app to the user. (Microsoft 2012.)
		Spend the time to design a beautiful, memorable app icon. It's not unusual for users to base the decision to download an app on the quality of its app icon. (Apple 2012, 65.)	Users expect visually pleasing and carefully considered layouts in modern applications. Your application may make use of intentional open space, typography, or animation to attract the eye; alternatively, you can make your designs minimalistic and let the content be the central attraction. Whatever you decide, make a play for users' attention. (Microsoft 2012.)
		It's often said that people spend no more than a minute or two evaluating a new app. When you make the most of this brief peri-	

		od by presenting useful content immediately, you pique the interest of new users and give all users a superior experience. (Apple 2012, 72.)	
		Your App Store description is a great opportunity to communicate with potential users. In addition to describing your app accurately and highlighting the qualities you think people might appreciate the most, follow these guidelines: - Be sure to correct all spelling, grammatical, and punctuation errors. Although such errors don't bother everyone, in some people they can create a negative impression of your apps quality. -Keep all-capital words to a minimum. The occasional all-capital word can draw people's attention, but capitalizing every letter of every word in a description can make it very difficult to read. (Apple 2012, 61.)	
Indirect	Reward	Rich, beautiful, engaging graphics draw people into an app and make the simplest task rewarding (Apple 2012, 64).	Motion masks slow performance. When network speeds lag or the system pauses to work, animations can make the user's wait feel shorter. (Microsoft 2012.)
		Consider replicating the look of high-quality or precious materials. If the effect of wood, leather, or metal is appropriate in your app, take the time to make sure the material looks realistic and valuable. (Apple 2012, 65.)	
Intrinsic	User understands the lack of skills to master the usage of the application		