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IMPROVING THE USER EXPERIENCE OF A BUILDING DESIGN SOFTWARE AND ITS TRIAL PROCESS

Master's Thesis
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ABSTRACT

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Building Information Modeling (BIM) systems are nowadays having a massive amount of different features and therefore are quite complex systems. That is why they are becoming harder for the user to learn. User Experience (UX) and usability have not been taken into account much in the development of new features.

Software trials are used more and more as a way of introducing products to new users. This new process has been introduced in Vertex Systems Oy (Vertex) too and free 30-day trial of Building Design product called Vertex BD is offered to new customers. As this whole process is new there is a need for it to be improved further. Good user experience is important in this trial process because the goal is to convert as many trial users into buying customers as possible.

The main goal of this thesis is to improve the user and customer experience of the Vertex BD product and its trial process. The research questions in this thesis are: how to improve the user and customer experience of the Vertex BD product in trial period, how to make the Vertex BD product easier to learn and what are the main user experience problems in the trial process and how to fix them. To answer these three research questions heuristic evaluations and user research was done. User research was done by online surveys that were sent to trial user worldwide via email.

From heuristic evaluations there were 40 usability problems found. Most of them related to the Vertex BD product itself but there were also findings regarding the trial process. The number of answers to the user research was rather small, only 25 answers overall. Still there were some findings from the survey answers too, mainly related to the installation of the software, tutorials and communication in the trial process. Based on these results there were improvement suggestions made for the Vertex BD software, installation, trial process communication (emails, websites etc.), tutorials and documentation. To continue the work started in this thesis these improvement areas will be designed further and implemented with the help of different development teams in the company. In the future user experience is taken more into account in the development process and user research is done also in the future.

Keywords: user experience, usability, BIM, software trial

TIIVISTELMÄ

Anu Tolvanen: Rakennussuunnitteluohjelmiston ja sen kokeilujakson käyttäjäkokemuksen parantaminen
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Rakennuksen tietomalli eli BIM(engl. Building Information Modeling)-ohjelmistot sisältävät nykyään valtavan määrän erilaisia ominaisuuksia ja ovat tästä syystä yhä monimutkaisempia käyttää. Tämä tekee näistä ohjelmista vaikeita oppia käyttämään. Käyttäjäkokemusta (UX, engl. User Experience) ja käytettävyyttä ei ole otettu kovin hyvin huomioon kehitysvaiheessa.

Ohjelmistojen kokeilujaksot ovat yhä yleisempi tapa tutustuttaa uudet käyttäjät johonkin tuotteeseen. Tämä uusi tapa on otettu käyttöön myös Vertex Systems Oy:lla (Vertex). Vertex tarjoaa uusille asiakkaille 30 päivän ilmaisen kokeilujakson rakennussuunnitteluohjelmistostaan Vertex BD:stä. Koska koko tämän prosessi on uusi Vertex:ssä, sitä tulee kehittää yhä paremmaksi. Hyvä käyttäjäkokemus on tärkeää kokeilujakson aikana, koska tavoitteena on saada mahdollisimman monta käyttäjää ostamaan tuote käyttöönsä.

Tämän työn tärkein tavoite on parantaa Vertex BD:n ja sen kokeilujakson käyttäjä- ja asiakaskokemusta. Työn kolme tutkimuskysymystä ovat: kuinka parantaa Vertex BD:n käyttäjä- ja asiakaskokemusta kokeilujakson aikana, kuinka tehdä Vertex BD tuotteesta helpommin opittava, sekä mitkä ovat isoimmat ongelmakohdat kokeilujakson käyttäjäkokemuksessa ja kuinka niitä voitaisiin korjata. Näihin kysymyksiin etsittiin vastauksia tekemällä heuristinen arviointi ja käyttäjäkyselyitä. Käyttäjäkyselyt toteutettiin verkkokyselynä, joka lähetettiin sähköpostilla kokeilujakson käyttäjille maailmanlaajuisesti.

Heuristisen arvioinnin avulla löydettiin 40 käytettävyysongelmaa, joista suurin osa liittyi itse Vertex BD ohjelmaan, mutta myös kokeilujaksoon liittyviä ongelmia löytyi. Käyttäjäkyselyihin ei tullut kovin montaa vastausta, vain 25 vastausta kaiken kaikkiaan. Siitä huolimatta kyselyjenkin kautta tehtiin löydöksiä käyttäjäkokemukseen liittyen, erityisesti liittyen ohjelman asennukseen, opetusvideoihin ja kommunikointiin kokeilujakson aikana. Näiden tulosten pohjalta kehityskohteita muodostui liittyen Vertex BD ohjelmistoon, sen asennukseen, kommunikointiin kokeilujakson aikana (sähköpostit, verkkosivut yms.), ohjevideoihin ja dokumentaatioon. Työtä jatketaan suunnittelemalla muutoksia tarkemmin yhdessä niitä toteuttavien tiimien kanssa ja auttamalla tiimejä toteuttamaan muutokset. Tulevaisuudessa käyttäjäkokemus otetaan yhä paremmin huomioon tuotteen kehityksessä ja myös käyttäjäkyselyitä tullaan tekemään jatkossakin.

Avainsanat: käyttäjäkokemus, käytettävyys, rakennuksen tietomalli, ohjelmiston kokeilujakso

PREFACE

This Master's thesis was done in collaboration with Vertex Systems Oy. This thesis has been the first user experience related work in Vertex, and I am sincerely grateful for this opportunity to work in the company. It has been a pleasure to work with people who seem to be genuinely interested of my thesis topic and the work I have been doing. For this reason, I want to give my thanks to all my co-workers at Vertex and especially to Pekka Moilanen and Jukka Haho for their support during this thesis work.

I am thankful for all the help I got from my thesis supervisor from Tampere University, Kaisa Väänänen. Despite the busy schedules we both had, I got valuable feedback, especially in the beginning of the project.

I want to give huge thanks to my family for pushing me forward in my studies and always believing in me, even when I had some doubts about myself. Dad, I made it!

Thanks to all my friends for giving me peer support in my studies and also at times giving me some other things to think about too. Without you, the student life would not have been as fun as it has been.

Finally, Aleksi, thank you for all the endless support I have got from you.

Tampere, 24 April 2020

Anu Tolvanen

CONTENTS

LIST OF FIGURES

LIST OF SYMBOLS AND ABBREVIATIONS

Vertex	Vertex Systems Oy
Vertex BD	Building Design Vertex product
BIM	Building Information Modeling
CAD	Computer-Aided Design
HCI	Human-Computer Interaction
UI	User Interface
UX	User Experience

1. INTRODUCTION

Computer-Aided Design (CAD) and Building Information Modeling (BIM) systems have nowadays so large scale of features that they are becoming harder for the user to learn. Also, the User Experience (UX) and usability has not really been taken into account in the development of these kind of systems. Still they are continuously developed further. There are multiple tasks that can be done with these systems by different professionals in engineering and architectural fields. [1-4]

Trials are more and more often the way that companies offer the users to get hands-on experience of the product. Also, in the case of international market areas, it is not cost-effective to travel to every customer to introduce the product.

Vertex BD is a BIM software product that is developed in Vertex Systems Oy (Vertex). Vertex has started to offer 30-day free trial for the users of Vertex BD product. With the trial software the users can get familiar with the Vertex BD product and the goal is to convert as many trial users as possible into buying customers. Therefore, it is very important that the trial user get a very good first impression of the product.

This thesis is done because the whole trial process is new in Vertex. There is a need to gather more information on how to make it better. The whole trial process is to be improved in order to convert more trial users into buying customers. It has also been acknowledged that there are minor usability issues in the Vertex BD product and there is a need to find them and make the usability and user experience of the program better. Therefore, the goal of this thesis is to improve the Vertex BD trial process and its user and customer experience together with the Vertex BD software. The research questions in this thesis are:

- How to improve the user and customer experience of the Vertex BD product in trial period?
- How to make the Vertex BD product easier to learn?
- What are the main user experience problems in the trial process and how to fix them?

The aim is to gather more information about the usability issues in the software and in the trial process. With this information the needed actions can be decided. The main goal

of this thesis is to get a list of improvement areas. A concrete list will help with the next steps in the making of the better user experience of the Vertex BD and its trial process. It is also important to gather feedback from the trial users about the trial process. This kind of research has not been done before in the company so it will be valuable information for the business.

To meet the goals of this thesis a research needs to be done to get the best possible results out of this thesis. First some literature reviews must be done. After that heuristic evaluations will be done. User research is done with online surveys that are sent to trial users worldwide. With the information gathered from the evaluations and user research the improvement suggestion list will be created. After that, the future steps to this whole project can be decided.

The intention in the company is to implement the improvement objects that come up from this thesis. Other minor goal of this thesis is to bring user experience awareness more into to the company. This kind of know-how is new in the company and with this thesis the competence in this area in the company increases. New ways of working are introduced, and the goal is to bring them into the everyday development work.

The structure of this work is the following. First the related work is covered in section 2. In that section the terms computer-aided design, building information modeling, user experience, customer experience and software trial are explained. After that, the case study in this thesis is introduced in section 3. The Vertex BD software and its features are described in more detail in section 3.1 as well as the trial process with Vertex BD in section 3.2. In section 3.3 the customer journey with Vertex BD is introduced and section 3.4 is about the research focus in this work.

After that the methods used in this thesis are introduced in section 4 and section 5 is then about the results that came from the research. Heuristic evaluation results are in section 5.1 and user research results are in section 5.2. In section 5.3 the improvement suggestions that were made based on the research are explained in high level. Discussions can be found from section 6 and finally the conclusions in section 7.

2. RELATED WORK

Small literature review was done to map the main terms and concepts related to this work. First computer-aided design and building information modeling terms are shortly explained in sections 2.1 and 2.2. After that in section 2.3 user experience related theories are examined. In section 2.4 customer experience is shortly defined and in section 2.5 some background information about software trials is described. Section 2.6 contains a short summary of the related work section with main findings and how they relate to this work.

2.1 Computer-aided design

Computer-Aided Design (CAD) means the use of a computer to aid the design of 2D or 3D models. These graphics software systems are made to help with drawing from simple straight lines to more complex drawings and animations. The design process is faster with the help of CAD software and the quality of the design is good. CAD systems also help with the designing phases like documentation, evaluation and optimization. CAD software solutions are usually made to help the designing process in engineering and architectural fields. [5,6]

The CAD systems in the market have expanded the range of functionalities they contain. This has allowed the designers and engineers to do multiple tasks with CAD systems. But this has also led to problems. Complicated CAD systems cause that the users are not that satisfied to the system and its efficiency and reliability. Complex tools take too much effort from the user and if even some simple tasks require complex actions it comes very difficult to work with the system. [1]

2.2 Building information modeling

Building Information Modeling (BIM), or Building Information Management as it is sometimes referred, means the process that is helping to design, understand and demonstrate the building characteristics. This process is computerised, and this basically means that a computer software is used to help to visualize the building in 3D. But the 3D model is not all that the BIM system does. BIM is helping with the construction and operation of the building by simulating it. The result is a **building information model** that contains the all information that is needed not only in the building phase but also in the whole life-

cycle of the building. Information can be used in design, construction, maintenance and also in regeneration and finally even in disposal or recycling of the building. [3]

Like in CAD systems in BIM there are also 2D and 3D models to visualize the project object and similarly they both contain drawing and designing of components. The thing that separates BIM from ordinary CAD system is that BIM is designed to help specifically with management of buildings and its used in construction and civil engineering industries. The purpose of BIM is to not only help the designer and engineers with their work but also to make significant cost savings throughout the whole life-cycle of the building. This can be done because the amount of inaccurate and conflicting information reduced in the BIM systems. The fact that the building can be constructed virtually before it is actually built in the physical world helps the companies to avoid mistakes in real construction site that could be both dangerous and expensive. [3]

Because BIM systems are used throughout the whole life-cycle of the building there will be a lot of data that is useful to many team members that work in the project. Collaboration is one of the biggest benefits of BIM systems. The entire team can participate in development of the project design. The employers, architects, engineers, consultants, contractors and other team members all benefit from the use of BIM system. [3]

2.3 User experience

User Experience (UX) is defined in many different ways in the field of Human-Computer Interaction (HCI). There are also many models and theories created to describe it. [7] In ISO 941-210:2019 standard user experience is defined in the following way: “user’s perceptions and responses that result from the use and/or anticipated use of a system, product or service.” [8] But that is not considered to completely describe the complexity of the term. User experience is a complex term to understand and it is even harder to design user experience for interactive systems[7].

In the ISO 941-210:2019 notes about the term user experience it is further clarified that “Users’ perceptions and responses include the users’ emotions, beliefs, preferences, perceptions, comfort, behaviours, and accomplishments that occur before, during and after use.” and “User experience is a consequence of brand image, presentation, functionality, system performance, interactive behaviour, and assistive capabilities of a system, product or service. It also results from the user’s internal and physical state resulting from prior experiences, attitudes, skills, abilities and personality; and from the context of use.” [8] With these additions the definition is more thorough, but it is not very easy to get complete picture of the term just based on this definition.

Understanding user experience is extremely critical for those who are designing interactive systems[7]. That being said the experience designed for the product can be very different than what the user actually experiences. People have different personal standards that vary depending on the situation. Also, people can change throughout the time and thus the way they experience different products may change. [9]

Forlizzi & Battarbee [7] have created a framework that helps to understand the user experience of interactive systems. They think that interaction-centered view is the best approach when wanting to understand how the user will experience the product. In the framework the user-product interactions are divided into three groups: fluent, cognitive and expressive. Fluent interactions are automatic and do not need much attention from us, like riding a bike or making coffee in the morning. Cognitive interactions focus on the product that is used in situation. From that kind of interactions, the user can gain knowledge, or they can get confused and cause an error. These interactions can happen when a user is encountering a new product, for example when traveling and the ordinary things are different than in your home country. Expressive interactions help the user to build a kind of a relationship to the product. For example, the user could personalize a chair by painting it with some different colour or change a background image for mobile phone or some other way customize the product they are using. [7]

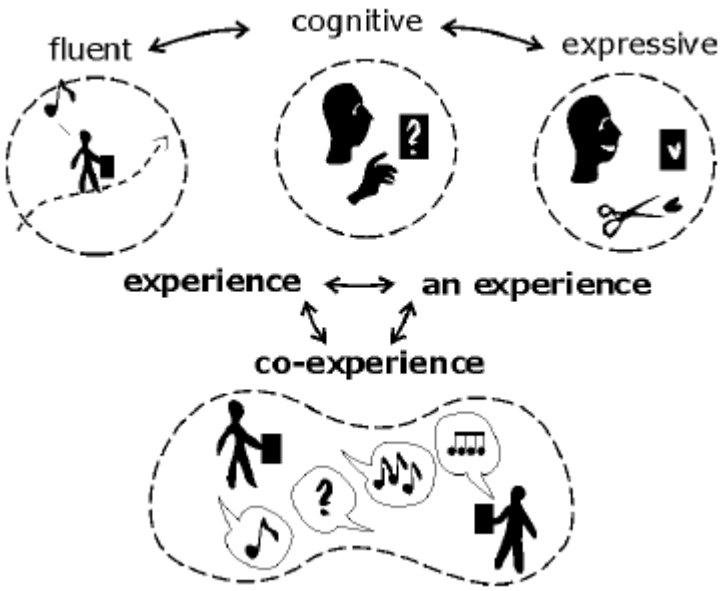


Figure 1. *Interaction-centered framework of experience [7, p.264].*

In the framework also divides the types of experiences into three groups: experience, an experience and co-experience (Figure1). Experience in this context means the experiences that are somehow ordinary in the user's life and happen in a constant stream. An experience is something more special that can be named, or some other way articulated

and has a beginning and an end. Co-experience means that people are experiencing the product together in some social context. [7]

Hassenzahl [9] has created a model where user experience is viewed either from designer perspective or user perspective. The key elements of the model are presented in Figure 2. The product has features that makes product character visible to the user. This product character is not always the same from the user's point of view as the designer intended it to be. In the model they are presented as intended product character if viewed from designer perspective and apparent product character if viewer is the user. Product character is built from two kinds of attributes. These attributes are called pragmatic and hedonic attributes. Further the product character in some usage situation leads to consequences. [9]

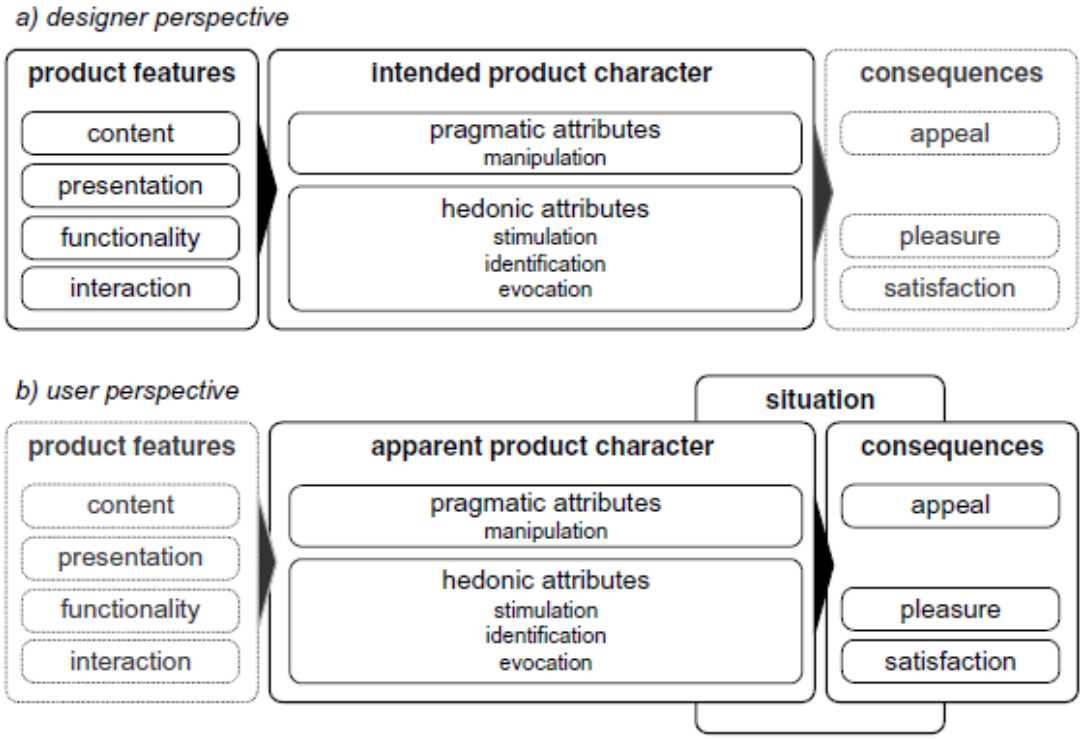


Figure 2. *The key elements of the Hassenzahl's model of user experience from designer and user perspective [9, p.302].*

Pragmatic attributes let the user manipulate the environment. For example, "clear", "useful" and "supporting" are pragmatic attributes. With pragmatic product the user is trying to fulfil behavioural goals. Other product character attributes are hedonic, and they focus on to the user's psychological well-being. They could be expressed to be for example "outstanding", "exciting" and "interesting". Hedonic attributes are divided into three groups: stimulation, identification and evocation. Stimulating products help the users to develop themselves. Identification means that the user is able to express their self to

others with the product. Evocation refers to the products ability to provoke memories in people. [9]

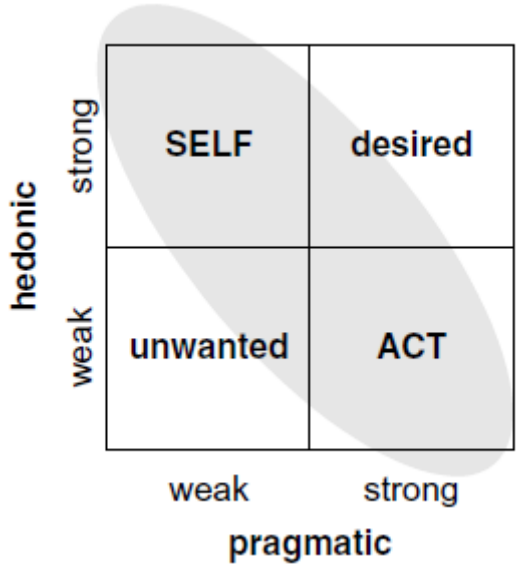


Figure 3. *Product characters with combinations of pragmatic and hedonic attributes [9, p.307].*

When a product is strongly both pragmatic and hedonic it is considered to be desired product. When it is neither pragmatic or hedonic it is unwanted. Hassenzahl [9] categorizes strong hedonic products to be SELF products and strong pragmatic ones to be ACT products. These are presented in Figure 3. When a person is experiencing a product it will lead to emotional consequences. Like can be seen from Figure 2, these emotions can be for example satisfaction or pleasure. Usually a person will value the product more if they are satisfied on how the product fulfilled their needs in a particular situation. This usually is related to the fulfilment of behavioural goals. [9]

2.3.1 Usability

The main goal in the design is that the product in hand satisfies the need that the user has in the situation because that is what people appreciate in products. [9] This can be thought to refer to the usability of the product. But one should remember that usability does not mean the same thing ad UX. Usability is typically one part of the whole UX experienced by the user. [10]

In industry, UX is often seen differently than in the academic literature. User experience is often used even as a synonym for usability. [11] ISO 941-210:2019 standard says usability is “extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.” [8] This definition focuses more on the actual task and how well the user

gets that done. UX on the other hand focuses more on the user's feelings while using the product. Even when there is broadly agreed difference between the terms UX and usability the most experienced UX or usability experts can have trouble saying whether some specific user research question is about usability or UX. There are cases that this kind of separation is impossible to do. [12]

2.3.2 User experience at work

In work life people tend to think that jobs just need to be done and there is no need to satisfy any human needs. Harbich and Hassenzahl [13] argue that work is not that much different than playing a game in home or some other private context. They ask why there could not be motivating, desirable and enjoyable tools in workplaces too. In games there are usually some tasks that need to be done. There is same kind of goal-directed behaviour in them than in work life. Difference is that in home the people can decide what product, technology and software they will use. In work life these options are usually very limited. It should be noted that this does not mean that people will use the given tools at workplace. People can alter or even reject the task they are given, and usually there are lots of time to procrastinate. [13]

Usually in work life the motivation to use some product to finish a given task is extrinsic, meaning that someone else gave the task and gives reward for finishing it. As if the motivation would be intrinsic the employees might be more motivated to find better ways to get the things done. Intrinsic motivation is the person's natural tendency of looking for new challenges. This motivation drives to find new ways of doing things, learn and explore one's own capabilities. This way the motivation comes from the person and is not given by someone else. [13,14]

Harbich and Hassenzahl [13] present a model called e^4-model that is made to help the designing of products used in work life. e^4-model has four groups of desired behavioural outcomes: execute, engage, evolve and expand. Execute refers to task completion meaning that the user accomplishes the given behavioural goal. When users are motivated to work, they usually perform better at workplace. Engage refers to this and the desired behaviour is persistence in task execution. The users like to use the given tools and even look forward to it and explore the product with their own time or some other way put extra effort to the task. Evolve refers to modification of tasks meaning that the users discover new and better possibilities to use the product and can do their tasks more efficiently and with better quality. When the user knows the product well enough to create and accomplish new additional tasks it can be called expanding. Then the desired behaviour is creation of novel tasks. [13]

2.4 Customer experience

Traditionally customer experience has not been thought much in marketing, retailing and service management as a term. The focus has been more on how to measure customer satisfaction and service quality. [15] Nowadays it is however becoming an increasingly important topic in both literature and in practice and it has been examined more and more. Therefore, there are now many a bit different definitions of it. [15-17]

Gentile et al. define customer experience the following way: “The customer experience originates from a set of interactions between a customer and a product, a company, or part of its organization, which provoke a reaction. This experience is strictly personal and implies the customer's involvement at different levels (rational, emotional, sensorial, physical, and spiritual). Its evaluation depends on the comparison between a customer’s expectations and the stimuli coming from the interaction with the company and its offering in correspondence of the different moments of contact or touch-points.” [17, p.397]

Meyer and Schwager on the other hand define that “Customer experience is the internal and subjective response customers have to any direct or indirect contact with a company. Direct contact generally occurs in the course of purchase, use, and service and is usually initiated by the customer. Indirect contact most often involves unplanned encounters with representatives of a company's products, service or brands and takes the form of word-of-mouth recommendations or criticisms, advertising, news reports, reviews and so forth.” [18, p.2]

Customer experience is according both of the above definitions, interactions between the customer and some element that refers to the product or the company in question somehow. During the time that the customer is somehow interacting with the company in question directly or indirectly and this evokes different experiences in the customer. This experience can also be displayed in a form of a **customer journey**. Customer journey is a process flow that outlines the interactions from prepurchase to purchase and postpurchase. [16]

2.5 Software trials

When making the purchasing decision the customer might not have very detailed information about the product quality[19]. Companies use free trials to introduce the product to the customer. This way the customer can test the product before deciding whether they want to purchase it or not. It reduces the uncertainty that the customer could have about the functionality of the product. [20]

Trials can be time-locked trials meaning that the user gets a full product to use but the time they got access to it is limited. The other kind of trial type is feature-restricted trials. In feature-restricted trial the time period is unlimited, but the product version does not have all the features that the full version has. [21]

Trials can also have a negative effect to the company using trials. Some users might have a short term need for the product and in that case, they could get the benefits of the product free by using it only in the trial period. Also, if the user decides that they do not want to purchase the product after the trial period the company does not just lose a potential customer. They will also get no positive network effect from that trial user. [20]

2.6 Summary of related work

User experience related issues need to be taken more into account when developing new features to CAD or BIM systems. These systems are nowadays very complicated to use and not easy to learn. This fact has been acknowledged in Vertex too and this is one of the reasons why this work is done. BIM systems are used throughout the whole life-cycle of the building and there are a lot of different user needs for the program. In this work these needs are not that well covered. The focus is in the user experience in the trial period.

User experience of a product is something that every person will experience differently. UX focuses more on how the user feels when they are using the product when usability focuses more on how well the task that the user is doing with the product gets done. In this work the focus is more on usability even though the bigger goal is to improve user experience.

Intrinsic motivation is the motivation that is usually driving the people to try to do things differently and finding new better ways to work. This should be noticed in work life too. If all the motivation is extrinsic the employee might procrastinate more. If the user experience of a product is better, it might motivate the user to find new more effective ways to work with the product. This is usually what is wanted from the employee. For this reason, it is important to improve the user experience in the trial period. The trial user needs to see that it is effective to use the product. They need to see the benefits of the product to make the purchasing decision. After all the whole purpose of a trial is to introduce the product and its benefits to the user before they make a decision whether they want to use it.

Customer experience is the interaction that happens with the customer and the product and everything that relates to it and the company. The experiences that the customer is

having during these interactions are customer experiences. With customer journeys these customer experiences can be explained. In this work a customer journey with Vertex BD is used to map the experiences that belong to the trial experience.

3. CASE STUDY: VERTEX BD

This case study chapter includes more information about the case this thesis is made for. In section 3.1 the Vertex BD software product is introduced. Its features and some use cases are explained. Section 3.2 is about the Vertex BD free 30-day trial process. In 3.3 the customer journey with Vertex BD is introduced. Finally, in section 3.4 the research focus in this work with Vertex BD and its trial process will be explained.

3.1 Vertex BD software

Vertex BD (Building Design) product is a Building Information Modeling (BIM) software application for medium to large residential and commercial builders. It belongs to a product portfolio that the Vertex Systems Oy (Vertex) provides. It is designed to be used by architects, drafters, engineers and construction professionals to benefit the entire building process from detailing to manufacturing. The software is suitable for both wood and cold-formed steel framing. Vertex BD automates the design and manufacturing process. The purpose of it is to minimize errors in production and help the user to complete projects quickly and accurately. [22,23]

There are many features in the Vertex BD product and the users can purchase the product with the features they want and need. In high level the features are Architectural Design, Framing and Detailing, Truss Design and Engineering, Documentation, Collaboration and Manufacturing [22].

Figure 4. *Examples of Architectural Design and Framing & Detailing [22].*

Architectural Design is including the tools for drafting and 3D modeling for designing buildings. There are tools for creating building components, estimating materials and

also the costs. One important functionality is also that user can produce the architectural drawings with Vertex BD. [22]

Framing and Detailing means that in Vertex BD there is an option for automatic framing generator. By using this feature the user can generate automatically wall, floor, ceiling and roof panel fabrication drawings. Beside that also structural layouts, cut lists, material reports and manufacturing data can be generated, all to one BIM model. [22]

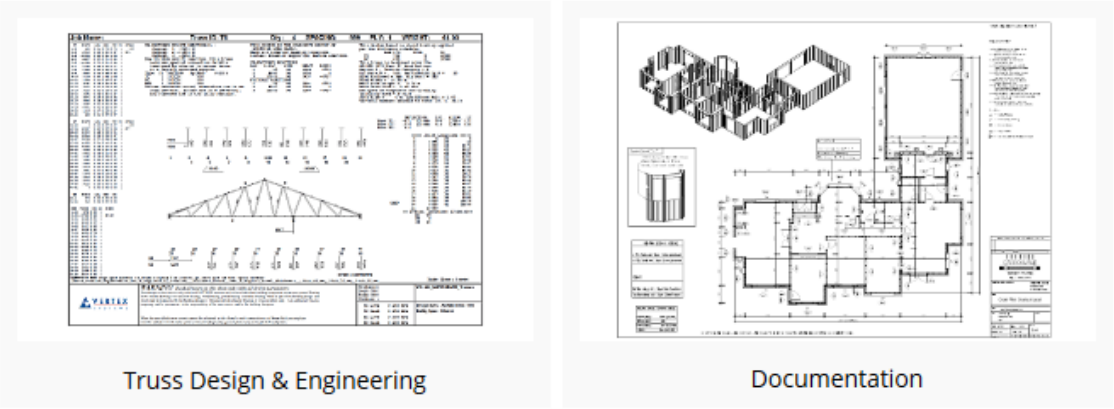


Figure 5. *Examples of Truss Design & Engineering and Documentation [22].*

Truss Design and Engineering is made for detailers and engineers who can use Vertex BD to help their work with both roof and floor trusses. The user can for example use the automatic wind load calculations for roofs that is in the software. Vertex BD also helps in the process of designing the truss shapes and structures. The user can choose to use any truss type and does not have to use just predefined shapes and profile sizes. As a result, the user can get all the necessary details of each member and connection with drawings and diagrams. [22]

Documentation is made easier to the user in many ways. The user can show their designs to others for example with 3D models and 2D drawings or show the cutting lists and reports to team members. The reports like material reports that include among other things bill materials, window and door schedules and cutting lists could be made with Vertex BD by using some of the templates that come with the program. The Vertex BD program automatically generates and updates the reports from the BIM model. [22]

Figure 6. *Examples of Collaboration and Manufacturing [22].*

Collaboration is supported with over 20 file formats. This way the user can import 2D drawings and 3D models from other CAD systems and export projects to make collaboration with others smoother. [22] There is also a new product called Vertex Showroom that allows the user to view their 3D models online with any device.

Manufacturing data can be sent directly from Vertex BD to manufacturing equipment. This way the user can save time and minimize errors in production. Framing data can be exported to over 25 different machines both for cold-formed steel construction and wood framed construction business needs. [22]

The typical users of Vertex BD work with home building, production home building and truss design engineering in cold-formed steel framing or wood framing construction business. Vertex BD is also used in prefabricated and modular construction as well as in manufacturing. The customer can choose what features they want in their Vertex BD to best answer the needs that they have.

Possible use case with Vertex BD could be for example in single-family home building when a company is doing the whole project from designing to actually building the single-family home. Or actually it does not have to be just one company that does this since the documents can be shared also between the companies doing the project.

First the architectural designs are made for the building. After that framing and detailing could be done. When all the designs are done the manufacturing of all the parts for the building can be done based on the documents that were generated using Vertex BD. Then the elements can be built with the help of the drawings coming also from Vertex BD. Production models and drawings can also be used in the construction site when actually installing everything into place. Communication is easier when using the documentation made with Vertex BD. Time and costs can be saved in all phases of the project.

Next one user interaction case with the Vertex BD product is walked through. The case explained here is one of the very first actions the user usually does when they start to design the building. When the user has started a new project they want to start to add the elements to model a new building. Good starting point is to add the walls to the building. The steps that the user needs to do in the User Interface (UI) are shown in Figures 7-9.

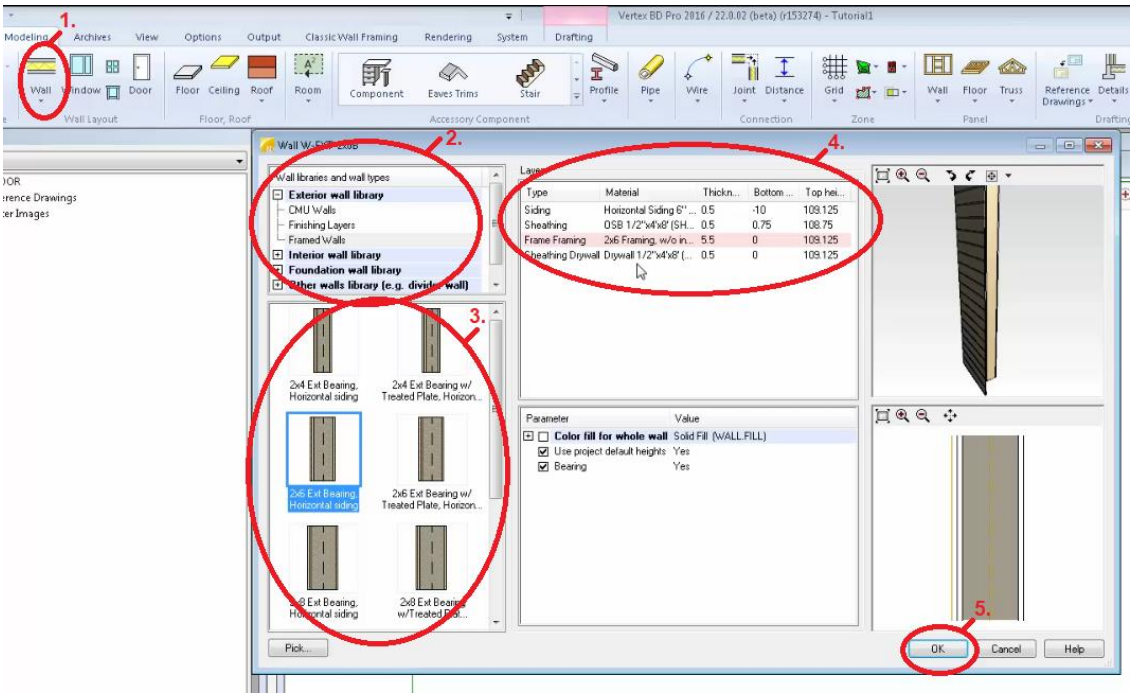


Figure 7. *Steps the user needs to do to add walls to their project.*

In the Figure 7 the steps that the user needs to take are numbered. First the user has to press the Wall-button on the up-left corner of the window. After that the window seen in Figure 7 appears on top of the modeling windows. The second thing the user needs to do is to choose what kind of walls they want to add to the project. In the third step the user chooses the exact wall type they want to use. The fourth step needs to be taken if the user wants to change some layers in the wall. After the user has done all the modifications they want to do, they can see the 3D and 2D previews of the walls in the right panel of the window. Then when the user is ready add the walls to the model OK-button needs to be clicked.

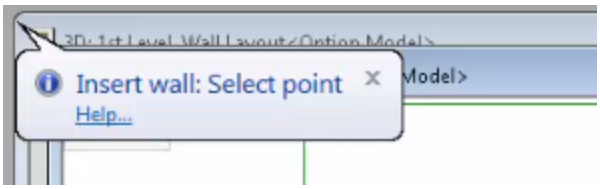


Figure 8. *Bubble tips help the user in the program when adding walls.*

The 2D view is visible and bubble tips gives the user info what they should do next. As can be seen from Figure 8 the bubble tip instructs the user to select the point where to start the wall. After the user has done that the program suggests to select the next point. At this phase the user can see in grey the shape of the wall and it moves with the cursor so the user can see where they are adding the wall. There is also a feature that helps the user to add the walls in straight lines to the model. This can be seen in the sixth step from Figure 9. There the program shows a grey dotted line where the wall would go straight. This direction can be locked if the user in this kind of situation clicks normally the left button of the mouse.

The preview with grey lines also has an arrow in it and the purpose of that is to show the user where is the outer layer of the wall. After the direction of the wall is chosen the length of the wall can be chosen also by just clicking in the wanted length. The walls are added in chains so after the first wall is added the direction of the second wall can be chosen. This continues as long as the end of the wall chain is brought to the starting point of the wall chain. At this point the walls will look like the walls in the seventh phase in Figure 9.

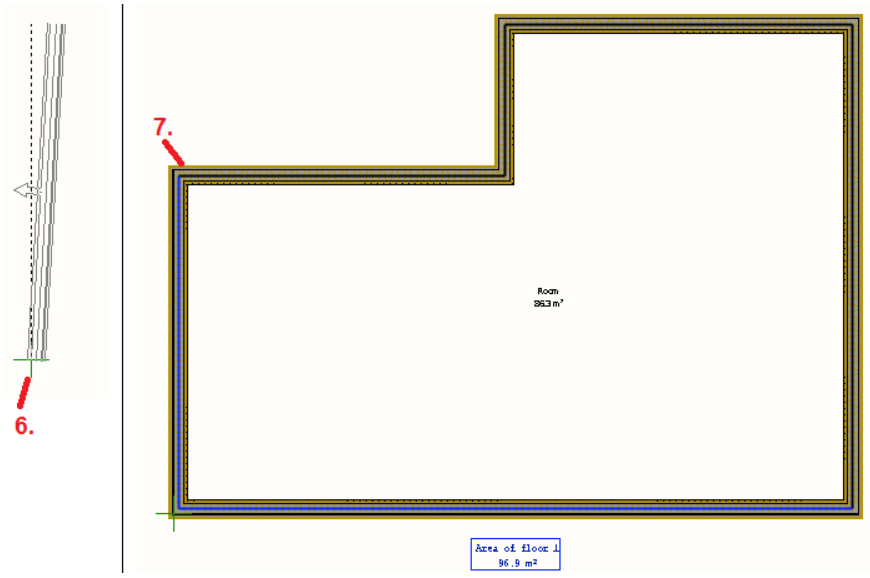


Figure 9. *Screenshots of the program when the user is modeling the walls.*

After that the user can continue to add more walls to the model by clicking the place where they want to add the next wall, or they can end the action of adding the walls.

Then they can move to for example adding floor, roof, windows and doors to the model. In Appendix A there is an example of project that has the typical basic things modeled in it. The screenshots from both 2D and 3D models can be seen in that document. The program is automatically making both of the views form the model.

3.2 Vertex BD free 30-day trial process

Vertex as a company has been focusing more on international growth than before and the traditional way of selling the product in person is sometimes not possible anymore. Traveling costs would be too high if there would be a need to travel to meet the international customers in person. The customers would like to have an opportunity to explore the product alone and that is why Vertex offers a free trial for them. Nowadays people are more used to buying products online and trying them out by themselves. In Vertex this is seen as a cost-effective way to increase international sales. Vertex BD trial period lasts 30 days and during that time the trial user can use the Vertex BD product.

Vertex BD product has a lot of features and the customer can choose what features they really need and purchase the package that suits best their needs. In the Vertex BD trial version, most of the features are available, but few features are disabled. All the basic features are included so that the user can experience the potential that the program has. The features that are left out from the trial package are more advanced features that the trial user would probably not have time to explore anyway.

First the user signs up for the trial period with the form found on Vertex webpage. The user will then receive a link for the installation page via email. The user will download the installation package and then install the program with that. After that the user can start to use the program.

The Vertex BD product is a big and complex product and the learning process can be long. Therefore, good training material is important for the trial user so they could get started with the program as fast as possible. In addition to product documentation Vertex has made video tutorials and how-to articles to make it easier for the user to learn to use Vertex BD. Trial users can also contact the Vertex staff if they have some questions.

During the trial period there are also weekly emails sent to the trial users. In these emails it is communicated to the trial users that they can get help from the documentation, how-to-articles, videos or personally by contacting the Vertex sales or support teams. Also, hands-on training is offered online or on-site. One email also informs the user that the Vertex BD is highly customisable software.

The whole trial process in Vertex is new and needs to be improved further. The goal with the trial is to get more buying customers through it. That is why it is important improve the customer experience in the trial period. If the trial users are more pleased with the trial it is easier to convert even more trial users into buying customers.

3.3 Customer journey with Vertex BD

The customer journey with Vertex BD has been thought through and is presenter also in Figure 10. The purpose of this journey is to explain in high level what the customer will experience during their journey with Vertex BD. In this work the focus is in the fourth phase in this journey, but the following paragraphs briefly explain the whole journey.

The journey starts from a point where a possible customer somehow finds out that there is a product named Vertex BD and some basic knowledge about what its purpose is. In this first phase, called **Awareness**, the customer can read reports, eBooks or some educational content to gain more insight about the product.

In the second phase the customer probably will gather more information about the product. This **Consideration** phase is the time when the customer will think about if they want to try out the product. This thinking will then lead to the **Decision** to actually go forward with this product and the customer is ready to learn more about the solution. In this third phase the customer will sign-up for trial and maybe even for some live or online demos.

The fourth phase is **Learning** phase. In this phase the customer will learn hands-on how to use the product. To help this learning there are video tutorials, how-to articles and personal support available for the customer. After the user has learned to use the product and has now even better understanding how this product will answer to the wanted needs, will come the decision of **Purchase**. The customer can ask for a quote or simply purchase Vertex BD from online shop.

Configuration is the fifth phase where the program is localized and personalized for the needs that the customer has. Also, in this phase the support from the Vertex staff available. The seventh and final phase, **Production use**, is when the product is actually in use in the customer site. In this phase also the more advanced features of the product will be in use.

Figure 10. *Vertex BD customer experience journey (internal documentation).*

When thinking about the customer journey in Figure 10, this thesis will focus mainly on the learning phase, phase 4 in the Figure 10. The trial period is one month long and everything that happens in that time is considered to be in this scope. The main focus is in the product; how to get it, how to install it, how to start using it etc. Also things like how to get help and find all the tutorials and how-to articles are considered but the contents that these materials have are not in the main focus. Of course it is important to know if there is something missing from these or if something is not explained well enough.

3.4 Research focus with Vertex BD and its trial process

The goal of this thesis is to improve the trial process and its user and customer experience together with Vertex BD software. As the whole trial process is new it will be developed further still in the future as it is learned what works best for the customers and also for Vertex as a company. In Vertex BD product there will probably always be something to improve both in user experience and in functionality because it is so big and complex program and the industry will always change its ways and technology will improve.

In order to achieve the planned goals research questions have been formulated. These three research questions are:

- How to improve the user and customer experience of the Vertex BD product in trial period?
- How to make the Vertex BD product easier to learn?
- What are the main user experience problems in the trial process and how to fix them?

The expected outcomes from the work done in the scope of this thesis are improvement suggestions for the Vertex BD product itself and also for the whole trial process. These improvements will be implemented in an order that is agreed with Vertex BD product manager and the team implementing the changes. Improvements will be designed based on the research done during the thesis work.

The main focus in this work is in the usability and learnability of the Vertex BD and its trial process. These focus areas are selected because there has not been any previous UX evaluations or research done before for the Vertex BD product or to the trial process. Usability is the most important thing when thinking about user experience in this kind of software that is made to be used in companies to perform tasks as efficiently as possible.

Learnability is important especially because of the trial period focus in this work. The trial user has very likely never used the Vertex BD before and needs to learn how to use it in rather short amount of time. In order to move from learning phase to purchasing the product the user needs to get proper understanding of the program. The user needs to find out whether Vertex BD answers to the needs that their company has. The user has to see how Vertex BD will make the design process faster, easier or some other way better compared to the tools that are currently in use in the company.

4. METHODS

In the following two chapters the method used in this work are explained. Two research methods were used, heuristic evaluation and user research. There were two different heuristic evaluations made with two a little bit different viewpoints. These two expert evaluations were done before the user research was conducted. More about heuristic evaluations in section 4.1. User research was done by sending online surveys to trial users via email. There were two surveys that were sent to trial users. The first at the beginning of the trial period and the second 18 days later, after the user had got time to get hands-on experience of the product. User research method used in this work is explained in section 4.2.

4.1 Heuristic evaluation

Heuristic evaluation is a usability engineering method that is based on ten heuristics for user interface design. The purpose of this method is to find usability problems so that they could be noticed and taken into account in the development. The ten heuristics are not specific usability guidelines. They are general principles and so-called rules of thumb. In heuristic evaluation the interface is examined with these usability principles. [24-27]

The 10 usability heuristics by Jakob Nielsen are:

1. Visibility of system status
2. Mach between system and the real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition rather than recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Help users recognize, diagnose, and recover from errors
10. Help and documentation [25,26]

The ten usability heuristics are explained in more detail in Appendix B.

Heuristic evaluation is done by a set of evaluators because it is not possible for one person to find all the usability problems. Evaluations are done individually. Evaluators work alone to inspect the interface. They will compare the interface to the ten usability heuristics and report problems that violate them. After all the evaluators have done their evaluation the results are discussed. The findings will be aggregated and as an output from this process a list of usability problems is created. [24,26,27]

After all the findings are gathered the evaluators will rank the usability problems individually using some agreed severity ratings. Usually if only one evaluator has done the ratings, they are not very reliable. That is why more than evaluator should rate the usability problems. That way the quality of the ratings is better, and the results are more reliable. Severity ratings used in this work are designed by Jakob Nielsen. [28,29]

The severity ratings by Jakob Nielsen:

0 = I don't agree that this is a usability problem at all
1 = Cosmetic problem only: need not be fixed unless extra time is available on project
2 = Minor usability problem: fixing this should be given low priority
3 = Major usability problem: important to fix, so should be given high priority
4 = Usability catastrophe: imperative to fix this before product can be released [28,29]

Not only one thing affects to the severity of the usability problem. When usability problems are rated with using the severity ratings three things need to be considered. How **frequent** it is, what is its **impact** and how **persistence** it is. The things evaluators need to ask themselves are does the problem happen often, is it hard to bypass and does it bother the user every time it happens. If there are problems with all of these three factors the problem is most probably very severe usability problem. [30]

In this work it was not possible to have multiple evaluators doing the heuristic evaluations. Because of this it should be noted that the evaluation was not as effective as it would have been if there were multiple evaluators. Two heuristic evaluations were done from two different viewpoints. First one was done before this project started but it was thought to be useful in this project too. In the first heuristic evaluation the Vertex BD product itself was examined. In the second heuristic evaluation the whole trial process was examined.

There were two different heuristic evaluations done in this work. The first one focused on to the Vertex BD product and its usability. That evaluation was done during the summer 2019. The results from that evaluation led to improvement suggestion list. Many of those improvements were already done during the summer 2019. That work gave a good starting point to this work.

The second heuristic evaluation focused more on to the trial process and everything that the user goes through during the trial period. This evaluation was done in November 2019. The results from both of the evaluations are presented in this work in chapter 5.1.

It was decided that the heuristic evaluations gave a good starting point to this research. Also, this way the program and its features in addition to the trial process could be inspected. Heuristic evaluation is also probably the most known expert evaluation method and the method was already familiar to the researcher.

4.2 User research

Usability can be tested also by using questionnaires or interviews. The user research done with these kind of methods does not directly inspect the user interface and the interactions in it. But with these methods the user's opinions about the product can be gathered. This way it can be found out if the user is not satisfied with something. [31,32]

The user research method used in this work was questionnaire. It is not always possible to do on-site user-centred research and that is why online web surveys are used. Gathering the research data can be hard and sometimes it is hard to get participants for the user research from all the target markets. [33] This was the case in this work also. The trial users are using Vertex BD all over the world and there was no easy and fast way to do the user research on-site. That is why the online surveys were chosen as a method here. That way the survey could be sent to all trial users worldwide with the exception of China and Russia because of the language barrier.

The purpose of the surveys was to get more insight from the trial users. There were two different surveys sent to trial customers. First one at the start of the trial period and the second one after 18 days from the start of the trial period. Surveys were sent to customers that have the English version of the software and where the trial process was also almost completely automated. The one thing that is not automated is that if the user reaches out for the support there are persons available to help them out. Everything else is automated. Link to the survey was sent via email to the participants. The survey results were gathered between December 12, 2019 and January 31, 2020. The survey was made with SurveyMonkey tool[34].

The questions asked from the users can be seen in more detail from Appendix C and D. The first question in both of the surveys was about how the user would rate their experience with the Vertex BD. There were five options from very positive to very negative. The following questions were multiple-choice questions that asked in more detail what was positive and what was negative. After each of this multiple-choice question there

was an open-ended question where the participant could tell more if they wanted. The order of these questions was different depending on what the user answered to the first question. If they answered positive it was first asked more about the positive things and then about negative things. If the first answer was negative the questions were asked the other way round.

Then it was asked what kind of needs the user has for the Vertex BD and in the second survey it was also asked how the experience could be improved. Then there were few background questions concerning for example the type of business the participant is practicing and how long of an experience do they have from similar programs. In the second survey it was also asked how likely the participant will purchase the product after the trial period.

Making one's own survey questions can be hard and, in some cases, problematic. That is why it is good to get familiar with the questionnaires already made and tested. If possible, it is good practice to use those instead of making a new one. [32] In this work it was decided that a new survey has to be made because there were not any surveys that would have perfectly answered the purposes of this research. There was also the problem that this survey would have to be very short and only have few questions. It was known that the trial users would probably not want to spend a lot of time to answer this kind of survey, so it needed to be fast to answer [33]. There was also a small incentive added to encourage the trial users to respond to the surveys.

5. RESULTS

In this chapter the results from heuristic evaluations and surveys are presented. Also the improvement suggestions are explained. Heuristic evaluation results in section 5.1 and user research results in section 5.2. The improvement suggestions are designed based on the results from heuristic evaluations and user research. Therefore, after the findings from them are presented, the improvement suggestions are presented in section 5.3.

5.1 Heuristic evaluations

From two different heuristic evaluations 40 usability problems were found. All the usability problems found from heuristic evaluations can be found from Appendix E. Other evaluation focused on the Vertex BD product itself and the other focused more on the trial process and what other things than the program itself the user encounters during the trial process. Many of the usability problems found in the heuristic evaluations were already familiar to the Vertex BD development team but there simply has not been time to find a solution to them. Also, some of the usability problems found in the heuristic evaluations were already fixed before the user research was done because the evaluations were done before the survey was sent to the users.

Table 1. *The distribution of the problems found (Appendix E) between the Nielsen's 10 usability heuristics (Appendix B) [25,26].*

Heuristic	**Number of problems related to the heuristic**
Visibility of system status	3
Match between system and the real world	4
User control and freedom	7
Consistency and standards	11
Error prevention	10
Recognition rather than recall	9
Flexibility and efficiency of use	4
Aesthetic and minimalist design	6
Help users recognize, diagnose, and recover from errors	2
Help and documentation	4

First heuristic evaluation done was inspecting only the Vertex BD product. From that evaluation 27 usability problems and 3 technical errors were found. The technical errors are not explained in this work. In the second phase, when heuristic evaluation was done with the focus on to the trial process, 13 usability problems were found. 15 of them were

rated to be major usability problems, 15 minor usability problems and 10 cosmetic problems. There were no usability catastrophes. [28,29] In Table 1 the distribution of the problems (Appendix E) between the heuristics (Appendix B) [25,26] is presented. Some of the problems related to more than one heuristic.

The usability errors found in this work were categorized to seven categories. These categories are: Undo and recovering from errors, Help, Element adding and modifying, Viewing the project, Settings, Installation and Communication in the trial process. The last two, meaning Installation and Communication, contain the usability issues found from the later done heuristic evaluation with the trial process focus. The issues in the other categories were found in the first heuristic evaluation with focus on the Vertex BD product itself. In the following sections the main points from these usability problems are explained.

5.1.1 Undo and recovering from errors

One of the biggest usability issues in the program is the undo functionality, or more specifically the lack of that feature. In some cases, you can undo something you just did in the program, but it is not fully working, and you cannot use ctrl-z to undo many previous steps. This usability problem relates to the third Usability Heuristic; User control and freedom.

Other big issue found in the heuristic evaluations was the case when some error happens in the program. The program does not help the user in most cases when some kind of error happens. If the user is not very experienced with the program, they might not know how to easily recover from the error. It would be important to clearly state to the user the status of the system. If there is some possible error that should be communicated to the user. This would help the user to recover from the errors. The heuristics these problems relate to are: User control and freedom, Error prevention and Help users recognize, diagnose, and recover from errors.

For example, there could be a situation like in the Figure 11. The user tries to stretch the walls to the roof, but the walls go past the roof since there is no roof at that place. In this case for example the undo function is not working so the user must find some other way to undo the action. There is a way to do this in the program but for a new user it can be hard to find. In cases like this it should be clearly communicated to the user how they can recover from the situation.

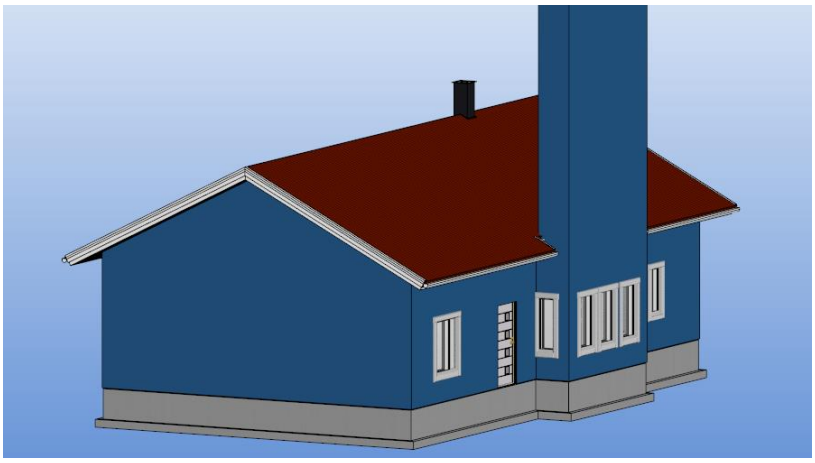


Figure 11. *Screenshot from the Vertex BD program when the walls are stretched to the roof but there is no roof above some of the walls.*

Similar problems may occur when the user makes a hole somewhere in the building. It seems for the user like there is no way to undo that modification. If the user does not find a way to delete the hole, they might end up deleting the whole element they did the hole to. In that case, they have to redo a lot of work when they are adding the deleted roof, wall, floor or any other removed element back to their design.

The problems described in the previous paragraph could be solved either with undo functionality or by communicating in the UI better what steps can be taken by the user to recover. It is important that the user is always aware of the status of the program.

In some cases, it could be also useful to warn the user about the user errors that could be easily done. This could be done by detecting some of the most frequently happening errors in the program and warning the user when something like this happen. This could help the user to recognize the mistakes earlier and that could reduce the work needed to fix the mistakes.

5.1.2 Help

Communication to the user is sometimes insufficient in the program. In the program there is a help function called bubble tips that the user can turn off if they feel like they do not need that. Example of a bubble tip in Figure 12. These bubble tips give hints to the user what to do next. For a new user this function is very useful. The problem is that sometimes these messages are a bit unclear. These problems relate to Heuristics number two and six, Match between system and the real world and Recognition rather than recall.

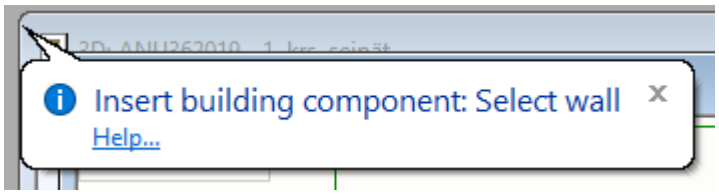


Figure 12. *Example of a bubble tip help text from Vertex BD.*

In the bubble tip there is also a link to the documentation like can be seen from Figure 12. The links is under the help text. The problem is that this link does not always lead to the specific place that concerns the function in question. Sometimes the link leads only to the front page of the help documentation. In addition to that the navigation in the help documentation is not easy and the user might get frustrated when looking for the right page in the help documentation. Match between system and the real world with Help and documentation are the Heuristics which are not fully realized in the program.

There were also other minor help related issues with mouse over texts. In some of the buttons there were icons with no text to help the user to understand what happens from them. The icons were small and because there were no textual clues for the user what happens from them it was considered to be a problem. This problem relates to the Recognition rather than recall Heuristic.

5.1.3 Element adding and modifying

The program lets the user to do modifications to the wrong Drawing-Model pair. For example, you should add a chimney to the first-floor walls Drawing-Model pair so it would show in the drawings correctly, but you can add it to any other pair too. The program could warn about these kind of user errors because it is very likely that the user does not always notice in which floor they are adding the elements. The user probably knows in which floor they should add the elements, but the problem is that the status about the floor that the user is currently working on is not as visible as it could be. This usability problem relates to Visibility of system status and Error prevention from the Heuristics.

It can sometimes be hard to get all the elements exactly in the place they were intended to. Especially the adding of walls and connecting them together to make rooms. The walls have different layers and it can be hard to separate them from each other since they are so close to each other. Also, when adding walls to make a room it sometimes can happen that you add the wall so that it seems to be connected to other walls to make a room but the program did not actually made the connection between the walls. This means that the program does not recognize the room and the user would have to add the connections between the walls separately. The program also does not show in anyway if there are connections made between the walls or not. From the Heuristics these

problems relate to Visibility of the system status, User control and freedom and Help users recognize, diagnose, and recover from errors.

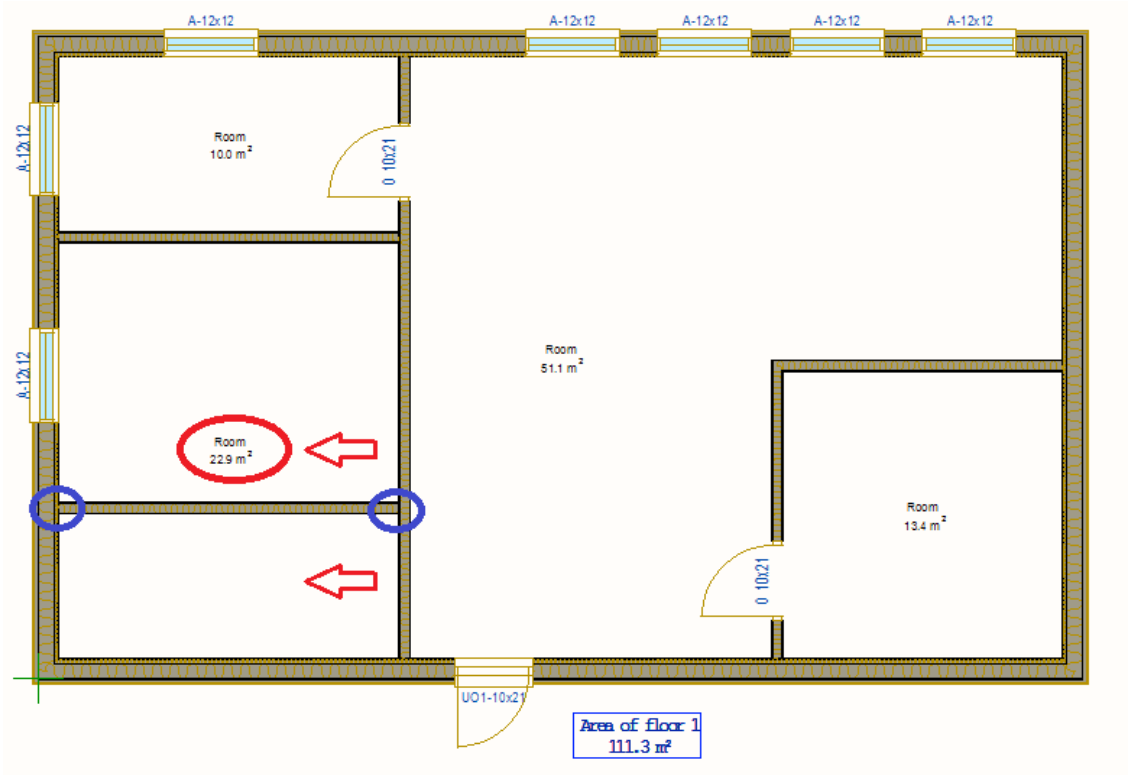


Figure 13. *Example where there is no connection between the walls in either of the places in blue circles. This can be seen from room space. There should be room space note also in the lowest room.*

In the Figure 13 some of the walls in the bottom left corner are not connected to each other to make the rooms correctly. This is why the program shows only one room size in the bottom left corner even though the user has intended to make two rooms. This case shown in the Figure 13 is actually not possible in the program anymore but similar situations with the walls can happen still. Also, there could be a case that the user will disconnect the walls themselves and in that case the user cannot easily see from this 2D view what connections between walls are made and what are not.

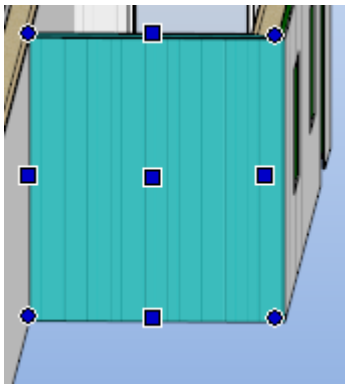


Figure 14. *From the square and circle shaped handles the user can modify the elements.*

The connections between the elements cannot be easily seen from 3D either. In the Figure 14 it can be seen that there are these square and circle shaped handles in the elements like walls. By clicking them the user can see the options what they can do to that element from this handle. From there the user can also make connections between the elements and therefore also find out if there are already connections or not. From these handles the user can also modify the elements like stretch them or move them. In a case that there are connections between the elements they cannot be stretched from these handles and that also can confuse the user because it is not communicated to the user in any way that this cannot be done. The functionality of these handles could be clearer and the connections between the elements could be more visible for the user. This relates at least to the Visibility of the system status and Recognition rather than recall from the Heuristics.

5.1.4 Viewing the project

The user can view the project in 2D and 3D. Moving between these two windows can be done by just clicking the other window or by the buttons in the top left corner in the window. In Figure 15 a screenshot from these buttons. The button in the middle lets you to move between the 2D and 3D model. When a tool is active this moving between is not always possible because in some cases there is no need to do that. There are some tools in the program that allow the user to move between the 2D and 3D windows but when this kind of tool is active the user can only move between the windows from the buttons in the windows. If the user moves between the windows just by clicking the other window the action they were doing is stopped. This problem relates to User control freedom and Error prevention from the Heuristics.

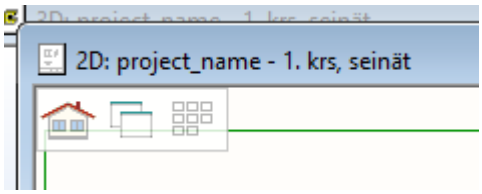


Figure 15. *Screenshot of the buttons that are used to navigate between the 2D and 3D windows.*

When a user starts to use the program, they might not know how to move around in the 3D model. If the user has not read any documentation or had some other instructions or previous experience of the program, they might try to move by pressing the left button of the mouse and drag the model to rotate it. In Vertex BD the user has to click and hold the mouse wheel to rotate the model. There could be some instructions on how to view the 3D model when the user starts the program for the very first time. From Heuristics this relates to Recognition rather than recall and Help and documentation.

There is also one other minor problem with 3D viewing. The user might not be that aware in which floor they are in the model since the 3D view is the same no matter what floor the user is in. The floor that the user is in is told to the user in the UI, but it is very small part in the UI. This information in the UI can also be seen from the Figure 15. The user can easily leave this unnoticed and might accidentally do changes to wrong place. This can become a bigger problem if the user does not notice this right away. In that case it might cause a lot of extra work to redo everything later. The Heuristics that relate to this issue are Visibility of system status and User control and freedom.

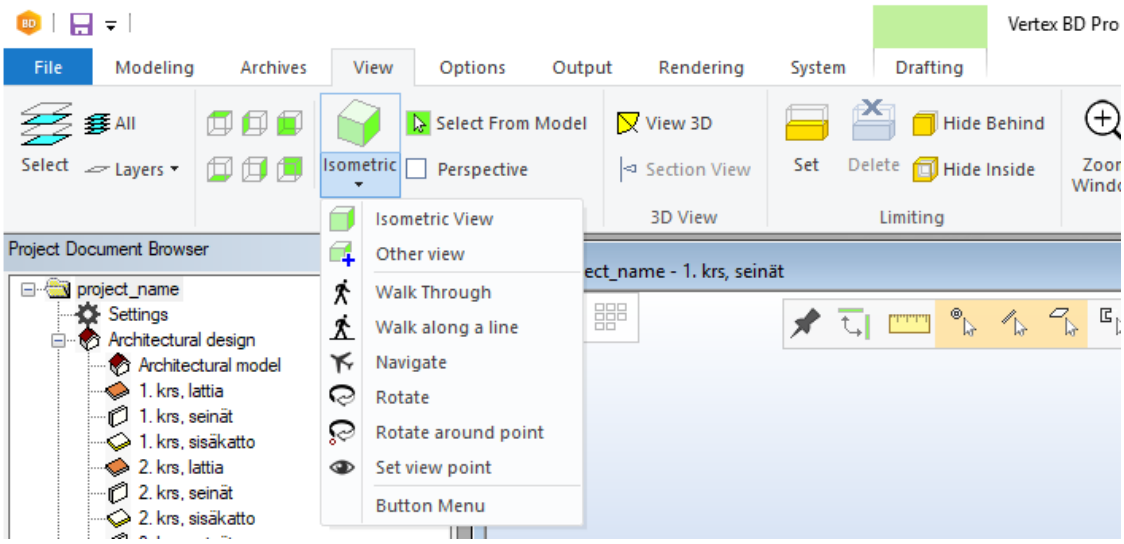


Figure 16. *Viewing options in the Vertex BD.*

There are many different options on how the user can move in the 3D model. These viewing options can be seen from Figure 16. When a user chooses to try out some different viewing option there is not any good instructions in the program itself on how to

use it. Some instructions can be found from the help in the program. There could be more instructions for example in the bubble tips when a user changes to use another viewing option. From Heuristics this relates to Recognition rather than recall and Help and documentation.

5.1.5 Settings

Setting have to be opened with the right button of the mouse and this is not a common way some dialogue is opened in UI. Usually the left button of the mouse is used to open menus. The location of this Settings menu can be seen from Figure 15. Settings are actually located in the program in this hierarchical menu and the user will probably expect the Settings option to work the similar way the other structure works around it. This problem clearly relates to Consistency and standards Heuristic.

It also may confuse the user that in File and in Archive tabs there are some same options in both of them. It might not be clear to the user why there needs to be two different places to have the same options. This also relates to Consistency and standards Heuristic.

5.1.6 Installation

Installation in the trial process is not as smooth as it could be. This usability issue is major because the installation gives the very first impression about the program. Also, if something goes wrong already in the installation phase the user could even give up and decide not to even use the program at all.

The biggest problem in the installation was that it was too complicated, and the user needed to know what to choose from many options. There were many pop-ups and the installation as whole had a lot of phases. Many of these options could have been decided for the trial user beforehand and they would not be even shown to the user. Also, many of the pop-ups could actually be asked in the installation window itself instead of a separate pop-up. From Heuristics these issues relate to Flexibility and efficiency of use and to Aesthetic and minimal design.

The installation package was changed a little during this work and the new installation was in many ways better. It was made to be more straight forward, and the user did not have to make that many options anymore. Some of the unnecessary pop-ups were still in there but overall the experience is smoother. There were minor UI fixes that could be done regarding the visibility of the buttons but nothing major. Example in Figure 17 where the buttons do not stand out very well in the UI.

Figure 17. *Modernized look of the first view in the installation UI.*

One other issue with the installation was that when the installation is done the program is not started right away. It could be considered a common way to start the program automatically when the installation is finished. The other common way is to have an option to start the program right away when the installation is finished. This option could be in the dialogue where it is informed to the user that the installation is finished. The Heuristic this problem relates to is Consistency and standards.

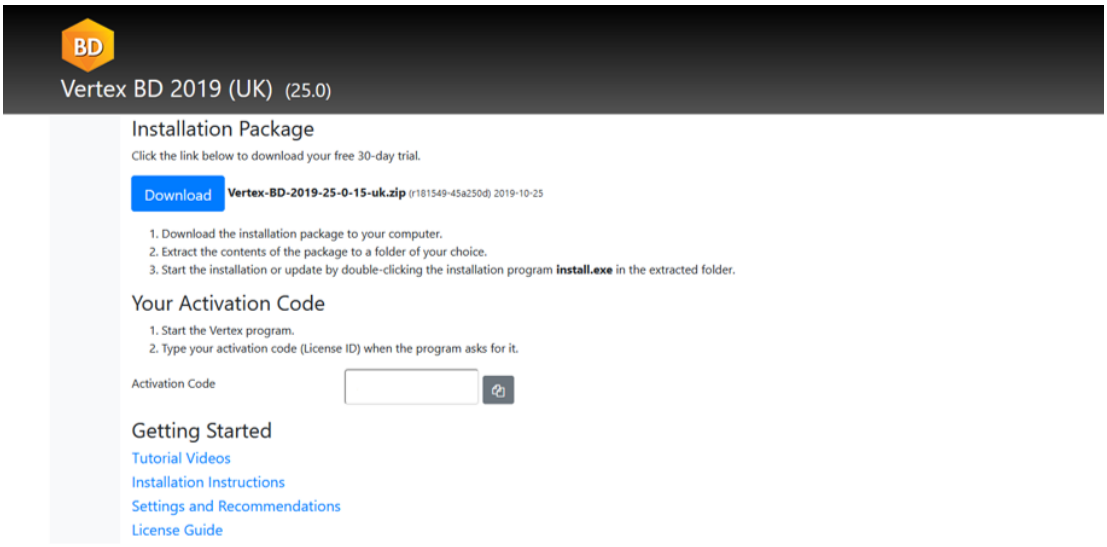


Figure 18. *Vertex BD installation page.*

In the installation page where the user can download the actual installation package there is a lot of information about the license and also links to documentation and instal-

lation help. Screenshot from this page in Figure 18. It is good that these links are available so that the user can get the information and help from them. For some people it might be so that in the page there are a lot of text and finding the important information is hard. This could be solved if the information and the links were more visual in the page. The most important thing, the download button, is pretty visible and noticeable in the page which is good. These issues relate to Aesthetic and minimalist design Heuristic.

5.1.7 Communication in the trial process

First usability issue encountered in the trial process evaluation was that when you send the trial request form the only confirmation message sent to the user in the page is small text at the end of the page. This confirmation message can be seen from Figure 19. The filled form stays visible in the page and that might confuse the user and they might wonder if the form is really sent forward. From the Heuristics this relates to Visibility of system status.

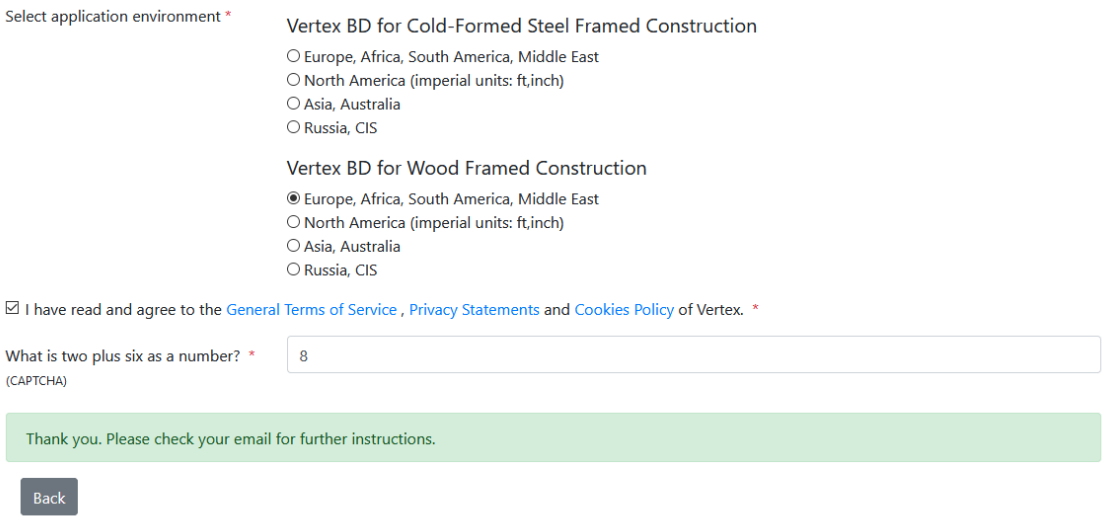
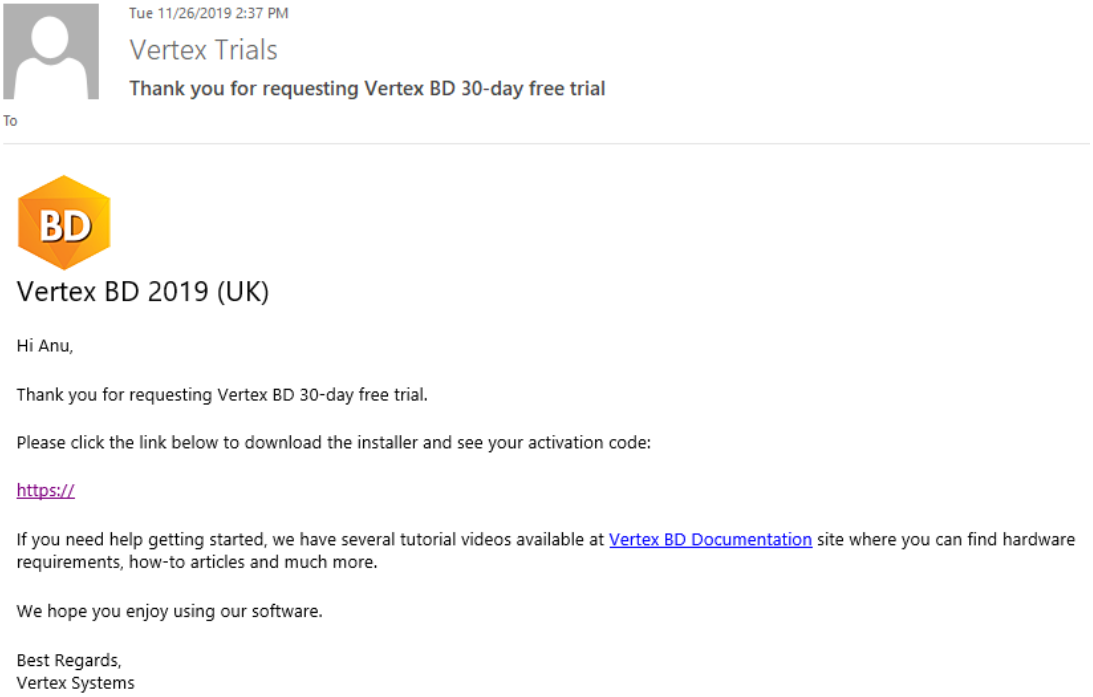


Figure 19. *Screenshot from the trial request confirmation message in the website.*

When the user has requested the free trial, they receive an email like in Figure 20. There are also weekly emails send to the trial users. These weekly emails do look professional and have proper Vertex logos and colours. Example of this kind of weekly email in Figure 21. The emails that contain the installation package link on the other hand do not look as professional. This installation email contains the Vertex BD logo but otherwise it is different than the other emails sent to the trial users. It might not be a big issue but some of the users might be suspicious of this email since there are so many email scams out there. Heuristics related to this are Aesthetic and minimalist design and Consistency and standards.



Tue 11/26/2019 2:37 PM

Vertex Trials

Thank you for requesting Vertex BD 30-day free trial

To

Vertex BD 2019 (UK)

Hi Anu,

Thank you for requesting Vertex BD 30-day free trial.

Please click the link below to download the installer and see your activation code:

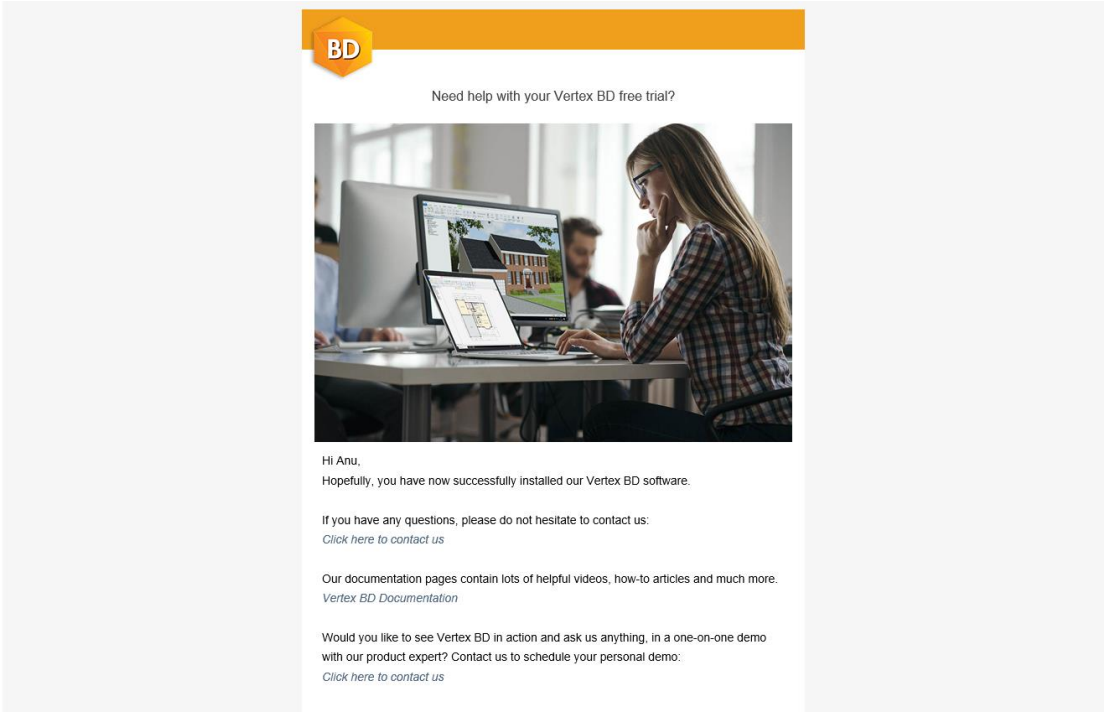
https://

If you need help getting started, we have several tutorial videos available at Vertex BD Documentation site where you can find hardware requirements, how-to articles and much more.

We hope you enjoy using our software.

Best Regards,
Vertex Systems

Figure 20. *Installation email without the email addresses and the actual link.*



Need help with your Vertex BD free trial?

Hi Anu,
Hopefully, you have now successfully installed our Vertex BD software.

If you have any questions, please do not hesitate to contact us:
Click here to contact us

Our documentation pages contain lots of helpful videos, how-to articles and much more.
Vertex BD Documentation

Would you like to see Vertex BD in action and ask us anything, in a one-on-one demo with our product expert? Contact us to schedule your personal demo:
Click here to contact us

Figure 21. *Example of a weekly email in the trial process.*

There are also regions that do not automatically get the installation package. In those cases, the email is sent by hand and obviously is not sent right away for that reason. The fact that the user does not get the trial right away might be a big minus to many users. The user might have the mindset that they can now start to test this right away. In this

situation a day or more to wait for the trial installation package might be too long time. They might get frustrated because of this.

If you think about for example that some manager decides that now they have time to test this new software and look if it would be good for the company and then they had to wait to actually get the software. The next day that the manager gets the email that has the installation link the situation might not be the same anymore. Manager might have a busy schedule and then the whole trial could be forgotten. Nowadays if you think about many free trials you usually can download them right away. The Heuristic this problem relates to is Consistency and standards.

5.2 User research with an online survey

Two different surveys were sent to the trial users. The first one was sent shortly after the user got the trial installation email. In this survey the goal was to get insights on how the users thought the very first experiences with the trial were. The second was sent few weeks after the trial period had started. The idea with this arrangement was that it could be possibly seen if the answers varied depending on how far in the trial period the user was. Both surveys were online surveys that were sent via email to the trial users.

From two surveys sent to the trial users overall 25 answers were gathered. 17 trial users answered to the first survey and 8 to the second survey. These response rates are not ideal. The survey was sent to hundreds of Vertex BD trial users worldwide. The answers had a lot of variation in them and because there were not a lot of answers it was hard to come to any conclusions based on them. In the following chapters the results from these surveys are analysed separately and also together.

5.2.1 Results from the first survey

17 answers were gathered for the first survey in total but four of them were incomplete answers. The four users who did not answer to all the questions did not answer to the background questions. The 13 people who answered the background questions had all used some CAD or BIM software before. One of them was in Cold-Formed Steel Framed Construction business, six in Wood Framed Construction and two in both. There was also one home builder who did not specify whether they used wood or steel, one engineer, one developer and also one student. Six of the participants were from North America, four from Europe, one from Asia, one from Australia and one from Africa.

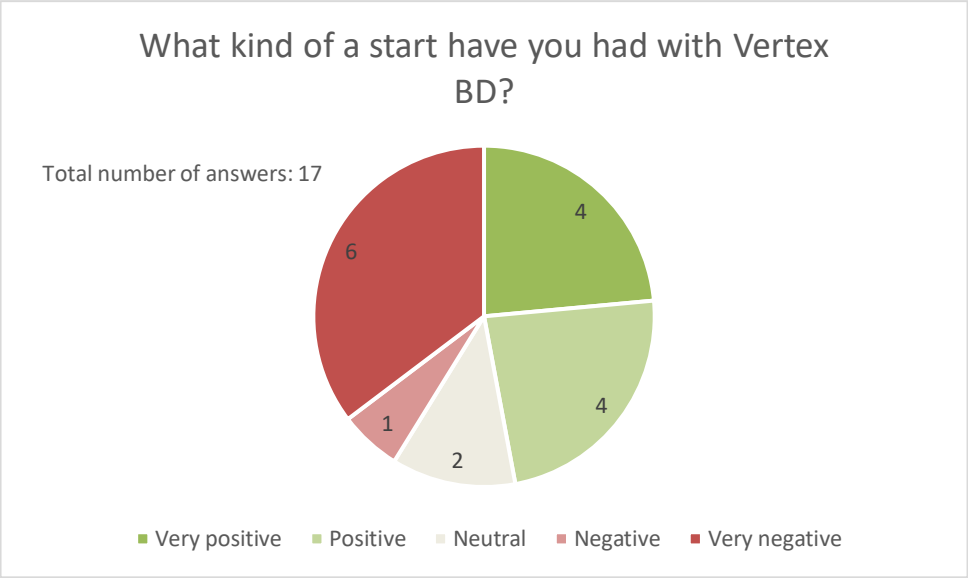


Figure 22. *Results from the first question in the first survey about what kind of a start has the user had with the Vertex BD.*

The first question in the survey was about what kind of a start the user has had with Vertex BD. The results can be seen from Figure 22. There were more positive answers than negative but six from all the 17 participants answered that the start was very negative. One answered negative and two participants answered that the start was neutral. Four thought the start with the Vertex BD had been positive and four thought that it had been very positive.

Combining negatives and positives the results overall are that there were seven negative, two neutrals and eight positive answers. The positive and negative answers are pretty evenly distributed. From this it could be thought that in this phase of the trial period there is nearly fifty-fifty chance that the user is either happy or unhappy with the start of the trial period.

The following questions in the survey mapped the positive and negative aspects of the trial. These two following questions were multiple-choice questions and many participants actually used them so that they reported many different positive or negative aspects. After each of the either positive or negative question there was an open-ended question so that more detailed information could be shared.

The results for the question about what had been positive so far can be seen from Figure 23. The most positive things were video tutorials and the Vertex BD product itself. These results tell that seven out of 17 participants thought that video tutorials were a positive experience in the start of the trial period, and same with the Vertex BD product itself. Installation was also considered to be positive.

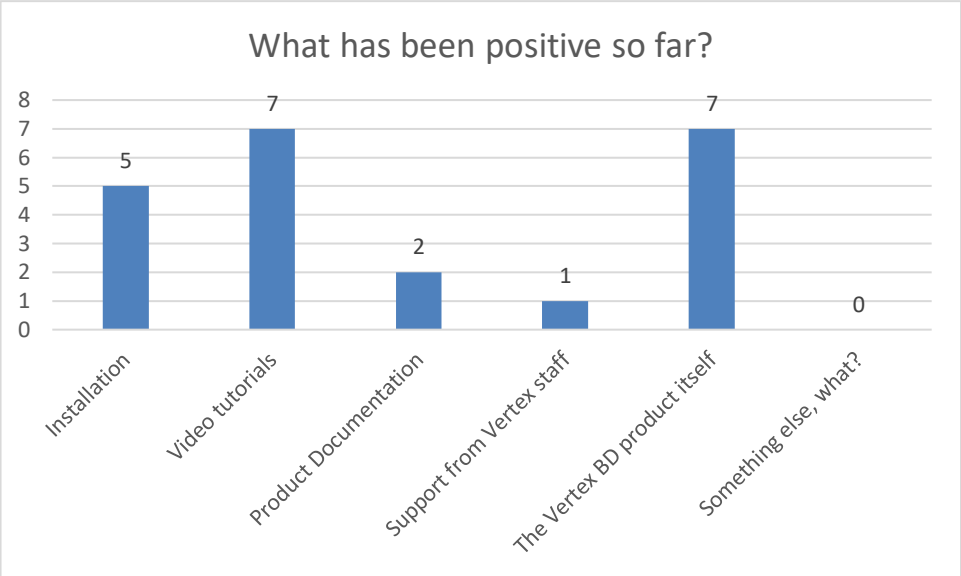


Figure 23. *First survey answers about positive things.*

From the open-ended question about what has gone well these same answers came up. There were 11 answers for the question that asked what has gone very well. In five of them the program was told to be easy to use and its functionalities were liked. Three of the participants said that the installation went very well and two thought that the tutorials were easy to follow.

"The overall functionality of the wood environment is great and is one of the few softwares that offer an almost all in one solution." - More than a year experience in similar programs, Cold-Formed Steel and Wood Framed Construction, North America

The negative answers can be seen from Figure 24. Installation and video tutorials were seen as negative things based on user responses. The things answered for the something else option varied a lot. One user had problems finding what they wanted from the program, one had problems with getting the download link and one was not happy with the Metric Unit support. There was also need from one user for a free simple version for students.

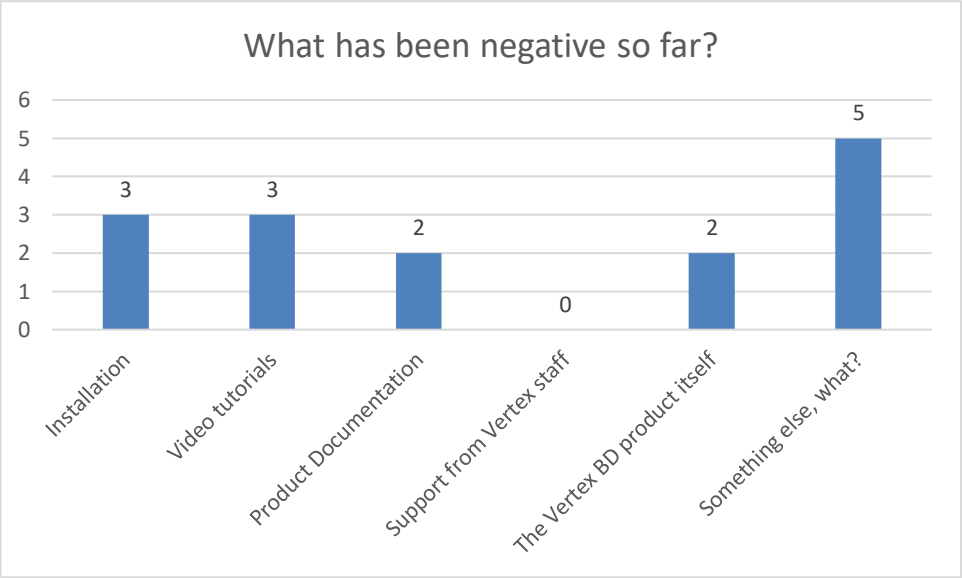


Figure 24. *First survey answers about negative things.*

In the open-ended question about if the users had problems there were many different answers. One thought the program was slow and other was not happy with the installation. Two participants had some minor problems with some specific functionality. There was also concern about the fact that the program has only Windows version and cannot be used in macOS. Two participants thought the tutorial was not thorough enough.

"Video tutorials are very basic, vague and do not help someone to get up and running and actually see the full capacity of Vertex BD" - More than a year experience in similar programs, Wood Framed Construction, North America

"Minimal training. A lot of trial and error. That works, but I would have learned the program much faster with some structure." - More than a year experience in similar programs, Developer, North America

These comments about the video tutorial are useful because they clearly state that there is work to be done with the making of video tutorials. They need to be starting from the very beginning and also cover the most important features in the program.

From the multiple-choice questions it can be seen that the same issues were both the most positive and most negative things. For example, installation and video tutorials were considered to be both positive and negative. Although there were quantitatively more positive than negative answers to these subjects it is really hard to come to any conclusion because there were so few answers overall.

Still the useful findings from this survey come from the open-ended questions and based on them improvement for the trial process can be thought. Especially improvements for

the video tutorials and installation should be thought. Also, there should be more communication to the user about what the trial version of the program contains and what system requirements there are. From the open-ended questions there were at least three negative comments that could have been avoided if there was better information about the program easily available. Of course, the comments could raise even if there was more information since some users might just leave this kind of information unnoticed.

5.2.2 Results from the second survey

Eight answers were gathered in total in the second survey and all the participants had used some BIM or CAD software before. Four said Cold-Formed Steel Framed Construction was their type of business and one said Wood Framed Construction. Three of them were from North America, two from Europe, one from Australia, one from Asia and one from Africa.

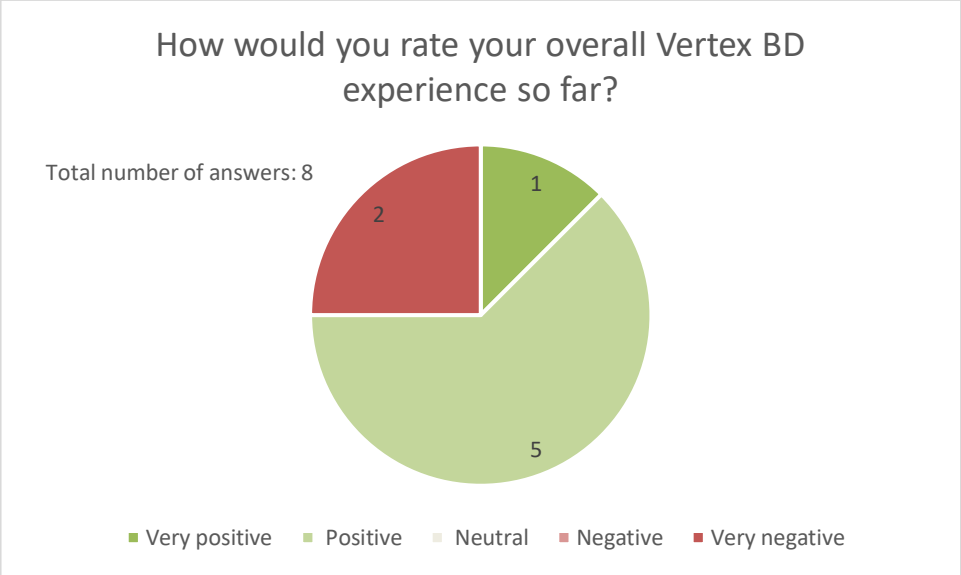


Figure 25. *Results from the first question in the second survey about how would the user rate their overall Vertex BD experience so far.*

The first question was about how the users would rate their overall experience so far with the Vertex BD program. Results for that question can be seen from Figure 25. The answers for this question were very positive. Only two participants thought their experience had been very negative. Other six participants thought their experience had been positive and one of the six very positive.

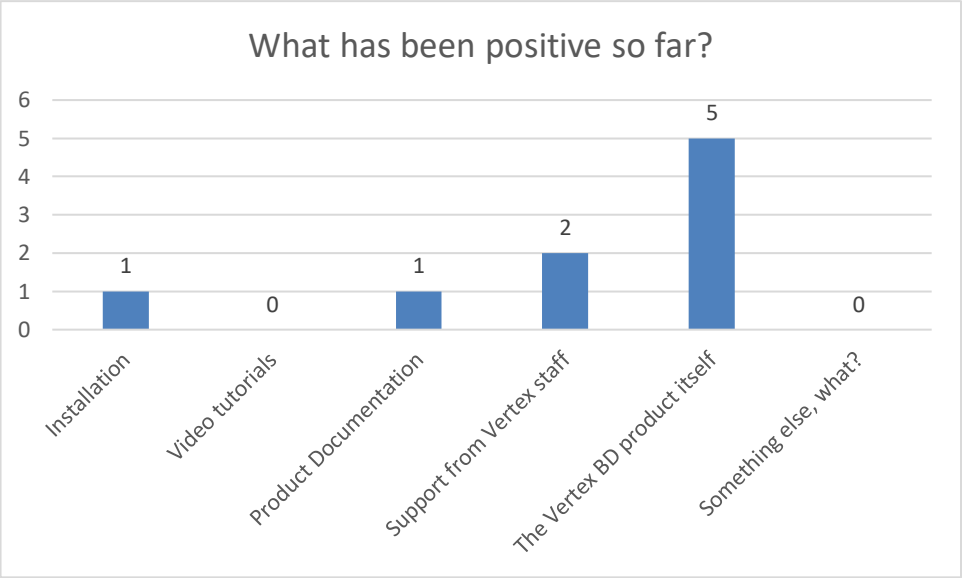


Figure 26. *Second survey answers about positive things.*

The following questions were again the multiple-choice questions about the positive and negative thing so far. The multiple-choice question answers for the most positive thing so far can be seen from Figure 26. The most positive thing was considered to be the Vertex BD product itself. Five out of eight participants thought that the experience with the Vertex BD product was positive. So over half of the participants were pleased with the product.

This was also found from the open-ended questions. Two participants gave positive feedback about the program and its usability. In the answers there were also one positive note about the video tutorials and one about the support. Combining the multiple-choice questions and open-ended questions it is clear that at this phase the users were pretty happy with the product itself.

"Just using Vertex based on what else is on the market for framing or option management is hands down the easiest UI to understand." – 3-12 months experience in similar programs, Wood Framed Construction, North America

The most negative thing based on the multiple-choice question was the product documentation as can be seen from Figure 27. In the something else option the two answers were about a usability problem and the other answer to that question was about that the user thought this survey was useless.

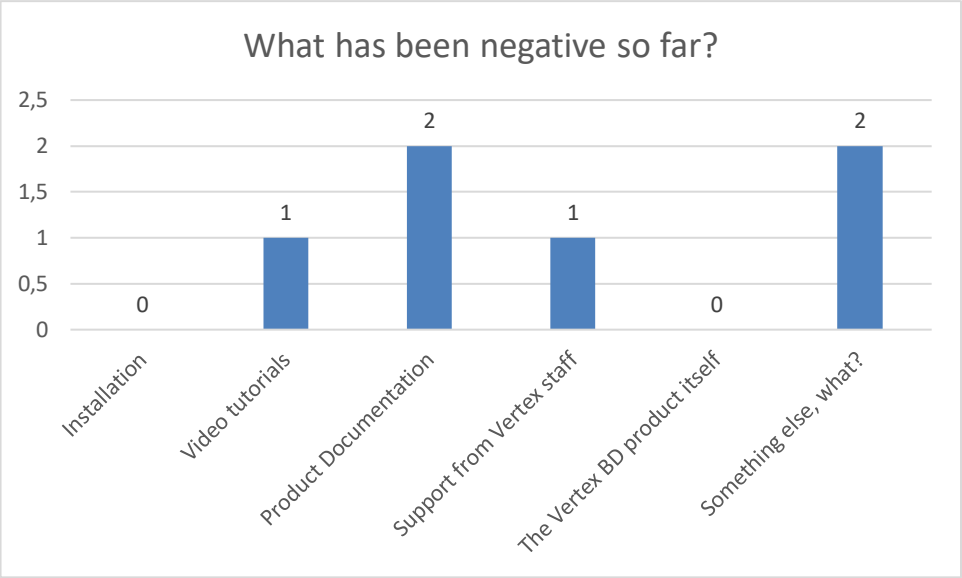


Figure 27. *Second survey answers about negative things.*

In the open-ended question asking about if the users had any problems three users reported having a usability problem with the program. One had problems with outdated documentation and one with the free licence.

"When I try to specify some walls at the library screen, I can´t scroll down" - More than a year experience in similar programs, Cold-Formed Steel Framed Construction, North America

"I find a lot of documentation is either outdated so it no longer applies to the new release or it applies but work different in the new release or imperial version of the software." - 3-12 months experience in similar programs, Wood Framed Construction, North America

There were even fewer answers to the second survey than there were for the first survey. Because of this the results are not very reliable. Nevertheless, the most positive thing from the second survey was definitely the Vertex BD product itself and the most negative thing was the product documentation.

Again, the biggest benefits of this survey come from the open-ended questions. It was found out that some features are not easy to find in the program and it is not that clear to the trial user what features are included into the trial version of the software. Also, there was one usability issue where the user thought they could not modify some parameters they should have been able to modify. Actually, the problem was that those parameters should not be modified by the user, but the UI was confusing in a way that it seemed for the user that they actually could modify those parameters. This problem refers to the comment above about specifying walls at the library screen.

5.2.3 Conclusions from the surveys

From these two surveys it could have been thought that the experience is more positive when the user is further on in the trial process. This conclusion could be drawn because the answers to the second survey, that was sent to the users later in the trial period than the first survey, were more positive overall. In this case however this conclusion cannot be made because there were so few answers altogether.

If it was true that the experience is actually more negative at the start of the trial period, the reasons for that could be found in the survey results. Some of the issues that could affect to that are that the installation, video tutorials and documentation need improvements. These are used a lot especially at the start of the process of learning how to use the program. They need to be very clear and thorough to help the user to learn as effectively as possible.

Clear communication and help are very important things at the start of the trial process. As found from the survey results this was not all well executed in the trial process. For example, it should be clearly told to the user what features are included in the trial version and what are the system requirements.

5.3 Improvement suggestions

The following improvements are designed based on the research done with the heuristic evaluations and the user surveys. These improvement suggestions can be divided to five different categories. These categories are: **Vertex BD, Installation, Trial process communication (emails, websites etc.), Tutorials and Documentation**.

These categories help with the understanding on what the improvements relate to. These also are divided so that the different teams and departments at the company can easier find the information on the improvements that are their responsibility. The improvements will be implemented in different teams, so this kind of separation is very useful in this case.

The improvements for the Vertex BD will be done by the development teams as well as the installation package changes. Changes for the documentation and tutorial videos are done by the documentation team. Marketing and sales team will make changes to the communication related issues with the help of the development teams.

5.3.1 Vertex BD

The most important and also the biggest change needed is the **undo functionality**. The user should be able to undo the previous action in the program. The undo is also mentioned in the Nielsen's Heuristics in the third principle called User control and freedom. It is a big usability problem that is not only affecting the trial users but also the more advanced users too.

One other bigger usability problem in the program is that the user is not always that aware of **the status of the system**. This again violates the Heuristics. The user might not remember to check on which floor they are at or some other way end up doing changes in a way they were not intended to do them. One possible solution to this is a **navigation cube** that would allow the user to move better in the model and also in that cube it could be indicated to the user more visually the place they are in the model. This solution would also make moving in the 3D model easier which was not found to be a problem in the research, but it would be a nice addition to the program. This kind of navigation cube is commonly used in CAD software.

The cube in Figure 28 would show to the user in which position the model is currently. Also, the layers in the small icon in left would indicate to the user which floor they are in. For example, in Figure 28 the user would be in the first floor walls view in the model. The navigation cube would locate in some corner of the window and the user would have an option to disable or hide the feature if they want to.

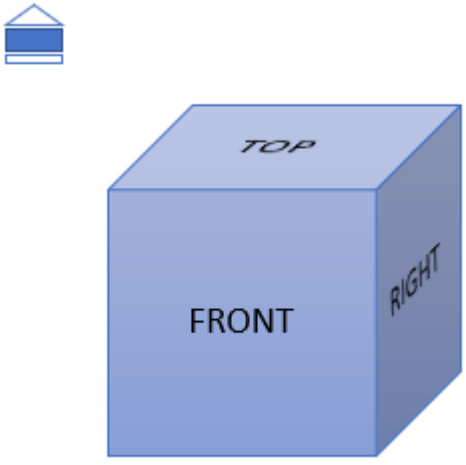


Figure 28. *One possible design of a navigation cube that could be added into the program.*

When a user is doing some action in the program, they sometimes have a need to **move between the 2D and 3D view** and that is not at the moment possible to do by just clicking the other window. This can be done from the button in the upper left corner of the window

but if the user is clicking from somewhere outside the window that is active the action that they are doing at the moment is terminated. For example, in a case when adding elements to make a roof there can be a need to move between the 2D and 3D views.

Related to the issues mentioned above there could also be **warnings** shown to the user when they are possibly doing something unwanted in the program. There are cases that the user can accidentally do things in the program that lead to errors. For example, the program is not checking if the user is adding the elements to the floors they are usually added to. There are elements like chimney that is usually added to the first floor in the model, so it shows correctly in the drawings generated in Vertex BD. There could be a warning in the program if the user tries to add something to possibly unwanted place. This kind of warning might be annoying for the more advanced users but for example for trial users this could be useful feature. Nevertheless, this is probably a feature that will not be implemented because it takes a lot of work to go through all the possible user errors like this and still it might be a feature that the users do not find useful. If this kind of feature would be developed more user research should be done to map if the users would find this useful and what kind of checks they would need.

When it comes to **informing the user** on what they can and cannot do in the program there are places where this could be done better. This refers to Heuristic named Recognition rather than recall. It was found from the user research that there are sections in the UI that look like the user can modify the parameters in it when they actually could not do that. This should be informed to the user better for example by disabling the columns that cannot be modified. The columns could be show to the user grey or some other colour that it is clear that they cannot be modified.

The **settings menu** also needs to be changed so that it opens in a similar way that the objects around it. That means that it opens like a hierarchical menu so that the user can open and collapse sections. The settings also might need some rearranging.

There should be better **instructions on how to use the different viewing options**. There are now some instructions on the bubble tips, but these instructions should be in more detail. I would also be could when the user starts the program for the very first time that there would be some instructions right away how to move in the model. This is told in the documentation, but it could help the user to get started faster if the controls would be shown to the user in the program.

There could also be some other basic instructions for the user when they start the program for the first time. An **interactive user guide** would be one option to help the user get started faster. The user guide could show the user how to use some of the basic

features in the program. Step-by-step messages would guide the user on how to use the program.

5.3.2 Installation

For installation there are **minor UI changes** that could be done. These relate to the colours of the installation window and the visibility of the buttons in it. There are some plans to do bigger modifications to the installation in the future, so UX will be taken into account when these bigger changes are designed.

Other thing about the installation is that when the installation is done the **program should** either **start automatically** or there should be an option in the installation UI to choose to start the program when the installation is finished.

5.3.3 Communication

These improvement suggestions relate to the communication to the user in the trial process via emails and websites etc. For example, the **visual appearance of all the emails** sent to the trial users should be unified. Including the email that contains the link to the installation package. Also, the **automated trial process** should be deployed to production in all regions. Meaning that in all of the regions the trial user will get the installation email automatically when they sign up for the trial period.

The **communication** about what the trial version includes needs to be improved. In the website where the user signs in for the trial period there needs to be information about what features the trial version of the software includes. The other thing that needs to be told in there is that there is only a Windows version of the program available.

In the trial sign up form, when the user sends the information forward, there is very small confirmation message shown to the user about the success of the trial sign up and the filled form stays visible for the user. The **confirmation message needs to be more visible** and the data that is already sent should disappear from the view.

5.3.4 Tutorials

New video tutorials should be done to help the user to get started with the project. These video tutorials should answer to questions such as how to create a new project, what are the different views in the project and how to use them. All the things need to be explained from the very start.

5.3.5 Documentation

The **documentation needs to be updated** so that it is always matching the latest version in the market. It was found out from the user research that in the documentation there was some information that was not updated to match the latest version.

The **search inside the program** is not always finding the help documentation the user is searching. This is because the user is not using the search words that the system knows. This issue needs to be solved. A solution to this needs to be thought with the documentation team.

6. DISCUSSION

There are few things that reduce the reliability of this study. First the most obvious thing that affected the reliability. There were simply too few answers to the online surveys done in the research phase. That was unfortunately a thing that affected negatively to the results. Not as many improvement objects could be found via the user research as was hoped to be discovered. It was thought that some other user research could be also done, but at the time it was found out that there were not many answers to the surveys, it was impossible to do any other new user research due to a tight schedule of this work.

The little amount of answers also led to the problem with how to analyse the answers in scientifically recognized way. The intention was to use thematic analysis [35,36] but as there was so little amount of answers it was not useful to do that. Instead all the answers were analysed separately and then summarised and improvement suggestions were made based on these results and results from the heuristic evaluations.

It would have been good to have at least longer more detailed survey so the data that was gathered from the surveys would have been more detailed. There are many questionnaire templates available in the field of UX and it would have been good if some of these could have been used. The analyzation if the data that would have come from them would have been a little easier to do. In this work it was unfortunately an option because the surveys needed to be very short, so that the trial users would bother to answer to them.

Interviews with the trial users also would have been a good option to gather information about the user experience in the trial period. The problem with this might be that how to encourage the users to participate to the interviews. Also, if there would have been more resources and time, doing some observations while the trial users use the Vertex BD could have been beneficial.

In this study the focus was not only in the usability of the product even though it was the main focus of the research and most of the findings related more to usability of the product than to user experience. Also, the whole user experience was also examined. User experience was examined via user surveys that hopefully gave the users a chance to express their experience and feelings with their own words. The feelings that could be reasoned from the survey answers were mostly related to frustration or on the contrary to satisfaction, but more detailed feelings and experiences could not be found via surveys.

The benefits of using online surveys are that it is fast to collect large amounts of data in sort amount of time. The risks are that response rates can be low and finding the correct participants can be hard. It might also restrict the research in a way that not all the user might not be able to answer the survey. This can be because they do not have access to internet or do not know the language the survey is done to name a few. Also the length of an online survey cannot usually be very long. [33]

In this study these issues were tried to be taken into account and even an incentive was added to encourage the trial users to answer to the surveys. Still the response rates were low. On the bright side, most of the answers that were received were of high quality since many of the participants also answered to the open-ended questions.

One other problem with the surveys was that clearly some of the participants had used the Vertex BD product before. This became clear from the answers they gave in the surveys. The problems they had were that advanced that they clearly had been using the product for a long time or the company they were working had used the program already for quite some time. This means that some of the data collected in the surveys might not be relevant in this case since the focus was more on the users that were trying the Vertex BD product for the very first time or otherwise had only a little amount of experience with it.

The limitation with the heuristic evaluations was that only one person did the evaluations. Usually there would have to be many evaluators doing their individual evaluations to make the results more comprehensive [24,26-30]. In this work this was not possible because of the nature of this work, meaning that because this was a thesis work it had to be done independently. Therefore, also the severity ratings of the heuristics are not very reliable because they are done by only one person. Also, the fact that the evaluated product is a very big software that has a massive amount of features means that not everything could have been covered in the evaluations. This again reduced the coverage of the heuristic evaluations.

Also, it cannot be said whether the improvements made based in the findings from this work will actually make the user experience in the trial process significantly better. To measure that another user research should be done after the improvements are implemented and the results from that user research should be compared to the results gathered in this work.

7. CONCLUSIONS

The research done in this thesis revealed many usability issues both in the Vertex BD program and in the trial process. Still there were also a lot of positive things too that came up in the user research. Many of the trial users were very happy with the Vertex BD program after all. Since the number of respondents was rather small there still is quite much uncertainty with how the trial users actually see the whole trial process.

When it comes to the research questions in this work they were answered reasonably well. The first question was about how to improve the user and customer experience of the Vertex BD product in trial period. There were many improvement suggestions established in this work through the research and evaluations. This question is answered in section 5.3 where the improvement suggestions are introduced in high level. By implementing these changes, the user and customer experience of the Vertex BD product is expected to be improved in the trial period.

The second research question was about how to make the Vertex BD product easier to learn. This is also answered in section 5.3 with the improvement suggestions. The main improvements when it comes to the learnability of the product are the ones that relate to documentation and tutorials. Also, there could be an interactive guide in the program that would help the user to get started with the product usage.

Finally, the third research question was about what are the main user experience problems in the trial process and how to fix them. It was hoped that through the user research it could have been found out why the trial user decides to not continue with the program after the trial period. For this question there were no clear answers. Some issues were found in the user research and in evaluations, mainly issues with documentation and tutorial videos, but there were not any clear big issues that could have been spotted. Again, because there were so few answers to the user surveys it cannot be determined how big the issues that were found from them were. This is unfortunate because this kind of information would have been very valuable for the company.

Even though there were not any clear answers to the third research question it could be assumed that the issues that came up in the research would affect many trial users. Therefore, it could be assumed that the user experience problems that came up are problems to many trial users. Because of this the improvements will be done based on the results from research and the issues that came up from the surveys would also be answered as well as possible, even though they do not represent all of the trial users.

Also, as the issues relate to the learnability of the product, they also relate to the second research question about how to make the Vertex BD product easier to learn. All in all, the results of this study are useful for the company because as a result there is an improvement suggestions list. After all this was the main goal of this thesis work, to get concrete issues to work on to make the user experience better.

The plan on how to continue after this thesis work is done is to plan on what timeframe the improvement suggestions will be implemented and by which teams in the company. Then the improvements will be designed in more detail that presented in this work. The teams that will implement the changes will get more knowledge about the user experience related issues and hopefully will take user experience and usability related issues more into account in their future work.

In the future it could be useful also to perform similar user surveys that were done in this work. It would be interesting to see how the answers to the surveys done in this work would change after all the improvements are done, or would they change. Also, it could be useful to gather more user feedback from the trial customer during the trial period. There could be small multiple-choice questions in the program itself that would ask the user to rate how positive or negative the user experience has been and there could also be more specific questions about the features in the program.

If there will be more data from the trial customers in the future about their experiences and other feedback, there would also be a need to analyse that data somehow. There needs to be a plan on how to analyse this data. Also, if there will be new development areas based on this new data from the trial users there is a need to prioritize these to get the most out of them.

One minor goal was also to introduce user experience more into to the development process in the company. This thesis work will start this process of bringing user experience methods and awareness into the company. The work will continue more when the improvements are designed, and the other future steps are taken.

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APPENDIX A: PROJECT EXAMPLE IN VERTEX BD

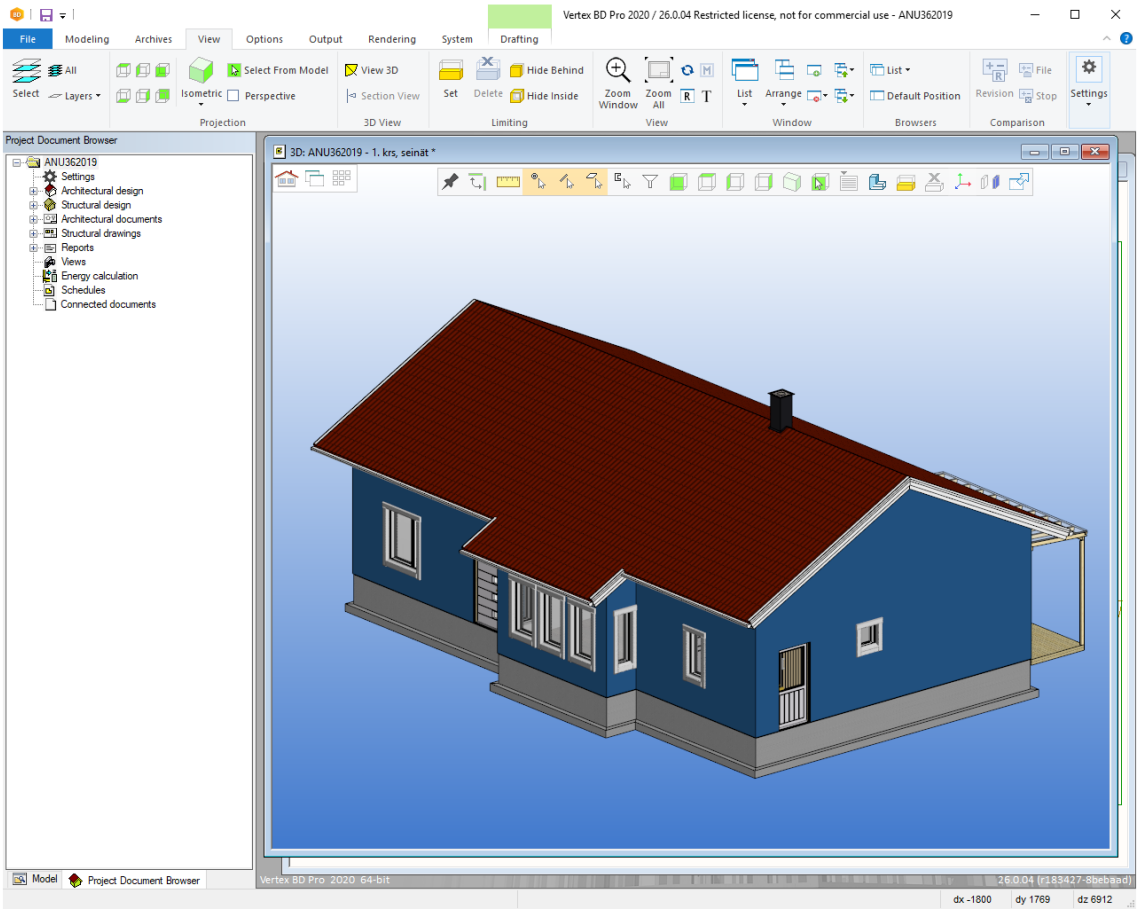

Figure 29. *Screenshot from the 3D model of an example project in Vertex BD.*

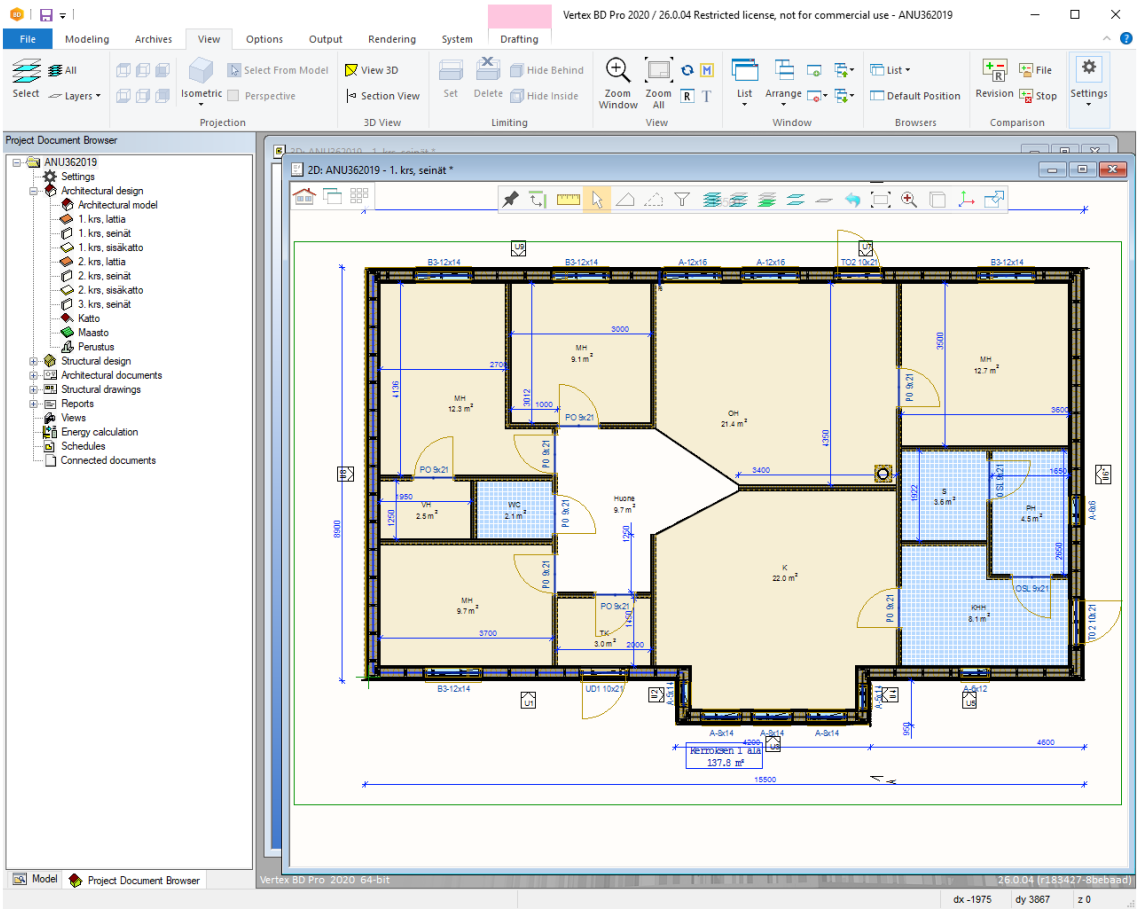

Figure 30. *Screenshot from the 2D model of an example project in Vertex BD.*

APPENDIX B: HEURISTICS

Jakob Nielsen’s [25,26] 10 Usability Heuristics for User Interface Design:

#1: Visibility of system status

The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

#2: Match between system and the real world

The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

#3: User control and freedom

Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.

#4: Consistency and standards

Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

#5: Error prevention

Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.

#6: Recognition rather than recall

Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

#7: Flexibility and efficiency of use

Accelerators — unseen by the novice user — may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

#8: Aesthetic and minimalist design

Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

#9: Help users recognize, diagnose, and recover from errors

Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

#10: Help and documentation

Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large. [25,26]

APPENDIX C: FIRST SURVEY QUESTIONS

Your Vertex BD Experience Survey

1. What kind of a start have you had with Vertex BD?

- ◯ Very positive
- ◯ Positive
- ◯ Neutral
- ◯ Negative
- ◯ Very negative

Your Vertex BD Experience Survey

2. What has been positive so far?

- [ ] Installation
- [ ] Video tutorials
- [ ] Product Documentation
- [ ] Support from Vertex staff
- [ ] The Vertex BD product itself
- [ ] Something else, what?

3. What has gone very well?

4. What has been negative so far?

- [ ] Installation
- [ ] Video tutorials
- [ ] Product Documentation
- [ ] Support from Vertex staff
- [ ] The Vertex BD product itself
- [ ] Something else, what?

5. If you had problems, what were they? Did you get past them?

Your Vertex BD Experience Survey

14. What kind of needs do you have for Vertex BD?

15. Type of business (you can choose multiple answers)

- [ ] Cold- Formed Steel Framed Construction
- [ ] Wood Framed Construction
- [ ] Home builder
- [ ] Component / Frame / Truss manufacturer
- [ ] Light Commercial
- [ ] Developer
- [ ] Engineer
- [ ] Other (please specify)

16. Which BIM or CAD software have you used before?

- [ ] I have not used any
- [ ] ArchiCAD
- [ ] AutoCAD Architecture
- [ ] Autodesk Revit
- [ ] Hsbcad
- [ ] StructSoft Solutions
- [ ] Tekla
- [ ] Other (please specify)

17. How much experience do you have from these programs?

- None
- 1-2 months
- 3-12 months
- More than a year

18. Select your region

- Europe
- North America
- South America
- Australia
- Asia
- Africa

19. Do you have any other comments, questions, or concerns?

20. If you would like to have a chance to win a $100 Amazon Gift Card, please leave your contact information below.

Name

Email Address

APPENDIX D: SECOND SURVEY QUESTIONS

Your Vertex BD Experience

1. How would you rate your overall Vertex BD experience so far?

- ◯ Very positive
- ◯ Positive
- ◯ Neutral
- ◯ Negative
- ◯ Very negative

Your Vertex BD Experience

2. What has been positive so far?

- [ ] Installation
- [ ] Video tutorials
- [ ] Product Documentation
- [ ] Support from Vertex staff
- [ ] The Vertex BD product itself
- [ ] Something else, what?

3. What has gone very well?

4. What has been negative so far?

- [ ] Installation
- [ ] Video tutorials
- [ ] Product Documentation
- [ ] Support from Vertex staff
- [ ] The Vertex BD product itself
- [ ] Something else, what?

5. If you had problems, what were they? Did you get past them?

Your Vertex BD Experience

14. What kind of needs do you have for Vertex BD?

15. Type of business (you can choose multiple answers)

- [ ] Cold- Formed Steel Framed Construction
- [ ] Wood Framed Construction
- [ ] Home builder
- [ ] Component / Frame / Truss manufacturer
- [ ] Light Commercial
- [ ] Developer
- [ ] Engineer
- [ ] Other (please specify)

16. How could we improve your experience?

Your Vertex BD Experience

17. Which BIM or CAD software have you used before?

- [ ] I have not used any
- [ ] ArchiCAD
- [ ] AutoCAD Architecture
- [ ] Autodesk Revit
- [ ] Hsbcad
- [ ] StructSoft Solutions
- [ ] Tekla
- [ ] Other (please specify)

18. How much experience do you have from these programs?

- ( ) None
- ( ) 1-2 months
- ( ) 3-12 months
- ( ) More than a year

19. Select your region

- ( ) Europe
- ( ) North America
- ( ) South America
- ( ) Australia
- ( ) Asia
- ( ) Africa

20. How likely you'll purchase Vertex BD after your free trial period?

- ◯ Very likely
- ◯ Likely
- ◯ Neither likely nor unlikely
- ◯ Unlikely
- ◯ Very unlikely

21. Do you have any other comments, questions, or concerns?

22. If you would like to have a chance to win a $100 Amazon Gift Card, please leave your contact information below.

Name

Email Address

APPENDIX E: HEURISTIC EVALUATION RESULTS

Table 2. *Results from heuristic evaluation that was inspecting the Vertex BD product*

No.	Usability problem	Heuristics	Severity rating	Improvement suggestion
1	Undo is not always working	User control and freedom	3	Implement undo functionality.
2	Missing information on how to recover from error	Help users recognize, diagnose, and recover from errors	3	Instructions and help on how to recover from errors to most frequent cases since undo is not working.
3	Error info missing when walls are stretched	User control and freedom, Error prevention, Help users recognize, diagnose, and recover from errors	3	Add error messages to cases when user might have caused something unwanted behaviour in the program.
4	Bubble tips have sometimes unclear info texts	Recognition rather than recall	3	Check and rewrite bubble tip info texts.
5	Help link on bubble tip is not instantly helping the user	Help and documentation	3	Modify the link to lead to correct place in every situation.

6	Info texts about buttons when modifying windows are missing	Recognition rather than recall, Error prevention	3	Add more informative texts to buttons.
7	Info text about icons missing	Recognition rather than recall, Error prevention	3	Add mouse over texts to help the user to know what happens from the buttons that have icons.
8	Impossible modifications when changing window parameters	Error prevention	3	Program should warn the user if they are doing some modifications that are not possible.
9	You can do modifications to wrong Drawing-Model pair	User control and freedom, Error prevention	3	Program should warn the user if they are doing some modifications that usually are done in some other part of the model.
10	Moving between 2D and 3D view when a tool is active is not intuitive in all cases	User control and freedom, Error prevention	3	Change the functionality so that the user can move between the 2D and 3D views more freely.
11	Attaching more than two walls to same corner is not	User control and freedom	3	Implement a feature that as many wall as the

	working if they are not at right angles			user wants can be attached to each other in no matter what angle.
12	Making a room with walls is not always working	User control and freedom, Consistency and standards	3	Improve the feature that is creating automatic rooms. Try to recognize better how the user is connecting the walls.
13	Finnish in UI when language is changed to English	Match between system and the real world	2	Check how the language is defined in the program and make it consistent.
14	Modifying elements with connections is not familiar to the user at first and user is not seeing from the UI when there are connections between the elements	User control and freedom, Recognition rather than recall, Error prevention	2	Inform the user better in the UI how they can modify the elements.
15	3D view same in every floor	Match between system and the real world	2	In 3D view it could be better indicated to the user in what part of the model they are.

16	No instructions on how to use the viewing options when starting to use them	Recognition rather than recall, Error prevention	2	Add instructions to viewing options when they are activated.
17	Turning around viewing only with arrow key controls	Consistency and standards, Flexibility and efficiency of use	2	Add option to control this viewing option with a mouse or at least add instructions.
18	When using arrow keys to move cursor it does not work well	Match between system and the real world	2	Fix the movement to follow the directions that are in the arrow keys.
19	Settings button does not work as user might expect	Consistency and standards, Recognition rather than recall	2	Change the settings to open similarly than the other objects in the same menu.
20	Selection filter status is unclear to the user	Visibility of system status, Error prevention	2	Change some of the logic in selection filter to work more like the user would expect it to work.
21	When the program window is smaller the fixed menu does not stay visible	Recognition rather than recall, Flexibility and efficiency of use	2	Keep the fixed menu always visible if the user has pinned it to

				stay in the window.
22	Project info window has a ?-button that does not do anything	Consistency and standards, Recognition rather than recall	2	Remove the ?-button since there is help in other location in the UI.
23	It is not clear how to delete a hole	Help and documentation	1	Undo would also help with this issue.
24	It is sometimes hard to get everything exactly where you want	Error prevention	1	For this issue it is hard to come up with one good solution. The user will get better with this when they use the system. Some highlight colours could be used to help this.
25	It is hard to choose specific parts of the floor	Consistency and standards	1	Could be improved with some highlight clours
26	Viewing the project from different angles in 3D	Recognition rather than recall	1	It is not instructed when the program starts that how to view the project, this should be done.

27	File and Archive tabs have same options and it is not clear to the user how they differ from each other	Consistency and standards, Aesthetic and minimalist design	1	Rearrange some of the tabs in the program.

Table 3. *Results from heuristic evaluation that was focusing on to the trial process*

No.	Usability problem	Heuristics	Severity rating	Improvement suggestion
1	Not automated trial process(In Finland)	Consistency and standards	3	Bring automated trial process to Finland too.
2	Old installation too complicated	Flexibility and efficiency of use	3	Make the new installation more straight forward.
3	The old installation pop-ups	Consistency and standards, Aesthetic and minimalist design	3	Remove most of the pop-up questions and ask the needed questions in the installation window instead.
4	Logos etc. missing from first trial emails(In Finland)	Consistency and standards	2	Add the same consistent visual look to this email too when designing the automatically sent emails.

5	The installation package email does not have the same visual look as the other next emails have	Consistency and standards, Aesthetic and minimalist design	2	Design again this email with same visual look with the other emails.
6	The program does not start automatically after the installation is done	Consistency and standards, Visibility of system status	2	Program should either start automatically after the installation is done or there is an option for the user to start the program straight from the installation window.
7	Trial form confirmation message in the web page is not clear and visible enough	Visibility of system status	2	A new page is shown to the user that says that the sign up was successful.
8	Too many options that the user has to choose when signing up for the trial period	Flexibility and efficiency of use	2	Remove many of the asked things from the trial sign up form and leave only the very necessary questions.
9	Missing information about what is included in the trial version	Help and documentation	1	This information could be added somewhere or at least examples of what actually could be done

				with the trial version.
10	Installation page has a lot of information in it	Aesthetic and minimalist design	1	Try to rearrange some of the information in the page and make it more visual instead of having just textual links in it.
11	Installation instructions	Help and documentation, Aesthetic and minimalist design	1	These too could be made to be more visual and shorter.
12	NetVID-licence term is not familiar to trial user and might confuse	Match between system and the real world	1	Use some other term like just licence.
13	Installation UI	Aesthetic and minimalist design	1	Small changes to the installation UI.