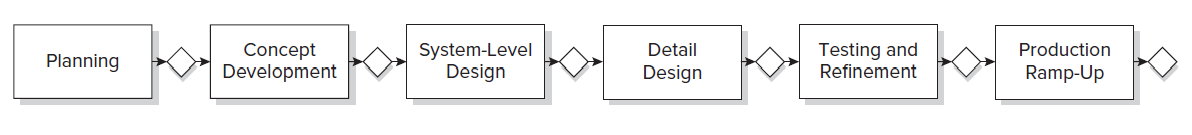
**Verkfræði X – Oral Exam**

**CHAPTER 2**

1. **Describe the product development process and how you have applied it on your project.**
   1. A product development process is the sequence of steps or activities that an enterprise employs to conceive, design, and commercialize a product. Many of these steps and activities are intellectual and organizational rather than physical.
   2. We pretty much followed this process, of course the weekly assignments were in-line with it as well. We started with planning which did take several weeks and then moved to concept development where we switched ideas and had to do the planning part again. We then did the system level design and currently we are working on the design details.

**

1. **Describe the strengths and weaknesses of an organizational structure and how you have structured your workflow in your project or how you would if it were an organization.**
   1. The most appropriate choice of organizational structure depends on which organizational performance factors are most critical to success.

Diagram

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Considering these strengths and weaknesses we decided on a project organization.

**CHAPTER 3**

1. **Describe an opportunity and some different types. What opportunities did you seek in your project?**
   1. An opportunity is an idea for a new product. It’s an product description that describes a thing at a rudimentary stage that shows potential for development.
   2. There are three main types of opportunities:
      * 1. Horizon 1 - Existing need/market that we currently serve:
           1. For ex. improvements, extensions, variants…
        2. Horizon 2 – Existing need/market that we do not address:
           1. For ex. next generation products and services for core markets.
        3. Horizon 3 – New need/market
           1. For ex. Exploration into new markets, new-category products and services.
   3. For our project, we are seeking horizon 2. We are working for Kvika in the financial market, which can be considered a core market. Our project isn’t completely new, but it hasn’t been done (at least by Kvika) before so we are addressing a existing need that hasn’t been addressed by Kvika.
2. **What are some ways of identifying opportunities? How did you apply this in your project?**

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* 1. There are many ways to generate opportunities, for example **study customers**, **imitate but better** and **consider the implications of trends.**
  2. For example, we used the study customers method, we interviewed potential customers and came up with a couple of opportunities from those.

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1. **Evaluating an opportunity:**
   1. To provide an advantage, an opportunity must be:
      1. Valuable
         1. Must either allow a firm to achieve greater performance than competitors or reduce a weakness relative to competitors
      2. Rare
         1. Must be rare (hasn’t been done before)
      3. Inimitable
         1. Must be hard to imitate
      4. Nonsubstitutable
         1. Can’t easily be substituted
2. **Real-Win-Worth-It method**
   1. Is the opportunity real?
      1. Is there a real market and a real product?
   2. Can you win with this opportunity?
      1. Can we win? Can our product be competitive? Can we succeed as a company?
   3. Is the opportunity worth it financially?
      1. Is it worth doing? Is the return adequate and the risk acceptable?

**CHAPTER 4**

1. **Summarize the 5 steps of the project planning process and how you applied this to your project.**

A screenshot of a computer

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* 1. We used multiple methods to identify opportunities including “study customer” and “intimate but better”.
  2. We then evaluated one of the opportunities and explained how they are VRIN.  We also evaluated the opportunity according to the Real-Win-Worth-it Framework.
  3. We fortunately had a pretty good layout set out for us, we mostly had to follow the weekly assignments to have good timing.
  4. We completed pre-project planning when we started the system design and design details.
  5. We are currently working on design details but we are pretty happy with our progress.

1. **Four types of product development projects**
   1. New product platforms:
      1. Create a new family of products based on a new, common platform.
   2. Derivates of existing product platform:
      1. Extend an existing product platform to address familiar or adjacent markets with new products or features
   3. Incremental improvements to existing products:
      1. Adding or modifying some features of existing products in order to keep the product line current and competitive.
   4. Fundamentally new products:
      1. These projects involve radically different product or production technologies and may help to address new and unfamiliar markets (neurolink eða eh þannig?)
2. **Technology Roadmap**
   1. A way to represent the expected availability and future use of various technologies relevant to the product being considered.

**CHAPTER 5**

1. **Describe the 5-step process of identifying customer needs and how you applied this in your project.**
   1. Skiptist í:

1. Gather raw data from customers.

2. Interpret the raw data in terms of customer needs.

3. Organize the needs into a hierarchy of primary, secondary, and (if necessary) tertiary needs.

4. Establish the relative importance of the needs.

5. Reflect on the results and the process.

How we applied it:

* 1. We did a interview with a representative from Kvika that discussed with us that they want the product to do.
  2. We interpret the raw data by filtering it according to the customer's needs. For example, from the interview we got the information that the user would like to get analytics like correlation, expected rate of return, but also that things like the visual look must be nice.
  3. The primary needs are that the program is easy to use, visually pleasing and that it will do reliable calculations. Under each primary need are the secondary needs, like “the input requirements are clear, the customer does not need to spend time trying to figure out the right format” and “the program will display the data on graphs”.
  4. We establish the relative importance of the needs by choosing the primary and secondary needs. All the primary needs are necessary for the project to function. Hence there is no relative importance between the primary needs.
  5. We went over if there was something that we were forgetting, since our interviewee pool was only a single employee from Kvika. We got most of the required information from the interview.

1. **Hierarchical list**
   1. Shows primary and secondary customer needs. Can also include ratings for the secondary needs that show the importance of each need.
2. **Functional requirements**
   1. The functional requirements are requirements that the product must do, from the customer needs we can obtain the functional requirements.
3. The model will calculate correlation, market risk, predicted future growth, and other important numbers so the users will get a better understanding of the market/sector’s behavior towards IPO’s.

1. The program will display a graphical representation of the results and let the user choose what type of graphs is shown and what data is included in them.

1. All information that is visible in the program needs to be easily understandable and clear to every user, even if the user has limited computer knowledge.

1. The program will display how old the data is and from what time interval so the customer has better knowledge of the results.

1. The program will always get data from a reliable source and will constantly try to use the most recent and up-to-date data available.

All these functional requirements are measurable and testable. Since this is a software based product, the tests will be based on getting potential users to try the software. Following that they will be interviewed to measure the product's quality.

**CHAPTER 6**

1. **Explain the 4 steps of establishing product specifications and how it applies to your project.**

*Prepare the list of metrics.*

*Collect competitive benchmarking information.*

*Set ideal and marginally acceptable target values.*

*Reflect on the results and the process.*

*Bls.98-99*

How we applied it:

* We found for example the following metrics:
  + The sector’s increase/decrease that potentially happens because of the IPO has to happen within +-30 days of the IPO release.
  + The correlation between the past IPO’s and the chosen sector has to be > 0.3 to be considered relevant.
* Our honest reflection was that metrics were not very relevant for us so we did not put much focus on it.

1. **Competitive benchmarking chart**
   1. Shows the metrics and their attributes.
2. **What are the 5 steps in setting the final specifications, how might you apply it to your project.**

*1. Develop technical models of the product.*

*2. Develop a cost model of the product.*

*3. Refine the specifications, making trade-offs where necessary.*

*4. Flow down the specifications as appropriate.*

*5. Reflect on the results and the process.*

*Bls 107-109*

1. We created a figma product with core functionality, we also have an excel spreadsheet that we are currently working on with more defined calculations.
2. We developed a cost model of our product, estimated the manufacturing cost and arrived at a number around 3 million ISK for two months of product development.
3. We then refined the specifications and selected primary and secondary needs.
4. …
5. We are currently well on our way into design details are are so far happy with our progress.
6. **Target costing**
   1. Set the value of the manufacturing cost specification based on the price the company hopes the end user will pay for the product and on the profit margins that are required for each stage in the distribution channel.
   2. Since our product has no material components, the cost analysis is relatively simple. The main cost would be the cost of time for the production of the program.

**CHAPTER 7**

1. **Describe the 5-step concept generation method and how it could be applied to your project.**
   1. The 5-step concept generation method:
      1. Clarify the problem
         1. Understand the problem and break the problem down into subproblems if necessary.
      2. Search externally/internally
         1. External search is aimed at finding existing solutions to both the overall problem and the subproblems.
            1. For ex. interview lead users, consult experts, look at similar products.
         2. Internal search is the use of personal and team knowledge and creativity to generate solution concepts.
      3. Explore systematically
      4. Reflect on the solutions and the process

How it applies to our project:

1. We first had to clarify what our project / problem was, we wanted to see how the volatility of IPO’s impact a portfolio / sector
2. For concept development we interviewed our customer and searched externally (on the web and emailing professors) for concepts that could help us with our problems and customer needs. We found a few models that could be used.
3. We screened the concept and arrived at a final result, using CAPM and fama-french 3 at the time. (Although with new information we are currently reconsidering).
4. We are currently well on our way into design details and are happy with our progress so far.

**CHAPTER 8**

1. **Explain the benefits of a structure method of concept selection. How may this apply to your project?**

**Concept selection is the process of evaluating concepts with respect to customer needs and other criteria, comparing the relative strengths and weaknesses of the concepts, and selecting one or more concepts for further investigation.**

Example of benefits of a structure method of concept selection:

1. **A competitive design:** By benchmarking concepts with respect to existing designs, designers push the design to match or exceed their competitors’ performance along key dimensions.
2. **Reduced time to product introduction:** A structured method becomes a common language among design engineers, manufacturing engineers, industrial designers, marketers, and project managers, resulting in decreased ambiguity, faster communication, and fewer false starts.
3. **Effective group decision making**

How it applies: We used the structured method to decide which programming language we would use to make the software. It is important to decide this early; a) we don’t have to spend time later on thinking about this, because of that this helps us with knowing what is possible and what isn’t. b) This helps us gain a better understanding of what the members of the group know. For example, when deciding which programming language we would use, we talked about what languages we know and that was a big factor on deciding which language we would use.

1. **Describe the process of concept scoring and how you applied it in your project.**

Prepare the selection matrix, rate the concepts, rank the concepts, combine and improve the concepts, select one or more concepts, reflect on results.

We put all the concepts in a table together with criteria’s that are important to be met. For each concept we give it a score; -, 0 or +, based on how well it meets the criteria. The concept that ends up with the highest score wins the scoring matrix.

Table

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**CHAPTER 9**

1. **Describe the 7 step process of concept testing. How did you test the concept of your project?**

* *Define the purpose of the concept test.*
  + *What do we wish to answer with the test*
* *Choose a survey population.*
  + *Who will be testing/look at our concepts*
* *Choose a survey format.*
  + *Face-to-face, telephone, mail, internet…*
* *Communicate the concept.*
  + *Verbal description, sketch, interactive multimedia…*
* *Measure customer response.*
  + *Interview*
* *Interpret the results.*
* *Reflect on the results and the process.*

How we applied it to our project:

* The main reason why we need to do a concept test is to make sure that the customers' needs are accurately fulfilled. Another reason is to give the customer a grasp on where the project is heading and how it is being developed.
* Our survey population is our contact at Kvika Eignarstýring since we are developing this for them.
* Our survey format for this project was the internet, because it is convenient for everyone.
* We decided that we would communicate the concept with a verbal description and with sketches.
* We collected the customer response by doing an interview
* Based on the customer response we can assume that our customer would buy our product.

**CHAPTER 10**

1. **Describe the different types of product modularity and how it would apply in your project/how could you apply it to a software? Bls193-194 (kubba myndin)**

* Slot-modular architecture: Each of the interfaces between chunks in a slot-modular architecture is of a different type from the others, so that the various chunks in the product cannot be interchanged.
  + Ports on a computer
* Bus-modular architecture: In a bus-modular architecture, there is a common bus to which the other chunks connect via the same type of interface.
  + usb port
* Sectional-modular architecture: In a sectional-modular architecture, all interfaces are of the same type, but there is no single element to which all the other chunks attach.
  + Lego cubes

The slot modular architecture is a good example of how a software (mainly the functions/classes). Each function and class will work for it’s chunk but does not work for other chunks. That is, the input for each function must be correct and match the functions expected input, to get the desired output.

1. **What are the four steps of establishing product architecture, and how does it apply to your project?**

*1. Create a schematic of the product.*

*2. Cluster the elements of the schematic.*

*3. Create a rough geometric layout.*

*4. Identify the fundamental and incidental interactions.*

How does it apply:

We created a schematic that explains how our elements will communicate with each other. Since we have a software-based product it’s mostly computers and servers communicating. For example, after we clustered our elements into chunks, we had backend, data layer, logic layer and schematic layer (frontend). This is how a typical software system is set up, which is very relevant for us.

For us, the incidental interaction graph is not very relevant, but either way we decided to do it. Since we have a software, the only interaction is sending data and files between layers.

**CHAPTER 11**

**1. Explain the importance of user experience needs and how it could be applied to your project.**

User experience needs are very important, especially for software based products. User experience covers how well a product meets all of a user’s needs, including mental as well as functional. It relates to usability, user interface, human interaction, etc.

For our product, the usability and human-computer interaction are very important factors. Our software must be understandable and we have the goal to make users learn how to use the product quickly. How we enforce that is by doing tests regularly. By making an actual user try our product and giving us feedback, we can easily improve the usability and the user experience of our software.

**2. Describe the 6-step industrial design project, and how it can be applied to your project.** Bls223

* Investigation of customer needs.
  + Document the customer needs. Study the customer, interview, etc.
* Conceptualization.
  + Come up with concepts for the product’s form or user interfaces. Can be done by doing sketches (like we did).
* Preliminary refinement.
  + Build models of the most promising concepts. For us, we could do this in Figma by doing a quick and not very detailed drawing of how the software could look (like we did). We can then later improve it.
* Further refinement and final concept selection.
  + Here we improve the models and make them look better. For our software based product, this is basically part 2 of the step above.
* Control drawings or models.
  + Control drawings or models document functionality, features, sizes, colors, etc. In software, this is very important. For example, colors can change how the user view buttons (for ex. is it obvious that the user should click the button?). This can be studied a lot.
* Coordination with engineering, manufacturing, and external vendors.
  + It is important to communicate with the people that will make the actual product. For example, if it is possible to do everything. For our product, this isn’t really a problem since we will have the same people making the industrial design and the software itself.

**CHAPTER 12**

1. **Describe shortly each of the 7 steps in the design for environment process. What environmental considerations did you make for your project?**
2. **Set DFE (design for environment) agenda**
   1. This is split into 3 parts; identifying the internal and external drivers of DFE, setting the environmental goals, setting up the DFE team.
      1. Internal/External:
         1. Why do we want to address the environmental performance of our product? (public image, product quality…)
      2. DFE goals:
         1. What are our environmental goals. Zero landfill? All green electrical energy use?
      3. Set up the DFE Team
         1. leader, environmental chemistry and materials expert, engineer, etc.
3. **Identify Potential Environmental Impacts**
   1. First, we have to find the potential environmental impacts of the product over its life cycle.
      1. Are the materials hazardous? Does the production factory pollute? Does the use of the product cause pollution?
4. **Select DFE guidelines**
   1. For each stage of the products life cycle, we can set guidelines to follow.
   2. For example: we will only use nonhazardous materials of some type, we will use a little packaging as possible, etc.
5. **Apply DFE guidelines to initial design**
   1. Since we have the guidelines in step 3, we should use them and follow them when we are making our initial design. Like using materials that follow the guidelines for the products prototypes, etc.
6. **Asses Environmental Impacts**
   1. Calculate the environmental impact of the product over its entire life cycle. What changes if it is recycled or disposed?
   2. We can do this by using a life cycle analysis tool. (How much energy is used and **how much co2e does that release, etc.)**
7. **Refine Design**
   1. From the steps above, is there something that we can improve to make our product even more environmentally friendly?
   2. Repeat this until the environmental impacts have been reduced to an acceptable level.
8. **Reflect on DFE process and results**
   1. Self explanatory.

**How this applies to our product:**

Through this process we discovered that Iceland is exceptionally well suited for software-based products. We used green-algorithms.com to calculate the environmental impact score of running a computer for 24 hours in Iceland. The result was that it was 0.5 g of CO2 equivalent which is very low. If we were in, for example Australia this would be almost 1000 times larger.

**CHAPTER 13**

**The DFM (design for manufacturing) method (7 steps)**

1. **Consider the strategic sourcing decisions**
   * What will we do ourselves and for which activities will we rely on suppliers.
   * We will make the actual product ourselves but use software from others. Not very relevant for software but the method would be full vertical integration.
2. **Estimate the manufacturing costs**
   * What is the total manufacturing cost? Including everything.
   * Split into:
     + component cost
     + assembly cost,
     + overhead costs and supplier profit
     + logistic costs
   * Since we have a software we will mainly just have assembly cost, i.e. the cost of the time that it takes to make the software.
3. **Reduce the costs of components**
   * For most engineered assembled goods (not for us), the cost of purchased components will be the most significant cost. By finding and designing cost effective components, we can reduce the production cost by a lot.
4. **Reduce the costs of assembly**
   * Same as step 3
5. **Reduce the costs of supporting production**
   * A reduction in the number of unique parts reduces the demands on inventory management. (ekki relevant)
6. **Reduce the costs of logistics**
   * The freight cost, duties, etc.
   * If the product is small but expensive, the product may be shipped by air which makes the freight cost low.
   * Freight costs are generally determined by a combination of volume and weight.
7. **Consider the impact of DFM decisions on other factors** 
   * Minimizing the manufacturing cost is a big part of the product development process, but no the only part. We must take in consideration that the quality of the product is good relative to the price/cost of making it.

**CHAPTER 14**

* A prototype is an approximation of a product.
* There are two dimensions of prototypes: physical and analytical.
  + My groups product can be considered analytical so that was the better fitting prototype for us. That is, analytical prototypes are subjective, they can’t be touched.
* Prototypes can also be focused or comprehensive. That means how focused we will be on a particular segment of the product. If we do a focused prototype, we get a good feel of how some specific thing works. Comprehensive will give us an overview of how the product overall performs.
  + My group did an analytical-comprehensive prototype in Figma of our software.
* **Prototypes can be used for:** 
  + Learning (will it work?)
  + Communication (is everyone on the same page on what the product should be?)
  + Integration (does everything work together?)
  + Milestones (shows that the product has achieved desired level of functionality)

**Planning for prototypes (4 steps)**

* **Step 1: Define the purpose of the prototype**
  + 4 purposes of prototypes: learning, communication, integration and milestones.
  + What do we expect from the prototype?
  + What are we testing?
* **Step 2: Establish the level of approximation of the prototype**
  + How close to the actual product is our prototype?
* **Step 3: Outline an experimental plan**
  + What do we want to experiment with?
  + How quickly the user can learn to use the program, does the user understand everything?
* **Step 4: Create a Schedule for Procurement, Construction and Testing.**
  + When will we make the prototype?
  + When will we test the prototype?
  + When will we interpret the results and produce the final results?