Institutionen för teknik och naturvetenskap
Department of Science and Technology

Examensarbete

Digital Learning Designed for Entrepreneurial First-Time Smartphone Users

Examensarbete utfört i Medieteknik
vid Tekniska högskolan vid Linköpings universitet
av

Marcus Nygren

LiTH-ITN-EX--YY/NNNN--SE

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Linköpings universitet
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Todo list

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Design och utveckling av mobilinlärning för entreprenörskapscoacher i Uganda och Zambia
Digital Learning Designed for Entrepreneurial First-Time Smartphone Users

Författare
Author

Marcus Nygren

Sammanfattning
Abstract

If your thesis is written in English, the primary abstract would go here while the Swedish abstract would be optional.

Nyckelord
Keywords

problem, lösning

Sammanfattning

Svensk sammanfattning här.

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If your thesis is written in English, the primary abstract would go here while the Swedish abstract would be optional.

Acknowledgments

Due to a chain of lucky events, this master thesis took the approach of combining service design, thoughtful interaction design, technology, learning effectiveness research, and entrepreneurship.

For service design, I want to thank Peter Gahnström at LiU Innovation, who led me to Expedition Mondial, and I especially want to thank Susanna for being a great tutor.

Thoughtful interaction design was introduced thanks to a recommendation from Lena Tibell and Konrad Schönborn, to go to Jonas Löwgren's first test lecture about interaction design at Linköping University, which led me to looking deeper into his literature, and discovering the book Thoughtful Interaction Deisgn, which was a perfect fit into the world of interaction design for me, coming from an engineering perspective. It showed me what being a great designer really meant, and I was compelled.

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For entrepreneurship education, I have so many to thank. But by biggest thanks goes to Konrad Schönborn, and the YoungDrive and Plan team consisting of Iliana Björling, Josefina Lönn and Gerald Emoyo at Plan.

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Thank you.

Linköping, Januari 2020
N N och M M

Contents

Notation

Några mängder

Notation	Betydelse
$\mathbb{N}$	Mängden av naturliga tal
$\mathbb{R}$	Mängden av reella tal
$\mathbb{C}$	Mängden av komplexa tal

Förkortningar

Förkortning	Betydelse
ARMA	Auto-regressive moving average
PID	Proportional, integral, differential (regulator)

1

Introduction

Introduction text

1.1 Background

YoungDrive and digital education.

1.1.1 Entrepreneurship Education, YoungDrive

En halv miljard unga människor i lever i arbetslöshet runt om på jorden (enligt World Economic Forum) och ungdomsarbetslösheten i utvecklingsländer brukar kallas för en tickande bomb.

The team behind YoungDrive works to foster and educate young entrepreneurs in developing countries. In 2015, 12 000 entrepreneurs in Uganda were educated in starting their own businesses and the ambition is now to to scale the program to more locations.

The entrepreneurship education concept is to work as a plugin to organizations with existing structures on place. Today, the education is held for Plan International in two areas in Uganda, Kamuli and Tororo. This is how it works:

- YoungDrive moves an entrepreneur to the location, which becomes Country Manager
- Who educates 6 local project leaders (4 days)
- Which educates 25 coaches in the 2 locations (5 days)
- Which finally roll out the training to the youth groups (10 sessions)

The entrepreneurship education program YoungDrive now requests two digital modules, to reach even better results and to be able to scale up the operations to more locations with confidence. The overall aim of my Master thesis is to do a Minimum Viable Product (MVP) of module 1, the Coach module. The master thesis is about how to design an app for entrepreneurship education, including evaluating it's effectiveness towards the coaches. The result is an app which the coaches use during and after the coach training.

1.1.2 A Working Future, Plan Uganda

"With funding and technical support from SIDA, Plan International Sweden and Accenture Development Partnership (ADP), Plan International Uganda is implementing A Working Future – Uganda (AWF), a three and a half year project intended to support employment and improve the economic empowerment of youth, with the targeted age group being 12,000 15 to 25 year-old young people. Savings Groups are used as an entry point to communities, a mechanism for organising youth and a platform for financial education and capital build-up.

To help youth move into the local economy, AWF provides practical entrepreneurship training and post-training mentoring. The greatest impact has been on individual income generating activities where youth have undertaken a new activity or diversified or somehow improved existing activities. An informal inventory of activities revealed a good variety of businesses in small trade, buying and selling agricultural produce, food processing and some animal-raising. Many of these are the result of market research rather than youth just copying activities already existing in their communities.

A lot of these businesses can be started on a modest scale with small amounts of capital that youth can access from their Savings Groups. Most members seem to have a plan for scaling up and show great discipline in reinvesting profits to build a larger capital base. One field assessment showed that many had doubled or multiplied their individual investment several times in a two to four month period.

Forging relations with private sector businesses to help youth take advantage of markets outside their communities is another feature of AWF. A micro franchise relationship has grown between a large manufacturer of household products and Savings Groups members who serve as sales agents in their communities. Other marketing and technical links exist with a large commercial producer of poultry and pigs and a distributor of solar lighting products."

1.1.3 Digital Education

In recent time, e-learning has had a tremendous impact both outside and inside the classroom. Most prominently, Salman Khan innovated flipped classroom when he created Khan Academy, recording high-quality education videos and publishing for free on YouTube. There are also examples of universities innovating, like MIT OpenCourseWare, or startups like Knowly and Lurn. With a growing teacher interest, research so far shows that digital education is hard, risky

and possibly rewarding. Thus, digital education shows both great potential and great considerations.

1.1.4 Uganda

Beskrivning av land:
Social Innovation and Social Entrepreneurship in Uganda:

1.2 Purpose

Purpose of the app

The app has the following purposes:

- Validate the coaches' level of knowledge during their education
- Train the coaches on distance
- Certify all staff

Young Drive's experience goal for the app is "It should be easy to understand, pedagogical and enjoyable to use, and the coaches should think it is fun and meaningful to learn via the app".

1.2.1 Research questions

There are two main research questions. The first question is the main focus of the master thesis (75%), whereas question #2 should stand for circa 25% of the work.

1. How can a design process of an application for entrepreneurial learning be implemented in a developing country context?
   (a) How is the development affected by the technical possibilities?
   (b) How is the design affected by the contextual constraints, e.g. young entrepreneurs, entrepreneurship education, and culture?
   (c) How can quiz questions be developed to support entrepreneurship learning?
2. How can user's feedback be used to inform modifications of the app?
3. How does design affect usability and learning done via the app?

1.3 Aim

In response to the research questions questions, the master thesis aims to contribute to:

- Be a contribution to the domain entrepreneurship education

- Demonstrate how certain technical design constraints can be overcome in a developing world context
- Provide methods of investigating usability and learnings with a digital training tool in the real-world training context
- App development in place in Uganda with the target group, combined with service design, means that I have innovation height

1.4 Limitations

The following things will be overlooked:

- Learning new material, will not be a focus of this thesis. Instead, material repetition is priority. As a consequence, instead of having three control groups: one group which has had the YoungDrive program and the app, one which has the YoungDrive program but without the app, and one which has not had the YoungDrive program but had the app, I will focus solely on how existing material can be tested and improved.

An implication of the time limit is that how the app should be designed for long-term development, after the Master thesis work is finished, will be mostly overlooked.

1.5 Definitions

The following words will be defined according to scientific definitions in the final report.

Entrepreneurship is the act of creating new businesses. An *entrepreneur education* is when an entrepreneur goes trough training. *Training* can be both physical and digital training, but always has the purpose to improve the skills or knowledge of the trained. *Effectiveness* is about keeping the same quality with less means (economical, physical, time resources, etc). *Coaching* is the activity in which a person is helped by being asked questions and support, often by a person. A *digital tool* is an electronic help for a person, designed to solve or assist a person in solving a task that otherwise would have been more cumbersome. A *digital education*, is an education which takes place on an electronic device, either partly or fully. An app or *application* is a kind of digital tool, and can often be downloaded from an app store, either on mobile or web.

In the final report, *entrepreneurship education* can be defined according to Ruskovaara (2015), and I can also use Liñán, F. (2004). The author talks about Intention-based models of entrepreneurship education. Piccolla Impresa/Small Business, 3(1), 11-35, contains a definition which may be useful as well.

Formative assessment (given to you, for your own sake) instead of *summative assessment* (given to the employee, for the employee's sake). You have to secure that it's a process. You have to see that there is an effect! "Assessing for Learning"

:) - much debated, has drawbacks. Feedback is one of the most effective ways for learning.

2

Theory

This chapter is divided into three overarching areas: design for learning, design process and app/web development.

2.1 Design for Learning

This section deals with considerations on how to design for learning, teaching and assessment.

The first section is about entrepreneurship education. The two sections thereafter, presents advancements within pedagogical development, applicable to mobile learning: cognitive psychology, and social psychology.

2.1.1 Considerations for Entrepreneurship education

According to Dickson **?**, there are few empirical studies available on entrepreneurship education.

Ruskovaara & Pihkala **?** concludes, that the teacher seems to be the main factor for entrepreneurship education, and that research agrees with them.

There seems to be no indication of difference between men and women, nor previous professional teaching experience.

Entrepreneurial activity seems to lead to better entrepreneurship education.

Recommendations for enhancing entrepreneurship education practices are mainly two things.

First, the playful side of teaching and learning is mentioned **?**.

Secondly, they encourage teacher training that develops the competences as a mentor, enabler or coach.

2.1.2 Designing learning using Cognitive psychology

Cognitive psychology deals with how our brain works in regards to our memory.

This section presents strategies and techniques to design learning for the mind, and what needs to be considered.

Two aspects are especially relevant when it comes to education: how humans learn (the first four sections), and how humans forget (the two last sections).

In how humans learn, the purpose is to find the most powerful strategies and techniques to design effective learning (mapping educational objectives, how to build skills, pattern-matching techniques, and the power of reflection and assessing).

In how people forget, UCLA Bjork's Learning and Forgetting Lab **?** researches how people forget, and how to design so that people do not forget (see Retrieval practice and Spaced practice).

Learning the Right Things: Mapping educational objectives with Bloom's Revised Taxonomy

What to learn should be determined by learning objectives. Depending on the learning objective, and where it fits in the Knowledge dimension and Cognitive Process dimension of Bloom's Revised Taxonomy, the design of the learning needs to be different. **?**

Building skills: by Spaced practice, Deliberate practice and Perceptual exposure

Spaced practice deals with spreading out learning, with the purpose of not forgetting.

Designing for this, could mean making the user apparent on the person's metacognitive ability (personal insight into what you'll remember), and meta-memory (when you need to repeat information in order not to forget).

Moreover, dividing learning into 45-90-minute chunks, getting to 95% reliable within three sessions, has been proven highly effective. This is called deliberate practice.

Sierra presents a number of strategies, most notably research within deliberate practice **? ?**. Deliberate practice has been proven to be an effective way to build skills. It has also been tested before for mobile learning environments. **?**

Sierra **?** suggests skills to be divided into three buckets: can't do (but need to do), can do with effort, and mastered (reliable/automatic). The goal then is to move skills from can't do into mastered, in the best way possible.

Desirable difficulties applies: with deliberate practice, it may feel as if learning gets harder and harder, but in the long term the user is actually learning more. As a result, less people does true deliberate practice, but they do not get the same reward in return. This needs to be designed for, e.g. using social psychology.

A way to build skills quickly, is to utilize that the brain is brilliant at pattern-matching, by the method "perceptual exposure". **?**

By exposing users to very high-quality samples during a very limited time, experts can learn intuitively.

Learning from Assessment

Knowing what learners know, and don't know, is crucial to effective learning, Luckin **?** says.

Assessment can partly help to design for flow, matching challenge and ability **?**, which is effective for intrinsic motivation (see next chapter).

Moreover, it also has cognitive benefits. It can help to offer appropiate feedback, increase learners' awareness of their learning needs, and give accurate assessment and analysis, and allows learning to be tailored.

By recognizing differences of students, in their ability to understand what they know and how they can progress, it is possible to ensure that everyone achieves their full potential.

Effective assessment by a teacher or agent includes individual feedback (task-oriented and informal) and appropiate feed-forward advice.

Learning by Thinking: Reflection & Retrieval Practice

When reflecting, the student develops neccessary skills and self-awareness to refine their own learning activities. This surely applies to the teacher as well, Luckin says. **?**

Stefano **?** suggests that that reflection has been an overlooked area of research for a long time.

They found that individuals who are given time to reflect on a task, outperforms students who are given the same amount of time to practice with the same task.

His results suggests that reflection as an activity that can be more effective than additional learning.

Similar to deliberate practice, it is a desirable difficulty. Individuals in the test themselves, had a tendancy to allocate time to practice on the task rather than reflecting on it.

Bjork **?** shows that retrieval from memory is more effective than people who repeat reading the same thing to remember.

They also showed, that the more effective students, retrieves from memory.

E.g. "What was in that article?", instead of immediately reading the article, is an example of memory retrieval that is extremely effective for learning, their research shows.

One design method to encourage this, would be flip cards, where the question is on one side, the answer is on the other, versus giving the person a multiple-choice question.

2.1.3 Designing learning using Social psychology

Social psychology can guide the design, when there is a wish to make people behave differently. A big research area is motivation.

With a compelling context, the users are already motivated. Their motivation, is to become better. Kathy Sierra **?**, instead suggests the focus to be how to help users progress.

To do so, she suggests two factors: what pulls users off (derailers), and what pulls users forward.

First, Sierra argues working on what stops people matters more than working on what entices them. Here, cognitive load theory is highly relevant. Even though the area is part of cognitive psychology (see previous section), in this section cognitive load theory is described as a way to remove blocks.

Second, Sierra aruges that to pull users forward, to stay motivated, progress and payoffs are essential. Both of these, are investigated in terms of motivational psychology.

What pulls them off: Cognitive load theory

Sierra **?** describes how humans have scarce cognitive resources.

CBT is divided into three areas: intrinsic CBT, extrinsic CBT, and germane CBT.

Intrinsic CBT, needs to be dealt with if the effort is too high. Sierra **?**describes two strategies. She first says that according to deliberate practice, if you can not get to 95% reliability within three 45-90 minute sessions, split skills that can be done with effort into sub-skills. The purpose is to reduce time spent practising being mediocre.

Extrinsic CBT, the way presented to a learner, should be handled via designing to support cognitive resources, Sierra says **?**.

Scaffolding is a technique to step by step remove the support wheels for the user, e.g. present information in different ways.

Also, reduce cognitive leaks by e.g. don't make them memorise, and make the thing you want the user to do, the most likely thing to do (affordances). Everything that takes willpower, reduces cognitive leaks.

Germane CBT, is the work put into creating a permanent store of knowledge. To support cognitive resources, escape the brain's spam filter by making the information essential. Either by designing for the compelling context, or desining for just-in-time learning versus just-in-case, Sierra says. **?**

What pulls them forward: Motivational psychology

Progress and payoffs, are methods to stay motivated. The feeling of progress can be emphasised by a path with guidelines to help the user know where they are at each step, e.g. for a training.

The best payoff, is a intrinsically rewarding experiences. It is superb to gamification, says Sierra **?**. This goes in line with self-determination theory, where e.g. Pink **?** says that the surprising truth about what motivates us is that drive is fostered by autonomy, mastery and purpose.

The most efficient way is therefore to design for having intrinsically rewarding experiences.

Caring for the compelling context, why the user wants to learn the skill, are helpful strategies. Other strategies are flow, mentioned before, or to give high pay-off tips, helping the user progress in a fair way.

2.2 The Design Process

Interaction design talks about the creation of digital artefacts specifically. When it comes to the design process, it is influenced by related areas such as human-computer science, and more recently human-centered design.

However, various disciplines suggests different design processes. For example, agile development suggest how do develop software efficiently.

Whenever a project is multi-disciplinary, various design processes may need to be combined. Whenever this happens, design thinking becomes a skill essential to thoughtfully design the process.

Löwgren **?** writes about design thinking and useful techniques in general, from his interaction design perspective.

Service design thinking connects various fields of activity **?**, and it's methodology relies on being close to the users.

While interaction design talks about the creation of digital artefacts specifically, service design talks about the creation of services.

As some digital artefacts are used within a service, or can be thought of as both a product and service simultaneously, the combination of the two are very useful.

Each discipline holds efficient methods and tools, that can be modified to suit the specific situation even better. From the field of graphic design, mental models are usable. From interaction design, desirability, utility, usability and pleasurability are useful principles. While not naturally a part of service design, these have been useful in service design projects previously. **?**

In difficult situations, this places demands on the designer. This is where design thinking becomes relevant.

Here, relevant methods and tools are briefly described, and what it means to be a good designer.

2.2.1 A good designer

The result of a method can not be better than the people engaging in carrying out the process **?**.

With its user-centered and T-shaped focus **?**, service design can be said to equip the designer with tools both for reasoning and design ethnography.

This is neccesary, as a good designer can deal with the complexities of design: a satisfactory (and surprising) solution or design can be achieved while working in a highly restricted situation.

According to Löwgren, "real" design is about finding ways to design a project within the existing preconditions and limitations **?**.

While a researcher is interested in reality, a designer is interested in what reality could become. **?** Being thoughtful means conceptual clarity from the designer, caring for the vision, and being equipped with appropriate tools of reasoning.

There are three roles as interaction designer in particular can take: the computer expert, the socio-technical expert, and the political agent. The trend is increasingly towards socio-technical experts **?**, the middle ground.

This seems to be a perfect fit with service design, where interaction design is both technical skills and design, and service design can be both design and ethnography.

2.2.2 Thinking of a product as a service

Service design thinking is described as a process of designing, rather than to its outcome.

A service's intent is to meet customer needs. If it does, it will be used frequently, and recommended. **?**

As this is often not the case, service design can be applicable to fields including social design, product design, graphic design and interaction design.

The result can be a product service hybrid. When designed and considered well, service design shapes the value proposition and desirability of the product for the better.

2.2.3 Service design methodology

Below, brief descriptions of the five principles of service design is described, together with how the work is divided into iterations, and examples of tools that can be applied.

The five principles

Stickdorn **?** describes five principles that constitute service design thinking, and how to follow these.

The book describes how to follow these principles, by making the process user-centered (e.g. via design ethnography), co-creative (involve all stakeholders) and holistic (keep the big picture). Sequencing (visualize the service, and make iterations) evidencing (make the service tangible) are the two last important principles.

Sequencing: The iterative process

While literature and practice refer to various frameworks, with different number of steps, every service design project includes: exploration, creation, reflection and implementation **?**.

Nissar **?** suggests a model where one iteration consists of insights, ideation, trigger material, and interactions.

The iterations should come closer and closer to a desired outcome. It is not always obvious what this outcome is. For each iteration, the process takes the project closer, from Why? to What? to How?, often with overlaps **?**.

Tools

There are a number of popular service design tools that follows the five principles, e.g. how to make it user-centered.

Explorative tools are e.g. Shadowing, Customer Journey Map, Contextual Interviews, The 5 Why's (same as "Why-why-why" within interaction design **?**), Cultural Probes, Mobile Ethnography and Personas.

Tools to create and reflect can be done via a certain work methodology, e.g. agile development, and structuring and inspiring brainstorms, e.g. via "What if...?" and Co-Creation, inviting stakeholders in the creation process.

2.3 App/Web Development

The history of app and web development is rich and increasingly intertwined. First, websites were developed for desktop only, and when smartphones became popular, they were made responsive.

With today's possibilities of native mobile development or developing a native app using web technologies, there are numerous viable alternatives available if an app should work on several devices, depending on budget and preferences.

One of the main argument for developing an app in web technologies, is that the whole application, including the server, can be written in one programming language, JavaScript (full-stack).

Tools such as Apache Cordova can compile JavaScript applications into native apps. Thus, they can appear on Apple iOS and Android Play Store, as well as on the web, or installable offline on a smartphone from the computer.

JavaScript is developing rapidly as a language, as well as its ecosystem of frameworks and tools. Frameworks has emerged and matured, like Meteor.js, which makes building full-stack applications in JavaScript reliable and fast.

Previously, web hosting has been troublesome for JavaScript server applications. Today, tools as Meteor.js and Heroku have introduced free and paid hosting for such applications, with smart bindings to code platforms such as GitHub, which makes collaboration and version handling easy.

3

Method

Using novel methods like *service design* when developing the app according to research question #1 and *data-driven design* and interviews for understanding interaction according to research question #2.

3.1 Preparations in Sweden

These were the insights before going to Uganda, addressed in the initial work plan.

3.2 Methods

Experts and literature has been used to get a theoretical understanding of the relevant research areas.

In the first section, experts in the project are described with their name, role and professional area. In the second section, the literature basis is presented.

3.2.1 Experts

I want to thank the following experts, who either have already helped me with finding research material, or will contribute with knowledge during the project.

- Service design: Susanna Nissar and Erik Widmark, Expedition Mondial
- Social innovation: Peter Gahnström, LiU Innovation
- Technical support: Daniel Marklund and Stefan FalkBoman, YoungDrive

- Entrepreneurship education: Konrad Schönborn, Linköping University, Joachim Svärdh, Thoren Innovation School, Iliana Björling, YoungDrive, Josefina Lönn, YoungDrive
- E-learning: Henrik Marklund, Pedagogic Development at Lurn AB

3.3 Preparations in Uganda

3.4 Chosen Design and Development Process

I'm the computer expert kind of designer, but aspiring to be a socio-technical expert (which e.g. Expedition Modial are, as service design experts).

Expedition Mondial will help with a method for creating a MVP of the digital support for the coaches, so that the app is developed from the perspective of the end users and the education and a "learning by doing" mentality. The suggested design process was designed with them after a start-up meeting on Skype, and an Education day in Stockholm. During that day a crash course in service design was given, then creating a common plan for the future work based on my needs.

The result is that the design and development phase in Uganda is an iterative process with the human in focus. The process is built on top of service design process and methodology. There are three iterations.

Expedition Mondial will give support in each iteration, helping with the design of each iteration, and the are able to educate me and assists with the different stages and methodologies. They will assist with recommendations on service design literature, and can highlight reports, previous studies, etc.

Each Interactions phase consists of meeting with two coach groups (one with the app and one without the app), to be able to compare the two and measure effectiveness for research question #2.

Lena Tibell's and Konrad Schönborn's competence is extremely valuable to me when formulating questionnaires. How to frame the questions is an art. Therefore in preparation for meetings with the target group we should discuss exactly what I want to know and they will help to phrase the questions. Then, Expedition Mondial can examine the questions from their a development setting.

The trigger material is used in the Interactions phase of the new iteration. This process you can loop as many times as possible, but the Master Thesis is divided into three iterations.

Each iteration ends with two check-up meetings. The first meeting is with the Experts. The next meeting is with the Partners.

The Expert group consists of Expedition Mondial and LiU Innovation. In Expert meetings, I share with them my needs. Expedition Mondial can help with the design process, and LiU Innovation can help if additional resources are needed. The meeting lasts for one hour.

The Partner group consists of most notably Iliana Björling, and preferably also Lena Tibell and Konrad Schönborn. In Partner meetings, The Analysis for the iteration is presented and discussed. Then I will propose possible decisions

Figure 3.1: *One iteration consists of Interactions, Insights, Ideation and Trigger material. The* ***Didactic phase*** *in this figure involves Insights, Ideation and Trigger material. By learning what works and not, new ideas emerge and app design is made, as well as questionnaires for evaluation. The* ***Technical phase*** *in this figure involves to code the improved app design, and evaluate how it works technically.*

and discuss the alternatives. Finally, we conclude if the master thesis work is going in the right direction. These meetings should be causual and friendly, and not take a lot of time to prepare, so the next iteration can be of focus.

The time plan for the design and development phase can be seen in the section "In Uganda". The three iterations is presented below:

The iterations

This is how I want the process to continue:

Iteration 1

The first iteration will have a very broad scope. The focus is on the coaches' needs, motivations, and context. After creation of questions for questionnaire 1, I'll do interviews with coaches and other involved parties. If coaches are met in-group,

open questions and dialogue will be done in group for them to be comfortable, posting anonymous answers via post-its on the wall, which leads to specific questions. These sessions will be recorded.

A first analysis will be done to determine needs, motivations, and expectations. Then, a summarizing meeting will be held with the expert and the partner group to determine possible ways of going forward. A first trigger/paper material will be created, for iteration 2.

Iteration 2

This time, the iteration has a more detailed scope, with a hypothesis on what needs the app should meet and in the end, and test the trigger material created to meet those needs.

I'll be helped with questionnaire material 2. I'll facilitate co-creating interviews with coaches, make an analysis to identify important functionality, and have a summarizing meeting with experts and partners to determine the way forward. A second trigger material will be created, one which was digital, and one which was only made on paper.

Iteration 3

Finally, I will be supported with the third iteration, with an even more detailed scope. A co-creation workshop will be held.

Before the workshop, the wished functionality and goals should be well formulated. Then, it can be discussed how to best design the workshop, together with Lena, Konrad, and Expedition Mondial.

Questionnaire 3 will be created. In conjunction with the workshop the coaches can be tested, interviewed, and their interactions studied.

In the end of iteration 3, a final analysis will be done, and a final summarizing meeting with experts and partners will determine they way forward.

3.5 Answering research questions #1

How the topic of Entrepreneurship affects the work

The scope of the app is to examine the entrepreneurship the student already has. The goal is to give good feedback.

Entrepreneurship is a developing area of research. The topic and the YoungDrive's methology largely effects the work, via its ethos "Dream big, start small", "Can you sell?", and emphasis on fun. Their existing training material and the structure of the program needs to be taken in consideration.

Entrepreneurship means using a learning by doing methodology. A challenging part of the work is that YoungDrive consists of both the practical skills of the entrepreneur, theoretical material of running a business, and an entrepreneurial mindset. Therefore, both how to assess knowledge, and build habits, needs to be examined.

How a Physical education affects the work

The physical vs. digital interplay needs to be closely examined. How does the app interplay with the physical education? For this, service design methodology will be used.

How the Time Constraints and Cultural Differences affects the work

The biggest challenge with regards to time constraints and cultural differences is that it is difficult to understand the audience.

Action:

- It led to me started planning the master thesis several months ago
- It led to me choosing to spend 3 months in Uganda, because the client and academy is there, and start the design process when I'm there
- It led me to the topic of Service Design

Positives:

- I will come closer to the client and coaches by moving to Uganda, which is necessary when taking a service design approach

Negatives:

- I will have limited internet outside of the work location
- Long distances between work place and home compared to Sweden
- I will still have long distances and limited access to coaches

These negatives needs to be overcome, by narrowing down the scope of the thesis work.

How the Design Constraints affects the design process
"Simple" in this cultural setting leads to design constraints and that design methodology becomes very important.

How the Technical Constraints affects the technologies used
Limitations on internet/electricity means:

- Web app
- Localized
- Database
- Fetch/pull functionality in the app
- Battery preserving app needed

Also, me as a developer have limited experience of building apps, and time constraints. As such, technical compromises should be made.

Furthermore, existing tools could be used, instead of building the app from scratch. E.g. using existing tools like Knowly or Typeform[1] during the first iterations for understanding users, and during development e.g. the Typeform API (http://typeform.io/). The Typeform API allows developers to create surveys from within their own applications or systems.

3.6 Answering research question #2

Consequences

To be able to answer research question #2, evaluation needs to be done. ***How the Evaluation affects the development process:*** If no evaluation, there would be no need to write code, instead of working with a hi-fi prototype by using existing design tools. Now, we want to use a data-driven approach to measure, and therefore an app needs to be developed.

How to measure

Answering research question #2 is a matter of choosing how to measure effectiveness. After choosing what should be evaluated, there needs to be a careful balance between what should be understood via interviews with the target group, and data collection via the app. There are three main aspects that are interesting:

These ways of measuring the questions are subject to change.

- **How do users interact with the app?** (Usability) Give the users a mandatory task (e.g. use the app once a week), and see if they use it more on a voluntary basis, in order to determine if they use the app *(Measure)* and determine why *(Interview and Measurement)*. "Have you during the latest week felt that you've needed any support? Have you then used the app? Did the app help? Or have you searched for support elsewhere?"

- **What usability aspects are associated with using the app?** (Usability) Do they like it? Ask: Are they stimulated? If not, why? What didn't they like? *(Interview)* When can they use the app, and when are they not able to?

- **What learning outcomes are associated with using the app for the coaches?** (Learning of Entrepreneurial Knowledge)) How good are they at answering the questions? 1. *(Measure)* What percentage of the answers were correct/inorrect? 2. *(Interview)* Were the answers were correct/incorrect because of lack of knowledge or wrong formulated?

[1] examples include https://showroom.typeform.com/to/ggBJPd and https://showroom.typeform.com/report/njdbt5/dIzi

Ask the teacher/country manager/project leader if they got valuable information. Ask: did it help them become a better teacher? Were the results trustworthy? *(Interview)*

Do they want to improve their knowledge via the app? This can be measured via how many times they repeat a test, what material they are studying for (e.g. measuring active time spent reading each section).

4

Implementation

4.1 Iteration #1

Here, the work and result from iteration #1 is presented.

Insights

Week 6-7 Learn about the YoungDrive organization

Start-up meeting with partners

On February 10th, a first stakeholder meeting was held between me and the country managers for YoungDrive (Iliana Björling) and Plan Interational (Shifteh Malithano).

Plan: Learn from previous work Led to visits and interviews with Designers without Borders and Grameen Foundation (carried out on February 26th).

Skype interview with Gerald, Plan, Tororo is used instead of both Kamuli and Tororo Entebbe, literature review & research Write on the report

Ideation

Week 6 Outbox workshop with Mango Tree Create Workshop #1 and Workshop #2 with Expedition Mondial

Week 8 Create questionairre guide with Expedition Mondial and YoungDrive Designers without Borders Grameen Foundation

Trigger material

Preperation Quizical Duolingo

Interactions

Week 7: February 23rd: Number of interactions for iteration #1 cut down Interactions canceled for week 7, the day before Wednesday-Friday, because of local elections.

"Det var tråkigt att höra att det inte blev lika många interaktioner som planerat. MEN jag tänker: Det här är verkligen en del av lärdomarna att jobba med tjänstedesign i andra kulturer (som jag även tar med mig från vårt projekt i Kenya). Det går bara att planera till en viss grad, och det blir aldrig riktigt som man tänkt sig :) Man får vara beredd på att ändra planen i sista sekund, mycket mer än vad man behöver i sin egen kultur. Bra lärdom!

Så utifrån dina fåtal interaktioner i början på nästa vecka kommer du iallafall ha en hypotes, även om den kanske är lite vagare än vad vi tänkt från början. Jag kan skicka dig nästa kapitel i Coaching Handbook som handlar om Analys senare i veckan så kan du börja fundera på hur du bäst gör analysen utifrån det material du har. " - Susanna, Expedition Mondial

Week 7, Thursday, February 25th I realize what I'm actually doing is "Designing and Developing Mobile Learning for Entrepreneurship Coaches in Uganda". The master thesis title is changed to this.

Week 7: Friday, February 26th Ringer Gerald 26 fredag februari, som meddelar att nya tidschemat jag hade är omöjligt. Han har bara bokat alla inblandade kl. 8-17, då Plan inte tillåter field trips p.g.a. local elections

Krismöte med Josefina, som föreslår att gå bakom kulisserna och engagera Christine och Patrick, utan Plans inblandning. Kanske till och med kan besöka coachgrupp Sammanfattning: interaktionerna har gått från 3 dagar, till 2 dagar, till 1 dag

Varje gång har jag behövt anpassa mig, och hitta ett nytt koncept Nu kanske det blir 1 dag i Plans regi, och jag ändå är i Tororo måndag-onsdag.

Week 8, Sunday-Wednesday in Tororo Sunday, travel to Tororo 4 (not 3 or 8) face-to-face-interviews 1 meeting with Plan, 1 with local partners Workshop #1: Customer Journey Map: A day as a coach Workshop #2: Quizical and Duolingo 2 field visits Stay over with Patrick

Week 8, Thursday & Friday Thursday: Expert meeting with Expedition Mondial and LiU Innovation Friday: Partner meeting with Linköping University and YoungDrive

4.2 Iteration #2

Here, the work and result from iteration #2 is presented.

The interactions for this iteration were planned to be in Tororo. However, during a meeting during the first week with YoungDrive project leader Josefina, I was invited to participate in the coach training in Zambia. A new work plan was created, so that I could travel to Zambia and develop the app and participate in the YoungDrive coach training together with the coaches.

Insights

There were two main insights from iteration #1.

1. The aim is for the coach to feel self-confidence for its youth session 2. The skill to be trained is having a youth session

During the evaluation meeting with Linköping University and YoungDrive, it was the determined that Iteration #1, is answering the research question #1, #1a, and #1b.

The iteration has provided a good basis for answering research question #2.

It was concluded during the partner meeting, that iteration #2 should:

1. Allow me to test the validity of my insights from iteration #1. 2. Be carried out in a way that I can compare usability and learning done via the app, between iteration #2 and #3.

Ideation

This was the start of the quiz app. The focus was on assessment. For example, it was decided with Iliana, that no facts would be presented before the quiz.

It was discussed, how the correct information about YoungDrive would be presented. Thus, for this iteration, questions were created by the YoungDrive team, and I developed the app.

The ideation started with me creating a quide how to write questions according to Bloom's revised taxonomy, which was shared to Iliana and Josefina.

The initial plan was that the team would only produce questions for two sessions, not all 10.

Iliana did questions initially for the two sessions, mapping each question to the Bloom taxonomy.

Then, when it was decided that the app would be developed and used during an actual coach training in Zambia, it was decided that questions would be created for all sessions.

Trigger material

Project leader Josefina in Zambia refined the first question sets, prepared for my visit in Zambia. Josefina created question sets with Bloom at the back of her head, also taking into account the structure and the order of the coach manuals, what it means being a coach within the topic, and lastly scenarios.

On the week before the trip, and on the airplane, I did a working prototype, a very basic quiz app, keeping it as simple as possible. I brought with be devices (tablets and smartphones).

When I arrived at the evening before the coach training started, I added the questions to the app, and installed the app to all of the devices. This process was repeated for all the days, Sunday-Friday.

Interactions

Design workshop #1

The coach training started with me having a design workshop with the coaches, not showing them the app that I had created.

Since the knowledge about smartphones and apps were low, I started by introducing these topics.

All were familiar with Facebook, so thus I showed the Facebook app. Me wanting to know what the app would look like if the coaches would have designed the app, I first needed to train them how to design an app via drawing wireframes.

Using postits, they started with during limited time drawing the start view from the Facebook app.

Then, they were asked to draw what they thought happened on the friend icon click, drawing the view on another postit.

Then, the mission of the YoungDrive app was described. They were then divided into two teams, having limited time to draw the best imaginable YoungDrive coach quiz app they could. First, they designed the app from the top of their heads. They then pitched their results to each other.

On the next iteration, they were to suggest and design improvements how the app should be designed to improve learning, not only assessment. They then again pitched their results to each other.

The result was fantastic, in the sense that it gave me an unbiased look at what the coaches expected from the app, what functionality wasn't important, and into their technical preferences.

The designs and insights gained were used throughout the week to further improve the app I had actually started creating, and gave great insights to who the coaches were and their thinking.

Assessment via quiz

At the end of each day, the app was used to test the coaches' knowledge. Each coach got either a smartphone, tablet or computer. The coach first took the quiz for the most recent session, and could then choose what to do next.

As there were no back-end developed, Josefina by hand documented the scores of each coach, writing the name of the coach, the session, number of correct answers, and what questions had been answered wrong.

Josefina then, when planning the next day, looked at the statistics, looking for trends that would inform the sessions for the following day.

She also evaluated the quality of the questions, before creating the new question sets for the next day.

Experimenting with quiz before or after the session

Since the coaches appreciated the app so much, we felt tempted to try what would happen with fun and learning if we tried using the app *before* a session instead of

only after. During the rest of the week, we continued, finally finding preferences and tendencies from the coaches, via observation, interviews, and survey.

Experimenting with design of questions

Number of questions Multiple-choice questions Framing of questions Challenge level of questions Determining what made a question hard

Testing the app outside the YoungDrive context

Test with refugee innovators was surprisingly successful, Humanitarian Innovation Jam Test with university student from Makarere University scored 100% correct

Result

Using the quiz before the session increases learning, slightly decreases fun of the session

The app works for assessment!
Results from the coaches:
Trends from the coaches:

Analysis

Bugs Simpler design than I thought (KISS)

Discussion

If I would have created myself, would have assumed more functionality was necessary and requested

Conclusion

- Short iterations are very effective, however not perfect
- Field hackathon, designing and developing together with the users, is fantastic
- I would never have come this far without the short iterations
- The app works for assessment!
- Fun and encouraging and good for learning for the coaches
- A good indicator for Josefina
- A great way to scale the YoungDrive training in the future, both for online coach-training and the physical training

4.2.1 Staging environment using Heroku

Needed when the Meteor free tier was removed. Connected to deploy from GitHub branches automatically. Could have benefitted from CI, passing tests before ready for production. Solved this by having a stage environment (since April 19th) where stage is YoungDrive-beta (branch Iteration 4), and YoungDrive is master.

4.3 Iteration #3

Insights

Findings:

- Josefina does not want to be replaced
- The app would be great and could actually work outside the physical coach training - with revision, be stand-alone, even being able to distribute online
- Refugee innovators has a great need for such an app
- Test with university student scored 100% correct, means that common sense can go a long way, and that the results can't be 100% trustworthy, and that multiple-choice questions has serious issues - this, we already knew during and before the coach training - but it needs to be taken care of

Check with findings iteration #1:

- The app is only working on assessment now, not for learning
- The need for a field app still feels relevant (especially for sessions long since the coach training)
- The potential for YoungDrive having online coach training is huge

Determine:

- Focus for the next iteration: design quiz app for learning, focus on field app (CI, CS, TM, FA), or design app that works stand-alone from the YD coach training.

After-talk with Josefina, on Skype in Uganda, 2016-04-02: Nu har vi praktiska bevis för vad jag upptäckte under Iteration 1:

* Utbildningen ska faktiskt träna dem i förbereda quiz-session * Därför borde även quiz testa detta * Vad det inenbär vara bra coach, är hålla bra ungdomssessioner * Det finns vissa coacher, Josefina hade velat stoppa från att hålla ungdomssession, om de inte har 90-100% correct information * Men hon kan inte asessa detta * Här, är quiz en väldigt bra möjlighet * Quiz-app under utbildning och ute i fält går därmed ihop

Ideation

Josefina: “Jag kan ju inte kontrollera dem på något sätt hur de förberett sig”

Förbereda session: Antingen inför du börjar, sedan har du ett hum vad du behöver träna mest Eller (bättre/säkrare iom quiz inte täcker allt), så bättre förebereder sig, och sedan gör quiz när de tycker de är färdiga

Har du fått 9/10 rätt, då är du förberedd! (9-10 rätt) Det de har fel på, det kommer de ju lära ut ungdomarna fel på.

Om du har 8 eller under, då ligger du i röd zon Om du har fel på t.ex. “Vad är en entreprenör?”, då kan du ju inte förklara det för ungdomarna!

Därför borde de ha alla rätt.

Där kan man ju också jobba mycket mer med feedback via appen, och skapa en annan typ av quiz för förberedande

Därför får jag Josefina att ta fram en ny quiz, som är "Förebered session X"

Syftet är att komma högre upp på Bloom’s revised taxonomy

Dessutom, pratade vi om utvärderings-appen: varför behöver den vara en app? Det är extremt tydligt att det fysiska ändå måste finnas. Den behövs för att ge coachen smart själv-utvärdering.

Lärdom: det passar faktiskt inom ramen för quiz-appen Frågor blir automatiskt meta-cognitive Passar jättebra med Learning by Reflection

Monitoring & Evaluation app can converge with Quiz App

När någon är där och ger dem feedback, så blir det extremt svart på vitt, att de inte är så himla förberedda som de tror

Och: “Vad händer om du ger fel information här?” Vad händer om du säger cost är X?

Varför behövs det en app för M&E? För coacherna, ska få insikt på hur de håller en session De är inte ärliga med sig själva egentligen

Appen skulle kunna ge självutvärderings-frågor?

Redan nu, så skulle man ju kunna fråga: “Vad hade hänt om du svarat X på Y?” “Varför är det viktigt du svarar rätt på detta?”

Appens fråge-struktur

För att förbättra multiple-choice och komma högre på Bloom’s taxonomy

Fyra idéer: 1. Coachernas idé från Zambia: "Gör om"-knapp (ger dig nytt quiz med bara de frågor du hade fel 2. Första idén för att lösa: håll in knapp för att spela in svar "Vad är en entreprenör?". När du klickar "Nästa", så syns multiple-choice och du väljer det alternativ som var närmast vad du svarat. Feedback experter: utmaningar med användarvänlighet (liknar Snapchat, ingen vana), du kan fortfarande välja det mest sannolika alternativet (coachen gör en självbedömning, kanske tycker A var närmast när B var närmast, och coachen kan ljuga). Fördel: YoungDrive kan använda de inspelade svaren på bra sätt. Nackdel för mig: tar tid att implementera.

3. Från Lena: gör som i NTA Digital, du får medalj guld, silver, brons baserat på hur många gånger du försökt få 100% rätt

4. Henrik Marklund kom med följande förslag istället, inspirerat av lärare han kände: "Är du säker?" efter varje fråga 4a) Först var idén: gör som läraren, Ta fram ett gemensamt betyg, MVG, VG, G, genom att vikta Korrekthet med Empowerment 4b) Fick feedback från Josefina: ha två separata staplar Korrekthet och Empowerment. Coacherna kan 1) vilja gamea systemet, och 2) undra hur de fick sin score. Kan då bli svårt att förklara.

Fanns extremt många fördelar med denna, och kom bara fram till ännu fler efter diskussioner med människor och Lena Tibell, framför allt hur denna kan förbättra utbildningen och 1-on-1 coachning, och bli väldigt bra självreflektion för coachen.

Sammanfattning, de 4 idéerna

App för lärande, inte bara utvärdering. 4 vägar att gå vad gäller hur frågor ska ställas: 1. Fältmetod: Efter du har fått slutresultatet så kan du trycka på improve för att få alla felaktiga svar. Klassiskt inom körkortsproven i Sverige.

2. LiUmetod: För varje försök sänks resultaten från guld, silver och brons. Motiverar till att studera innan = gamification.

3. Pedagogikmetod: Teknologi och förenkla livet. Efter varje fråga lades till ”hur säker är du på ditt svar?”. Kräver studenten att reflektera över sitt svar, metakognitivt tänkande.

Två staplar: Så här mycket rätt har du / Så här empowered är du!

4. Innan du får svarsalternativen så får du spela in dina svar, sen välja ett alternativ som de tycker är närmast. Det är bra för de som utbildar coacherna.

Beslut av approach

Idé för interaktioner blev först att A/B-testa Idé 1+3 vs. idé 4 under en workshop, och sedan testa Idé 2 ute i fält för att mäta användbarhet, i.o.m. den metoden gav mycket kvalitativ data, och var bra feedback till utbildarna.

Feedback kom först från Expedition Mondial (som hälsade på under veckan) att under min workshop med coacherna kommer säkert idé 1+3 och 4 blandas ihop.

Inför mitt möte med Grameen, pratade jag med innovationsrådgivare Peter Gahnström om hans analys av de 4 alternativen. Han gillade alternativ 4 mest, och gav följande nya insikt till mig: "Det här kan motverka traditioner och ”så här vi alltid gjort det” genom att tvinga en att reflektera över varför inte ens rätta svar korrelerar med hur empowered du känner dig. Bryter normer, sätter sig emot lathet och agerar proaktivt för en skarpare utveckling tillsammans."

Jag träffade Juliet och en utvecklare på Grameen Foundation (som gjort LedgerLink), och gick igenom de 4 alternativen. Svaret gavs att idé 2 definitivt är för okänd för användarna. När indikationer kom från även Grameen Foundation att 1+3 och 4 säkert skulle blandas, och var grymma alternativ, fråga jag "Hur?".

Svaret blev en diskussion med att i ett resultat efter ett quiz få två scores Korrekthet och Empowerment. Sedan på Improve, så får du medaljer/score baserat på Antal försök. (Grameen trodde ej det skulle bli problem med gamification på idé 3.) Du ska nå t.ex. 90% rätt på båda staplarna.

Hon (Juliet) föreslog också att du kanske inte måste ha chans på guldstjärna bara på första försöket. T.ex. att om du gör quizet gång 1, så måste du få 90% för guld, men på ditt andra försök måste du få 95% för guld. Detta då vi ju vill att

coacherna ska ha läst på innan.

Lena Tibell menade vid förslaget att "Belöna inte hur snabbt en elev går från att kunna till att inte kunna, för olika människor lär sig olika snabbt". "Vad vi ville åstadkomma med Antal försök var endast att undvika gissningarna".

Lena frågades också om vilken skala jag ska ha på 5, 4 eller vad jag inte tänkt på, 2-gradig skala. 5 eller 4 är vilket som enligt literatur, det finns två olika skolor. 2-gradiga skalan bedömde jag vara bäst, p.g.a. * användarvänlighet, tydligt för coacherna * behöver inte vara krångligare än så till en början, en bra test * blir enkelt att mäta empowerment, rätt svar + säker = pluspoäng, rätt svar + osäker = du gissade men hade rätt, gör om och var säker -> empowerment, fel svar + säker = måste ge feedback (väldigt intressant för Josefina), och fel svar + osäker = du ahde rätt, det var ett annat alternativ, gör om -> empowerment + korrekt information.

Appens datainsamling

Denna gång behövde appen samla in data av sig själv, istället för att Josefina manuellt skrev ner resultat-tavlan efter varje quiz.

Kravet kom dels från Josefina (det kommer inte gå om det är mer än 10 coacher, vi har oftast 20-30), dels från att jag i mina interaktioner i Tororo skulle testa på 2 olika kontrollgrupper med 10 personer vardera, och jag visste baserad på Interactions 1 att jag inte skulle ha tid att både skriva ner resultat och observera hur de beter sig med appen.

Inloggning Att samla in data för användare, skulle kräva inloggning. Men det är ett användbarhets-problem för de flesta. Om de skapar en användare med lösenord, hur ska de 1) tycka det är intutivt och 2) komma ihåg sina användarnamn och lösenord till Interactions 4 om 2 veckor?

Jag pratade med flera om detta, Expedition Mondial och Grameen. Från EM lärde jag mig att de trodde min idé med en färdiggjort lista med coachernas namn (vi vet ju vilka som är i Tororo) skulle fungera, och från Grameen fick jag höra om dera erfarenhet att de validerat använda samma approach, med en PIN (längre än 4 siffror dock), men att de inte nailat konceptet ännu, och att de också itererar på sin approach för nästa uppdatering av LedgerLink.

Tyvärr har också Meteor begränsningar med deras auto-login-modul. Den tvingar både användarnamn och lösenord, och har automatiskt registrering. Går det att stänga av? Jag kan skapa användare och lösenord åt alla, och funderade på hur jag skulle generera lösenord. Ett förslag blev att bara registrera deras förnamn, och sedan skapa lösenordet baserat på T9 med de 6 första bokstäverna utan att berätta det för dem. Sedan tänkte jag på det kulturella, att det kan vara oartigt med förnamn, och bestämde mig för efternamn istället. Hela namnet skulle bli för långt och krångligt.

Helst skulle jag behöva gå runt Meteors standard-inloggning, och istället ha en enkel login-rullista som den ovan beskrivet, istället för att använda deras standard-lösning.

Meteor Collections En annan problematik var att om data ska skickas till en server, måste det finnas en server med Collections. I version 1 av appen sparades

inga resultat i huvud taget.

Jag gjorde en exempel-app med Meteor Collections under veckan, och det är ganska coolt med DDP, och appen kändes snabb oavsett ej internet-connection. Det var däremot svårt simulera samma internet-problem som ute i fält. Det är en risk jag tar, att appen kanske inte kommer skicka in rätt resultat.

Därför ville jag även ha offline-databas, och då fanns det en plugin som hette GroundDB.

Detta var tidsödande, och vi får se om det fungerar bra på måndag.

Ett annat problem är, hur ska detta visualiseras pedagogiskt för Josefina och de andra utbildarna?

Educator Dashboard

Detta hanns inte med i Iteration 3 även om det var ett mål. Istället gjordes triggermaterial och workshop-upplägg till Tororo, då Expedition Mondial ifrågasatte "Visst är väl även Christine och Patrick?" målgrupp för detta? Och vad har de för utrustning? Christine har mobil, Patrick ingen. Så detta talade för att Educator Dashboard skulle behöva fungera på mobil, och inte bara dator som jag tänkt, iom att Josefina har dator.

Då bestämdes med Expedition Mondial att jag skulle ha workshop med dem på onsdag. Med samtal med Josefina, sade hon att de garanterat borde utrustas med tablets då de samlar in data digitalt, så jag kan tänka mig att de får en tablet framöver. Skönt! Detta stämmer även med vad Stefan FalkBoman hade tänkt sig, och de iPads han köpt in till mig. Så då kunde jag ha dessa som tanke att utforma educator-app-dashboarden ifrån.

Tekniskt

HighCharts var påtänkt som verktyg för att visualisera datan. Tanken var att den vanliga appen skulle kunna ha super-användare som är admins, och kommer till ett särskilt gränssnitt där de ser data om användarna. Detta kunde göras direkt i Meteor.

Stefan frågade vad jag tänkt om detta, och frågade om jag funderat över integration med deras verktyg Podio, och om det var möjligt. Det sade jag att det var framöver. Podio har ett API som bl.a. stödjer JSON, vilket jag använder. Då frågade jag om Podio har bra visual dash-board -verktyg, vilket han skulle kolla upp. Inom exjobbet behöver jag än så länge inte bry mig om detta. Problemet är att Stefan ser ett värde i att lagra datan i Podio, men de har inte i sig själv bra visualiseringsverktyg.

9 april hade jag då ett möte med SolarSisters COO Dave, som är en social enterprise med 1 huvudansvarig (Dave), 70 field staff och 2000 entreprenörer, så ganska likt YoungDrive i Uganda när Josefina var där.

Dave byggde 2013 upp deras backend i SalesForce för databas, och sedan TaroWorks för datainsamling. TaroWorks är en plugin till SalesForce, med offline-app anpassad för fält. De har sedan utrustat alla field staff med tablets, då det var för dyrt att ge till alla 2 000 entreprenörer. Field staff träffar entreprenörer varje dag, och hjälper entreprenörerna att knappa in t.ex. kvitton, utvärderingar och undersökningar (t.ex. från finansiärer) via appen.

Det tog 3 veckor att bara sätta upp systemet, och det var snabbt. För Dave har det varit en 100%-tjänst i början, och fortfarande 20%. Men fördelarna är att de nu är 100% datadrivna, och de kan följa exakt hur det går för field staff och entreprenörerna - detta guidar även vilka som får promotions och vilka som blir avskedade.

Det mest intressanta är kanske att SolarSister inte bara avnänder datan för internt bruk, utan även för dess partners. De gör undersökningar via TaroWorks som inte är direkt kopplade till SolarSister, för att få in pengar. Men framför allt, sticker de ut gentemot andra social enterprises, då de enkelt kan ge partners all data de önskar, och det gör dem väldigt framgångsrika med grants. De är sannerligen en datadriven organisation. Datan, ger SolarSisters story ett trovärdigt narrativ, vilket Dave beskriver som en extrem framgångsfaktor.

Idag står 2/3 av finaniseringen från grants (fördel med socail entrepriser, du kan få pengar både från finansiärer och kunder), 1/3 från entreprenörerna. De vill bli mer self-sustainable för varje år som går, och detta är storyn som datan måste berätta - vilket är varför de t.ex. avskedar människor som inte presenterar. Datan måste stämma med storyn de vill berätta, för den storyn är vad som avgör att de får in pengar.

Detta gav mig insikter på hur mycket min datainsamling från coacherna kan spela roll för organisationen. Det var något jag inte tänkt på innan, och som jag vill vara medveten kring. För om det är något jag lärt mig denna iteration, är det hur "kunskap är makt", och hur mycket vettig kunskap jag, coacherna och Josefina och YoungDrive kan få ut av att helt enkelt lägga till frågan "Är du säker?" till varje quiz-fråga.

Teknisk utveckling: från Meteor 1.2 till 1.3

Branchade ut projektet och uppdaterade till Meteor 1.3 från 1.2, vilket gav bättre utvecklarupplevelse och många sådana fördelar (till exempel kan använda NPM), men fanns inte längre bakåtkompatibilitet till mobilerna som coacherna använder, samt att buildpack för Meteor till Heroku inte hade uppdaterats, så vid en push (även om det fungerade på localhost) så krashade hemsidan youngdrive.herokuapp.com, vilket fick feedback från handledare Lena som behövt accessa sidan.

Detta är ett bra exempel på hur tekniska begränsningar påverkar projektet. I slutändan, tog det ganska mycket tid under veckan "i onödan", och jag fick ta igen tiden genom att jobba fredag kväll och lördag inför mina interaktioner.

Trigger material

Vad som guidade trigger material #3, litteratur: In particular, we theorize that, once a person has accumulated a certain amount of experience with a task, the benefit of additional practice is inferior to the benefit of reflecting upon the accumulated experience. In other words, the intentional attempt to synthesize, abstract, and articulate the key lessons learned from experience generates higher

learning outcomes as compared to those generated by the accumulation of additional experience.

Interactions

4.4 Iteration #4

Efter prat med Henrik: https://memorize.com/

Growht mindset vs Performance mindset Goal-mastery-mindset vill vi få dem hamna i

Flashcards vid Improve

Self-motitoring, vad du vill åstadkomma

Questions Used to Prompt Self-Monitoring and Self-Evaluation Self-Monitoring 1. Am I concentrating on learning the training material? 2. Do I have thoughts unrelated to training that interfere with my ability to focus on training? 3. Are the study tactics I have been using effective for learning the training material? 4. Am I setting learning goals to help me perform better on the final exam? 5. Am I setting learning goals to ensure that I will be ready to take the post test? 6. Have I developed a strategy for increasing my knowledge of the training material? 7. Am I setting learning goals to ensure I have a thorough understanding of the training material? 8. Are the study strategies I'm using helping me learn the training material? 9. Am I distracted during training? 10. Am I focusing my mental effort on the training material? Self-Evaluation 1. Do I know more about the training material than when training began? 2. Would I do better on the final exam if I studied more? 3. Do I know enough about the training material to answer at least 80correct on the post test? 4. Have I forgotten some of the terms introduced in previous training material? 5. Are there areas of training I am going to have a difficult time remembering for the final exam? 6. Do I understand all of the key points of the training material? 7. Have I spent enough time reviewing to remember the information for the final exam? 8. Have I reviewed the training material as much as necessary to perform the skills on the final exam? 9. Do I need to continue to review before taking the final exam? 10. Am I making progress towards answering at least 80post test?

INTERAKTIONSDESIGN FÖR LÄRANDE

Här gås hur jag utformat appen för lärande i iteration 2 och 3 igenom, med förslag till iteration 4.

ITERATION 2

Quiz-flödet 1.0: standard multiple-choice, designat för assessment, men ej för learning Besvara multiple-choice-frågor Få resultat-tavla med Question 1: 0, Question 2: 1, samt "Total score: X/X" Gå tillbaka till startskärm

ITERATION 3 Quiz-flöde 2.0: designat för learning och självreflektion, men ej för effektivitet vid varje fråga besvarar du det alternativ du tror är rätt samt "Are you sure?" Yes/No vid färdigt quiz, få en resultattavla med personliserad feedback läsa igenom dina felaktiga svar och hur säker du varit på dem observerat de

korrekta svaren klicka "Improve" för att bara få dina felaktiga svar igen upprepa tills inga felaktiga svar var kvar (det står "quiz try: 3", om det är försök 3) vid 100innan dess, uppmuntrades du läsa igenom coach/deltagar-manualen om du då fick något fel, fick du gå tillbaka till träning igen om alla rätt på, blev du Certified coach. Om du klarade det på första försöket, fick du även en guldstjärna (andra försöket = silver, tredje försöket = brons) sedan kunde du ta ett annat quiz Kommentar, fördelar med feedback-läge: Genom att på varje fråga besvara "Are you sure?": Yes/No, så stärker vi inte bara coachens meta-kognitiva förmåga, utan vi kan vi även ge personliserad feedback i resultattavlan, istället för att bara visa Question 1: 1 point. Question 2: 0 points, som i Iteration 2.

Detta gör att coachen kan reflektera över sitt lärande på t.ex. följande sätt: - få en självförtroende-boost (via feedback "You were correct, and you were sure") - gå från gissning till självsäkerhet (via feedback "You guessed, but you were correct") - ändra uppfattning snabbare (via feedback "You were incorrect, but you were sure") - uppmuntra coachen att läsa i manualen (via feedback "You were incorrect, and you were not sure")

Fördelar med tränings-läge, och certifikations-läge: Jag gillar idén att när coachen har kunnat svara rätt på alla frågor, kunna befästa kunskapen med hjälp av certifikations-läget, då coachen ska kunna få 100

FÖRSLAG ITERATION 4: designat för learning och självreflektion, och effektivitet Problemet nu, var att de tog certifikations-läget och inte fick 100

Tränings-läget behöver alltså förbättras, och vara säker på att coachen verkligen är redo för Certification.

Ett problem är att "Improve" endast upprepade frågor som varit inkorrekta, och inte upprepade gissningar som varit rätt. Det gjorde att en coach kunde få fel på Certification quiz, för att kunskapen inte var befäst. Så vill vi inte ha det. Därför föreslår jag följande förbättringar i Träningsläge:

Förbättringar Träningsläge: ta ett quiz, med "Are you sure?". Baserat på svar, låt frågor hamna i tre olika lådor: "Can't do", "Can do with effort" och "Can do effortlessly".

Låt coachen välja vilken typ av frågor de vill upprepa.

Frågor i "Can't do", är frågor som coachen ej vet svar på ännu (t.ex. om svarat fel). Frågor i "Can do with effort", har coachen ett hum om (gissat rätt, eller gått från fel till rätt). Frågor i "Can do effortlessly", har coachen rätt och den vet att den har rätt

Genom att ta en hög med frågor igen, flyttas de om till andra högar. Om du har fel på en "Can do effortlessly"-fråga, flyttas den tilllbaka till "Can't do" eller "Can do with effort". Om coachen igen har rätt på en "Can do effortlessly", blir coachen certified i just den frågan.

Frågor i "Certified", är frågor som coachen befäst genom att upprepat korrekt från "Can do effortlessly". De behöver inte upprepas. Coachen kan bli Certified i ett helt quiz, när den tar alla frågor som ligger i Certified. Då är den klar, och 100

Målet är alltså att i coachens egna tempo, flytta över frågor från "Can't do" till "Can do effortlessly" till "Certified". Så planerar jag bygga expertis som YoungDrive-coach.

Förbättringar Certifikationsläge: om coachen klarar det, ska coachen bli enormt glad. Guld, silver och brons-medaljer ska vara tydliga, och ljud kan förstärka storheten i att ha klarat det. Det ska synas på startskärmen, att du har fått stjärnor och blivit certifierad i ett topic.

Service design-insikter

SERVICE DESIGN Detta kapitel visar vilka insikter som har guidat mitt arbete med iteration 1, 2, 3 och 4.

ITERATION 1 & 3: What's it like being a coach? I iteration 1 fanns ingen digital ansats alls. Jag var i Tororo för att besvara "What's it like being a coach?". Upptäckte att vad det innebär att vara en bra YoungDrive-coach, är att kunna ha bra ungdoms-sessioner. För att ha bra ungdoms-sessioner, är din självkänsla och självförtroende enormt viktigt. Och det är inte alla coacher som har detta, och därför skiljer sig kvaliteten mycket, vilket Josefina upplever som en utmaning.

Jag började leta efter hur och var en coach-app kan underlätta. En aktivitet som alla coacher har gemensamt för lärande och avgörande för coachens framgång, är (1) coach-träningen (som jag redan visste var viktig), men framför allt (2) förberedelserna av en ungdomssession. Jag övertygade Josefina att vi skulle ha ett mycket fokus på (2) än hon tänkt. Medan Josefina kan vara inblandad i (1), kan en app vara extremt viktig i (2), upptäckte jag under mina fält-besök på ungdomssessioner och intervjuer med coacher och projektledare.

I Tororo iteration 1 kunde jag observera ungdomsbesöken, i Zambia iteration 2 kunde jag observera coach-träningen, och i iteration 3 i Tororo kunde jag observera förberedande av ungdoms-sessioner.

Därför fick app-utvecklingen för dessa iterationer ha dessa fokus. I iteration 1 fanns ingen digital ansats, men apparna Quizical och Duolingo testades för att få koll på coachernas tekniska förutsättningar. Resultatet blev att min app kan placera sig någonstans emellan i svårighetsgrad.

Iteration 2 gjordes en coach assessment quiz app, och iteration 3 utvecklades den till en coach learning quiz app. Dessa insikter guidade:

Iteration 1: Självförtroende = empowerment Enligt iteration 1 kom självförtroende ifrån att under ungdomstillfället kunna ha: Correct Information, Correct Structure, Time Management, och Fun Atmosphere. Det är alltså detta appen borde testa och träna.

Lösning: en coach-träningss-app hade störst behov av att fokusera på Correct Information, i andra hand Correct Structure och Time Management. Till iteration 2 kunde Josefina assessa Correct Information (lyckat), och till iteration 3 kunde coacherna lära sig CI (lyckat, men behöver göras mer effektivt). Till iteration 3 hade hon via ett "Are you ready?"-quiz även försökt använda multiple-choice-strukturen till att även assessa och träna Correct Structure och Time Management (ej särskilt effektivt sätt, testar Factual Remember, men ej högre Bloom).

Det finns en medvetenhet kring att CS, TM och Fun Atmosphere är lämpligast att testa efter en ungdomssession, men att vissa förberedelser kan göras i appen innan en session. Dessa är därför sekundära.

Iteration 2 och 3: Självkänsla = kunskap om dig själv, meta-kognition Under Iteration 2 i Zambia, passade jag på att fråga vad som byggde självkänsla. Följande kluster fanns: "I believe in myself" (3 personer), "I believe in God" (2 personer), men också "I am well prepared" (4 personer) och "I am certified" (1 person).

Till iteration 2, hade jag fokuserat på att assessa "I am well prepared" och då stärka självförtroende, med hänsyn till Correct Information.

I iteration 3 i Tororo, hade jag fokuserat på att bli "I am well prepared", och även byggt in "I am certified.". Det visar sig att de flesta inte bryr sig om "I am certified" (vilket ju undersökningen redan visade), men de bryr sig om lärande-resultaten.

Under iteration 3, lärde jag mig att det tog för lång tid för coacher att nå 100

Iteration 4: Effektivitet = en förutsättning för att coacherna ska ha nytta av appen Anledningen till misslyckandet i iteration 3: dels för att CS och TM tydligen inte lämpar sig för multiple-choice (gör sådana övningar drag-and-drop-istället), men framför allt för att feedback-systemet och tränings-läget behöver vara mer medvetet i när en coach verkligen kan sitt ämne och är redo för sin ungdomssession. Du vill inte testa 100

5
Result

Det här är kapitlet där resultaten presenteras.

5.1 Iteration #1

5.2 Iteration #2

5.3 Iteration #3

5.4 Iteration #4

5.5 Final Result

5.6 Future Work

6

Analysis

6.1 Theory

The Visualization Pipeline (Timo Ropinski, Scientific Visualization Group, Linköping University, TNM067 - Scientific Visualization, 9/12/2014)

Describes the process of generating an image from the data. 1. Data acquisition (-> data are given) 2. Data enhancement (-> data are processed) 3 Visualization mapping (-> Data are mapped to, e.g., geometry) 4. Rendering (3D->2D) (-> images generated)

6.2 Data acquisition

6.2.1 App usage

App pushes data to server when online (saves quiz start, and quiz finish)

Server receives JSON data, stored in a MongoDB database.

Each data point is saved in a database called Results, with the signed in user. (There is a Users database as well).

I wanted to store the data in Google Sheets, thus it was necessary to convert the JSON format into a Google Sheets-readable format, like CSV. Multiple approaches were tried, and the Google Chrome extension called Magic Json by agaze_dev_team (last updated October 29, 2015) was the one that worked without problems.

6.2.2 Pre-study

The Pre-study was done by coaches in paper during the app evaluation, meaning that their answers were manually recorded into Google Sheets.

6.3 Data enhancement

6.3.1 App usage

To make the data easier to work with, I reordered the columns, and made them sortable and filterable.

Some columns were given conditional formatting, so it would be easier to spot irregularities (did not have confidence when answering question, was on their certification quiz).

Lägg till bild "results-colored.png" (finns på skrivbordet)

After this, I could make some observations. For example, there was a surprisingly low number of answers where the user answered the question without confidence. Also, more users had started a quiz without finishing it than I anticipated. Finally, a lot of users had done quizes that were not Topic quiz 3 and Coach quiz 9, which might indicate high interest (if they did more than 2 quizes) or confusion (if they did not do 3 or 9, but they did do other quizes) during the app evaluation.

6.3.2 Pre-study

To see differences in answers more clearly, I first made the data sortable and filterable. Then, I resampeled the data for each column that hade numerable (sorteringsbar) data in text instead of numbers, so e.g. "The day before" was changed to -1 and "The same day" to 0. In a similar way, school level was divided into four different groups, from 0 to 4.

After this, each column was given conditional formats using a color scale, using Google Sheets built-in functionality. This gave a visual way to quickly get a overview of the pre-test data.

Observations from the data was that a surprising number of cells were left blank. One user had not done the pre-test, where some had left questions unanswered (most commonly "Do you own a company?" (should have used the word "business", plus Hours of preperation and Occations for a youth session (there is a tendency this might be because they were not proud of their answers, because of correlations with low quiz results).

Missing cells was not as obvious with the app results, were users could not progress in a quiz without answering both the question and the confidence. However, I could see that none of the passed quiz 9 certification answers had been submitted. Thus, I needed to add these from the manual recordings, which had been used as a backup in case anything like this would happen.

6.3.3 Summary of app results

To compare the test results with the pre-test results, it was clear that it would not be viable to test every dimension against every dimension.

Instead, since goals of the app evaluation had been predefined in the following way, I summarized the quiz results so that these could be derived:

* % correct 1st try * number of tries until 100% * number of tries until 100% in 1 try

These could be calculated by having columns for:

Quiz 3

* Start time training * % correct 1st try * Tries until 100% * End time certification * Time difference start to end

Quiz 9

* Start time training * % correct 1st try * End time 1st try * Time difference start to end 1st try * End time passed training * Time difference start to passed training * Tries until 100% * End time passed certification * Time difference 1st try to certified

Then, to see trends, I again added color scales. With numeric values, a gradual color scale is used (e.g. fastest time, from green to red), and with categorizational values (like if they used the manual or not) where there is no right value, different colors are used. Now, it was easier to spot outliers and trends.

First-hand observations were that there was a strong corrolation between pre-quiz results and quiz 9 try 1 (slightly visible also in quiz 3 try 1, but with more outliers). Also, with manuals there was a higher probability to finishing quiz 9 training + certification. More

Comparing the pre-test and results summary sheets

I joined the two sheets, meaning I had created a multiple-variate data set (serveral dimensions that I needed to compare with several dimensions).

I met with my university supervisors, so they could further support me in how to properly analyze the data.

It was clear that analysis in Google Sheets could only go so far. It was greatly helpful to sort by multiple columns (e.g. first by Manual?, then by School level, then by Quiz 3). However, it took a long time to filter the data on multiple parameters, and the work became tedious. It was not viable to discover the data using this approach.

Meeting with the supervisors, they started by comparing the means on the pre-quiz results with the two control groups. Since they showed similar results, the two control groups were comparable.

Then, we calculated the means from the other columns based on e.g. "Manual?", gender, school category, high app quiz result, etc.

A multivariate analyzation software or a visualization was suggested to discover the data in less time.

It was hard for us to determine a suitable multivariate analysis software suitable when having so few data points. Principle Component Analysis or Cohen's kappa would not be suitable, or to do Linear correlation on all dimensions.

After discussion with other Master thesis students working with large amounts of data (one from KTS and one from MT), parallel coordinates was suggested. It

would allow me to very quickly filter the data, find correlations, and distinguish outliers and common characteristics.

To learn how to analyse the data, Une-terre (2012) was consulted. He writes "||-coords are a data visualisation which allow you to "read out" the relationships and trends between your dimensions. Positive relationship (correlation), negative relationship (invert), or no relationship (random)."

6.3.4 Visualization mapping

The goal with visualization mapping is to generate renderable data.

Thus, I added a new spreadsheet, specific for visualizing the data.

I deleted columns that would serve no visual purpose (e.g. timestamps), gave all cells data values (even N/A when undefined), deleting users that did not have data, and shortened the column names so they would fit on the screen.

The data was then exported from the Google Sheet into CSV.

6.3.5 Rendering

For rendering, the JavaScript library D3.js was chosen. It supports data-driven documents for visualizing data with HTML, SVG and CSS. It supports both JSON and CSV data.

A visual framework for multidimensional detectives for D3.js was found, called "Parcoords.js", written by Chang Kai (2012).

The example code from "Linking with a Data Table" provided the basis for the rendering. It would be a great benefit to bee able to see both a parallel coordinates visualization, and to see the same values present in the Google Sheet.

I replaced the example CSV file with the exported Google Sheets data in CSV.

Eventually, I also changed the colors, and added to the example the toolkit's functionality to drag the axes titles around to reorder the dimensions, since the goal was to quickly compare and find correlations.

Lägg till bild på parallella koordinater-visualiseringen

6.4 Findings

In this section, the conclusions from the different group characteristics are presented.

6.4.1 Correlations

Youth mentor (brun), 6 st vs. CBT (blå), 14 st * Youth mentors has higher school level than CBT's * 1/6 Youth mentors had brought manual, compared with 8/14 CBT's * Only 1 CBT has above 2 (1 st 3) on School, while YM have (2st 0, 1 2st, 2 2st) * Inverse correlation: CBT old, YM young * There are no female Youth Mentors (i.e. 100% male Youth Mentors) * All of the YM's run their own businesses, compared with 5/10 for CBT's * Only CBT's said they didn't feel comfortable with smartphone (2 st) - because of age? * Seemingly no difference CBT vs. YM

in when prepares for session * All YM prepares 2 times for session, while CBT can train also 3 or 1 time) * 13/14 CBT's gjorde quiz 3 try 1, 6/6 YM's * YM's och CBT's presterar lika på quiz 3 try 1 * CBT 6/14 st certifierade, YM 4/6 st

Quiz 9 (rött=CBT: * 6 CBT's gör ej Q9 try 1, 2 YM gör ej * YM är top performers på Q9 try 1 jämfört med CBT's * endast 1 YM klarade däremot träningen, medan

* YM's är bättre på quiz 9 try 1 än CBT's * Det är endast 1/7 som klarade quiz 9 training som är Youth Mentor * Antal försök man gjorde är likvärdigt, förutom en YM som hade 12 försök (och klarade quiz) * Det var endast 2 st som klarade certifieringen, och båda dessa var YM och kvinnliga

6.4.2 Women

It is clear from the data that women: * Have lower education level than the men * Spread results on the pre-test (probably because of school level) * Half of them are around 25 years old, half spread out (up until 45 years old) * 2/6 har eget företag * Det är bara 1 som ej preppar alls * 1 st som endast preppar 1 gång, alla andra preppar 2 gånger (3 st) eller 3 gånger (2 st) * Alla hade max 1 fel på quiz 3 på första försöket! * De som ej hade rätt, tog det bara 2:a (1 person) eller 3:e försöket (1 person)

* 3/6 gjorde certifieringen - kolla upp: började de?

* Alla förutom 1 tjej gjorde svåraste quizet. De hade minst 42%! Varav 2 st hade 67%, 1 hade 50, 1 hade 42, och 1 hade 83

* Quiz 9 tjejerna hade mycket högre lägstanivå () än killarna (, och mycket högre högstanivå än killarna () - tiden är jämförbar, med svag tendens snabbare tjejer * Av de som hade 50% på 1:a försöket, gick det betydligt snabbare för tjejerna än killarna att jobba igenom quizet - tyder på att tjejerna är säkrare på materialet än tjejerna - dessutom är det bara 2 killar som fick över 50% på första försöket * Om du kollar tvärtom, så är det bara 1 tjej som fick under 50% på första försöket, medan det var 8 killar * Quiz 3 syns ej lika tydlig skillnad (OBS: kolla vilken fråga de flesta hade fel på, och kolla om det skiljer sig mellan killar och tjejer) * Skolnivå verkar oberende på hur quizen blir, om man kollar quiz 9 * Tjejer, antal försök quiz 9 hade de 2 (2 st), 5 (2st, 12 (1st) försök innan de klarade - bland killarna var det 5 (1st) och 7 (1st). Men sedan så var det 0 av killarna som blev certified, men 2 tjejer (de som gjorde på 12 försök och 2 försäk). Att antal försök skiljde sig mellan 2 och 12, men ändå klarar det, berättar att antal försök kanske ej korrelerar. Den på 12 försök hade 70% på försök, och jobbade igen de 12 försöken väldigt snabbt. * Den andra tjejen som klarade certifikation quiz 9 klarade 83% försök 1, (hade tillgång till hjälp), klarade träningen sedan på 2 försök.

Slutsats: * Anställ bara tjejer. De har högre kunskap och förbereder sig mer, trots lägre skolutbildning.

6.4.3 Use of participant and coach manuals

Användande av appen: * Vi hittade ingen korrelation quiz-resultat 9 första försöket om man fick hjälp eller inte, antagligen pga att man ej använder manualen före

6.4.4 Certified quiz 9

Only two people were fast enough to get certified on the final quiz before the app evaluation ended.

Characteristics were: * Both of them used the manual * Both of them were CBT's, not youth mentors * Both were women * They were 24 or 26 years old * They had a good pre-test score (57% or 71%) * They had top scores (1st place and 2nd place (shared with one other)) on quiz 9 try 1 * They had high scores on quiz 3 try 1 (100% and 92% * They prepared many times per youth session (2 or 3 times)

What didn't seem to matter: * Number of tries quiz 9 (12 vs 2 on Q9) * Time to pass training quiz 9 (35.5, slowest vs 12 minutes, below average) * When day trained (1 trained same day, 1 trained the day before) * One had a business, one didn't * School level (1 S?, one S lower)

Other: * They were medium skilled on using a smartphone

7

Discussion

7.1 Discussion of method

7.1.1 Consequences of involving end users and stakeholders throughout the whole process

Product Benefit from involving users and stakeholders

Design thinking, human-centered design and service design, has been proven to be crucial for the success of this project. Service design thinking and methods, gave a framework to have all of these perspectives in balance and consideration, always with the end user as the most important person.

Support Benefit from inolving users and stakeholders

The fact that the end users and stakeholders has been involved from the start, made them feel ownership of the product. This has many benefits, among others that they *everyone* involved is satisfied with the *final* app, since they think that their opinions and expertise has been taken into consideration and implemented. This further increases trust, and the the likelihood of them supporting future work. Even more so, the end users are more likely to use the app, as they have been co-creators of the product.

Complications

I was not a designer. I was a computer expert with social skills, now needing to design and develop an app for a cultural and socio-economic context very different from my own.

In this regard, the technical aspect was but one. I *did* need to learn how to develop hybrid apps in JavaScript that worked offline, and had an online backend. Those was the technical demands.

But more so, I needed to quickly become a good designer. Not mainly from a perspective of graphic design or interaction design, but *how* to explore, design, and implements what the user needs from the requirements "fun, user friendly, and good for learning". The approach to learn design from these perspective was to read extensive literature, consult a diverse set of experts, and be very humble and curious in interactions with the end-users and stakeholders.

This took me a long way, to the point where research, experiments, and constant improvements could lead to increasingly well-informed decisions.

I now have new-found skills in:

- etnologicy (getting to know and learn from people in a different culture)
- human-centered design
- design thinking
- service design thinking
- interaction design
- digital learning
- data analysis

It has placed high psychological pressure and leadership demands on me as a new designer, to:

- always be in charge of balancing all the different perspectives, with the end user's best in mind
- be able to change the planned process when new learnings or opportunities emerge (leading an agile design process)
- always implement new functionality from customer needs instead of designer or engineer bias
- continually design and run workshops and tests suitable for the target groups

The reason why this has been especially hard, is that simultaneously to learning design and technological skills, I have been in a different cultural setting than the designer is used to. This has also been extremely rewarding, at the same time exhausting.

7.2 Discussion of result

In three months time, an app was developed with precision to the needs and context of the end users. The design has been heavily influenced by the end users, from day 1 of the project, in conjunction with relevant research, and in balance to stakeholder goals and considerations, and supervisor advice.

8

Conclusion

Appendix

A

Appendix 1

Detta är ett appendix-kapitel. Jämför med appendixet i kapitel 5.

A.1 Original Time Plan

A.1.1 Before Uganda

Week	Focus
2	Workshop with Lena Tibell and Konrad Schönborn on Research questions & Proposal of method.
3	Start writing "Planeringsrapport". Study interaction design via guest lecture Jonas Löwgren, and reading the book "Thoughtful Interaction Design".
4	Interview with Take Aanstoot, Social entrepreneur in Kenya. Submission "Planeringsrapport". Education day in Service design in Stockholm (by Expedition Mondial). Meet Joachim Svärdh about Entrepreneurship research.
5	Approval "Planeringsrapport" with Camilla Forsell. Meeting with Lena Tibell and Konrad Schönborn (2016-02-02). Travel to Uganda.

A.1.2 In Uganda

Times specified are in local time to where I am. Uganda time (EAT - Eastern Africa Time) is 2 hours forward of Swedish time (CET - Central European Time). Meetings with Swedish partners are generally done via Skype, where Uganda meetings are preferrably done in person.

Note that during all of this time, writing the master thesis will progress. After the time in Uganda, the report will be a 100% focus.

1 day per week will be spent on report writing, including Analysis work for the meetings.

Week	Focus
6	**Cultural adaption**. Land, set up wifi, set up my apartment, learn about the YoungDrive organization, meet people. Be prepared for stomach disease. Get familiar with the transportation system in Kampala. Get familiar with the city. **Iteration 1**. Prepare Iteration 1 with Iliana. Start-up meeting with partners. Start report writing: analyze, collect material, sort, structure and plan.
7	**Iteration 1**. Prepare Interactions. Analyze Start-up meeting with partners. Write on report. in order to create *Questionairee guide*. Understand technical tools, without working on an app solution - the goal is to get familiar with the tools.
8	**Iteration 1**. Travel for Interactions. Do 8 face-to-face interviews, with no digital focus, hypotethical situations. Do minimum 2 field visits to understand the coach's situation, ideally living in Kamuli or Tororo a couple of days. This is a good opportunity to learn coaches how the tables and smartphones work.
9	**Iteration 1**. Analysis & Compilation. Thursday: Expert meeting (March 3rd, 6-7 PM). Friday: Partner meeting (March 4th, 11-12 AM). **Iteration 2**. Determine Needs. Ideation. Create low-fi Trigger material (pen and paper) and determine what the hi-fi (digital app) material should be.
10	**Iteration 2**. Design and Develop the hi-fi trigger material. *Half-time check-up with examinator.*
11	**Iteration 2**. Interactions, control group #1 & #2.
12	**Iteration 2**. Interactions, control group #1 & #2.
13	**Vacation** with fiancee.
14	**Iteration 2**. *Analysis #2* (What choices needs to be made? What path should be taken? Start formulate Customer path. If needed, document how people see apps, document limitations, document experience needs, document risks.) & Compilation. Thursday: Expert meeting (April 7th, 4 PM). Friday: Partner meeting (April 8th, 11-12 AM). Continued Development Creative Brief. Determine what actions needs to be taken outside of the development of the app. Create Behovsgrupper.
15	**Iteration 3**. Develop and Modifications phase.
16	**Iteration 3**. Develop and Modifications phase. Interactions: App Tests with Interviews & Measurements (with time allocated for late arrivals and missing participants).
17	**Iteration 3**. Interactions: App Tests with Interviews & Measurements. Analysis & Compilation. Friday: Partner meeting (April 29th, 11 AM) & Expert meeting (April 29th, 4 PM).
18	**Final analysis**. Finalize the app. Travel back to Sweden.

A.1.3 After Uganda

Week	Focus
19	Write on Master thesis report. Attend Auscultations.
20	Write on Master thesis report. Attend Auscultations.
21	Write on Master thesis report. Attend Auscultations. Find opponent for Master thesis.
22	Submission of report to examinator, after approval by supervisor. Examinator decides on date and time for presentation. Send report to opponent, and get the opponent's report.

A.1.4 After Semester

Week	Focus
35	Presentation of my Master thesis, with supervisor, examinator and opponent. Hand over publication approval to the administrator.
36	Opposition of another person's Master thesis.
37	Do changes to report if requested. Upload report to X-sys for approval (within 10 days). Write Reflections document and submit on X-sys within the 10 days. Publish master thesis in X-sys.

A.2 Half-Time Evaluation Time Plan

Bibliography

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