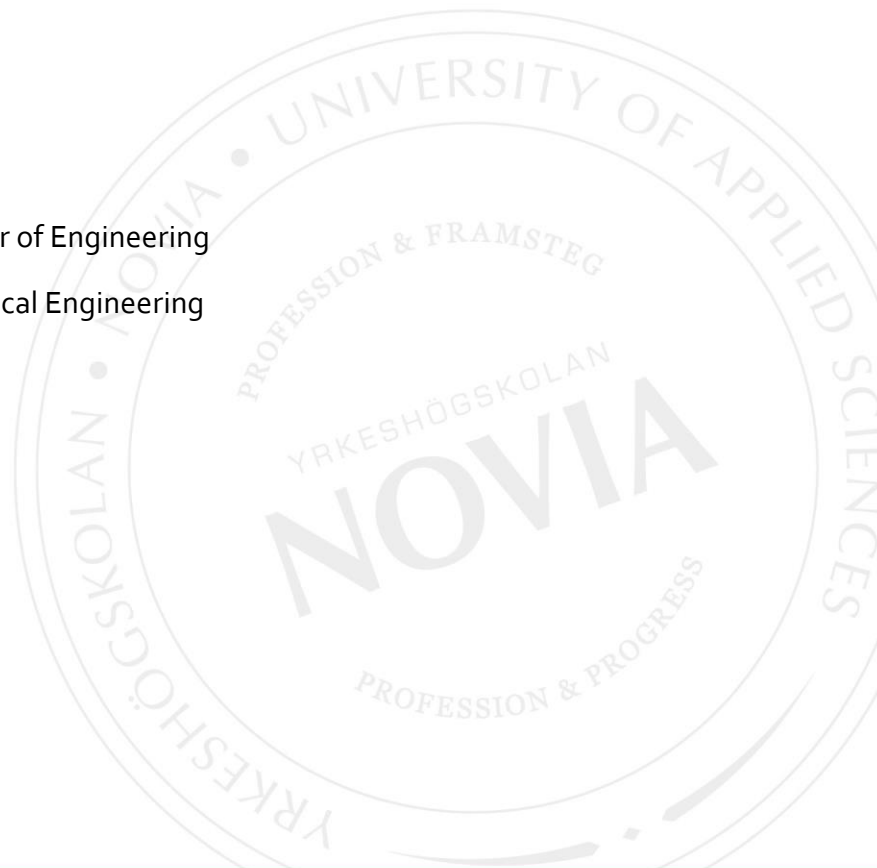# Development of E3 training material

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Degree thesis for Bachelor of Engineering

Degree program in Electrical Engineering

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BACHELOR'S THESIS

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Specialization: Electrical Power Engineering
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Title: Development of E3 training material
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Date: 3.5.2021   Number of pages: 16   Appendices: 1
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Abstract

This thesis was done for the Industrial Automation and Energy Industries department at ABB. The main objective of this thesis was to develop E3 training material for new ABB colleagues. E3 is an electrical design software that engineers use at ABB to design circuit diagrams for control systems.

The main objective of the thesis was to focus on how new colleagues can learn E3 and its features more efficiently. The thesis focuses mostly on how to use basic functions in E3. One of the most important things is that the newly hired colleagues should feel welcome and comfortable when they start working on projects.

The goal for this thesis was to have a clear and distinct E3 training material. In the long run, this training material would help all future E3 users in our unit and ensure that ABB has finalized training materials for future training.

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Language: english   Key words: E3, training material, electrical design
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EXAMENSARBETE

Författare: Kristian Damlin
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Inriktning: Elkraftsteknik
Handledare: Henrik Järveläinen & Nicklas Kronqvist

Titel: Utveckling av E3-utbildningsmaterial

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Datum: 3.5.2021   Sidantal: 16   Bilagor: 1

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Abstrakt

Detta examensarbete har skrivits för ABB:s Industrial Automation och Energy Industries avdelning. Huvudmålet med detta examensarbete var att utveckla E3-utbildningsmaterial för nya ABB kollegor. E3 är ett ritprogram som ingenjörer använder på ABB för att planera kretsscheman för kontrollsystem.

Huvudsyftet med examensarbetet var att fokusera på hur nya kollegor kan lära sig E3 och dess funktioner mer effektivt. Fokus ligger på hur olika funktioner ska användas på E3. En av de viktigaste sakerna är att de nyanställda kollegorna ska känna sig välkomna och bekväma när de börjar arbeta.

Målet för detta examensarbete var att uppnå ett E3 utbildningsmaterial som är klar och tydlig. På lång sikt skulle detta utbildningsmaterial hjälpa alla framtida E3-användare i vår enhet och se till att ABB har bra utbildningsmaterial för framtiden.

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OPINNÄYTETYÖ

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Koulutus ja paikkakunta: Sähkö- ja automaatiotekniikka, Vaasa
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Nimike: E3-koulutusmateriaalin kehittäminen

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Päivämäärä: 3.5.2021   Sivumäärä: 16   Liitteet: 1
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Tiivistelmä

Tämä opinnäytetyö tehtiin ABB:n Industrial Automation ja Energy Industries -osastolle. Opinnäytetyön päätavoitteena oli kehittää E3-koulutusmateriaali uusille ABB-kollegoille. E3 on piirustusohjelma, jota insinöörit käyttävät ABB:llä suunnitellessa piirikaavioita ohjausjärjestelmille.

Opinnäytetyön päätarkoituksena oli keskittyä siihen, kuinka uudet kollegat voisivat oppia E3:n ja sen toimintoja tehokkaammin. Opinnäytetyössä keskitytään siihen, miten perustoimintoja käytetään E3:ssa. Yksi tärkeimmistä asioista on, että vastapalkattujen kollegoiden tulisi tuntea olonsa tervetulleiksi.

Tämän opinnäytetyön tavoitteena oli kehittää selkeä E3-koulutusmateriaali. Pitkällä aikavälillä tämä koulutusmateriaali auttaisi kaikkia tämän yksikön tulevia käyttäjiä ja varmistaisi, että ABB:llä on koulutusmateriaali tulevaisuutta varten.

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Kieli: englanti   Avainsanat: E3, koulutusmateriaali, sähkösuunnittelu
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Table of Contents

1 Introduction

This bachelor's thesis has been written for IAEN Engine Power department at ABB Finland in Vaasa. IAEN stands for Industrial Automation and Energy Industries. IAEN makes control systems for surrounding equipment of engines in power plants that are located worldwide.

This chapter consists of background information, purpose of the study and a few words about ABB.

1.1 Background

I started working at ABB here in Vaasa one year ago. I asked them if there is a suitable project for my thesis and they helped me out. One of my colleagues suggested a topic of making training material for E3. I was familiar with E3 design software because I worked with it the entire summer. ABB needed training material for E3 because there was almost no material for new users. The training material ABB had was outdated and not so informative.

1.2 Task

The task is to make clear and distinct E3 training material, mainly focused to new users. The training material must contain installation guide, basics about drawing, short commands, basic functions, ABB features and exercises. I am also going to mention E3 database editor.

This training material would help all future E3-users in our unit and ensuring that ABB has finalized training materials for future training. This training material is not available for third parties.

1.3   Purpose of the study

The purpose of this thesis is to learn out E3 design software in the easiest and best way possible. To learn out E3 features in the correct order to make it more understandable for the new users.

This training material is a good way to help employees throughout their employment. To give employees a standardized plan about E3 will help them to be successful, give them more job satisfaction and motivation in the new company.

1.4   Employer – ABB

ABB is a leading global technology company. ABB has been operating successfully for over 130 years. ABB employs 110,000 professionals in more than 100 countries, of which about 5,000 are located Finland. [1]

In Finland, ABB operates in about 20 locations. The factories are in Helsinki, Vaasa, Porvoo and Hamina. Vaasa is focused on motors, low voltage products, low voltage systems, electricity transmission and distribution systems. [2]

IAEN is a subsegment of Industrial Automation and is divided in four segments of its own, Engine Power, Hydro, Nuclear & Thermal and Service. Engine power department specializes in gas and diesel engine power plant automation. It also includes system analyses and maintenance services to identify ways to improve power plant performance and reliability. [2]

2 Theory

2.1 Zuken

Since 1976, when the company Zuken was founded, it has been a world leader in electronic design automation (EDA). The company currently has over 1000 software specialists stationed in Japan, Europe and the United States. The company offers software solutions that maximize the efficiency of design and manufacturing processes for many of the world leader electronic companies. Zuken offers products and services such as PCB design, computer-aided design (CAE), sub-assembly for cables, cable design and data management solutions. In 2006, the company acquired the German company CIM Team GmbH, which has developed the E3 program. [3]

2.2 E3.series

E3.series is an electrical engineering environment provided by Zuken, that supports advanced requirements for electrical documentation, cabinets, wiring design and manufacturing outputs. E3 enables companies to automate design routines through API (Application Programming Interface). E3.series gives an efficient and accurate manufacturing and design for electrical planning, fluid planning, cabinet layouts and cable planning. E3's object-oriented structure and unique real time quality control always produce up to date and error free documentation. E3 is a modular Windows software that is independent and supports the input and output function of several different standard formats. [4]

2.2.1 E3.cable

E3.cable is one of the five software that is included in E3.series. E3.cable is an engineering design software for electrical wiring, control systems, documenting cable plans and wire harness layouts. [5]

E3-cable is the design software used by the IAEN department at ABB when designing circuit diagrams for control systems.

2.2.2   Usage of E3 at IAEN department

E3 is diligently used in all segments of the IAEN department. The training material is prepared from Engine Power point of view but much of the same E3 tools are used in the other segments of IAEN. The Hydro segment uses a lot of the same E3 tools as Engine Power segment.

2.3   How to create effective training material

When starting to write the training material, the creator should go through these three steps. Writing the draft material, which is about the layout and creating visual appeal. Editing the draft material is about reading and correcting the text in the training material, for example grammatical errors and careless errors. Finalizing the draft material tells us about adding the front contents. [6]

2.3.1   Write the draft of the training material

When writing the draft of the training material, connect sections with transitions. This means that the different steps should be in logical order, have a main idea and explanations of the main idea. For example, if the creator wants to teach basic electrical designing, start by defining the different terms before requiring new users to analyse or apply different steps. This is called chunking or transitioning the materials. New users who are reading the material, do not want to see huge amounts of text grouped together, create shorter paragraphs to reduce their anxiety when they are reading the material. In other words, the text should be easy to read. [6]

Additionally, the creator should also include images in the training material. This helps creating a bigger picture and improves communication with the users. Even though the training material looks good, it is worthless if it does not educate the new users. [6]

2.3.2 Edit the draft material

The draft material should be edited to ensure contents are clear, accurate and comprehensive. The user must understand what the creator is trying to communicate. The first thing to do after creating the draft material, is to read the material out loud. Misguided writers might think their writing sounds superb, but users cannot comprehend the meaning, they will not fill in the illogical gaps. [6]

2.3.3 Finalize the draft material

When finalizing the draft material, the creator should write the introductory materials, like table of contents, title page, things to note page and so on. In the title page, the creator may wish to mention the title, the company and one's name. The creator also needs to consider copyright rules and how they work if the training material is going public. Table of contents must be detailed that includes chapter headings, main headings and sub-headings. Index list is optional to have in training materials. An index list helps trainees to find information quickly, but a detailed index list takes a lot of time to do. The back contents off the training material includes: Appendix and references. Once created the front and back material, the creator should move on to the final edits for the entire training material, then it is ready to be bound. [6]

2.4 Purpose of the training material

Training materials takes a lot of time and effort to produce. The creator may be thinking a lot about what purpose will this material have and is it worth all this effort. It is important that these issues are discussed and that everyone involved agrees. Changes in goals and purpose late in the writing process will force the creator to do new revisions.

Look at the context in which the training material will fit. If the creator is planning a certain training material, it should be searched if there is a similar one. Review and identify all training materials, manuals and other literature sources that already exist.

Do not duplicating information or disclose important information that is not covered by other literature. [7]

2.5 Planning the training material

It happens too many times that people start writing training material without a plan. Willingness to start showing concrete progress immediately can be tempting, but it should not pass on the project until it is clear what information is required to receive by the user. The result can be catastrophic. Start by developing a plan. Plan the training material carefully, this will help to ensure that the material will meet its objectives. Good planning will also save time. [8]

It is also much easier to start writing the training material if the creator knows what headlines are going to be used, what to write about, which writing style to be used and how the information should be organized. Planning the training material also helps to coordinate any others involved in the writing.

2.6 Determining goals

Keep in mind the goals in the training material. For goals to be useful, they should be clear and measurable. For example, if the purpose is to develop training material about E3, then a goal can be how to provide all the features about E3 step by step. Deciding how many goals to have in the training material. The more specifically the creator defines the goals, the more likely will people understand goals for the training material.

The creator must watch out for unreasonable or vague goals. Focus on the most important tasks, the training material should not contain different tasks that comes up infrequently or are of minor importance.

Make a list of as many specific goals for the training material. When preparing to test the training material, look back at the list and use these goals to lead the reading. If the creator has written them clearly, it should be easy to understand them correctly. [7]

2.7   Analyzing the user

Once the creator has decided the goals and purpose of the training material, the creator should identify the user. Talk to future users of the training material to get a bigger picture of what they think is necessary. The creator must think about who will use this training material. If the creator knows the target group who will read the training material, it should have a better understanding how to provide the right information.

By knowing who is going to read and use the training material, the creator can adjust how to write down the information in a sensible way. It is very important using right terminology for right target groups. [9]

Once knowing which group will use the training material, it will ease the provision of information. The creator should also think about where to find this training material and how will this material be used. The training material should be in an easy place so as many people as possible can find it, for example online or in the library.

2.8   Prepare the outline and specifications

The first part of the description is the outline. The outline shows all the chapters, sections and topics. These should be dealt with in the same order as they are presented in. The creator should always start by doing a list of chapters. When the creator is satisfied with the chapters then the creator should move over to sections. When that has been done to list of all sections, the creator should identify all the different topics that are going to include in each section.

A good way to identify potential areas for training materials, is to look at manuals or training materials developed by other organizations. Use their training materials or manuals to create ideas, many organizations have published their manuals on the internet.

By preparing the specification for the training material, the creator should define the content, organization, design of the training material and how it will be produced and

distributed. If this is done well, it gives the user a clear picture of what the training material will contain and what it will look like before starting to write it.

2.9 Collection of information

The information for the training material may come from one's own knowledge, experience, other documents, workflow analyses or subject matter experts. The challenge is to get all this information well written in the training material.

By searching for training materials or manuals on the internet, the creator can find very great ideas and information for the training material. If the creator wants to take parts of a training material that belongs to another organization, the creator must ask for permission first. [10]

The organization or the group of people who will use the training material are usually the best source for information. From the beginning, involve these people as much as possible. They usually know what they want from the material and that will help succeeding with the training material. When choosing subject matter experts, try to get in touch with people who has different levels of experience and different backgrounds. This will help to get a more informative and bigger picture about the content.

2.10 Making the training material

The creation of a training material is divided into several different parts that should be done. The training material and its parts should be produced in a certain order. This is because the user will get a better view of the work. It will also ease the work when the creator has clear idea of its content. Do the theoretical parts before the actual writing process, this will help to understand what the training material will contain and how good it will be.

2.11 Maintenance of the training material

Do not forget about how the training material will be kept up to date, usually organizations forget about the training material when it is finished. The result is that the training material is unusable and unreliable. Training materials must be updated regularly to reflect new updates and updating errors found in the content. If the creator is writing the training material to a specific software, keep in mind that the software will get new updates and change visually as well. The training material should go through two phases: the maintenance phase and the development phase. [11]

3   Method

This section will tell you about the methods I used to make the training material. I will explain my strategy and how I gathered information for this training material.

3.1   Planning the training material

At the end of 2020, it became quite clear that an E3 introduction package or training material would be beneficial for the IAEN department at ABB. This was discussed with my manager, my supervisor and colleagues at ABB. The purpose of this training material is to give new users an overview of how E3 works and how to use the program. Meaning this training material gives the user all the basic information they need to know, before starting to work on projects. This training material would give a better understanding for those who have no experience of designing programs.

3.2   Collecting information

The information contained in this training material was gathered under one year as I was working almost daily with E3 software. I have been in contact with my supervisor who is more experienced E3 user than me. My supervisor shared his opinion on what features are good to include in the training material. He also handed me power points about E3 from where I can take information for my training material. I also got older power points about E3 that I used as sources, but some of the power points were outdated.

I have had meetings with my manager and colleagues to get their suggestions on what the training material should contain.

Basically, I gathered information to this training material from my own experience, from my manager, my supervisor, colleagues, new and old power points about E3. By gathering this information, I have shown interest in their work and actions to improve the cooperation in the project team.

3.3   Writing the training material

The structure of the training material was carefully considered when it was written. Deciding which chapters to start with to ease the reading and understanding of the training material. All the chapters are now in such order that the training material can be read without needing to backtrack.

As the theory suggests, the training material contains a lot of screen captures of the program. Because this makes it easier for the user to read the training material, so that everything is not just a text mass. Instructions to every tool in the training material was done with screen captures and an adequate explanation with text. The user should proceed in the training material with the help of list of content.

4 Result

The practical result of this thesis was a 56-page training material about E3 designing software at ABB. No versions of this training material will be published in public because it contains classified information. The training material will be sent as an attachment with the official version of this thesis.

I will explain what the training material is about, without giving out any classified information. I want to give the reader an overview of the work, what it will contain and how it is structured.

In this training material I will present installation of E3. I will explain step by step how to install the E3 software, where to find the installation package, where to set up the different ABB tools and plugins.

After I have presented the installation of E3, then I go into the user interface, how the E3 looks when you are opening it the first time. I will go through where on the user interface you will find certain things like project related stuff, different tools, components, symbols and so on.

I have presented all the basic functions that new E3 users need to know. Basic functions cover components and symbols, project sheets, different wiring and cable designing, global settings, revision handling, reports, shortcuts and so on. The training material explains how these are executed and things that should be considered when using these basic functions.

Lastly, I have also presented some E3 exercises, using the basic functions that I have covered. I followed the order in which I had written them so it would be easier for the user to follow and understand the different steps.

5 Conclusion

In this section I will present the concluding thoughts about my thesis. Did I manage to create the training material within the allotted time, how well have I reached my purpose, what were the biggest challenges when I made the training material and will there be any further studies to be done.

5.1 Reaching my purpose

When looking back at the training material, I can say that the material is very close to how I had planned it. The training material gives a good overview of the most important things the user should know before starting to work on different projects.

I superficially included all these features that I wrote about. I could have dug much deeper into the functions, but I intend to write that at a later stage. The main thing is that the most important things are included in the training material, like I had planned.

The training material offers a good start to the E3 program for those who are unexperienced.

5.2 Challenges

The most challenging part of writing this training material was how to structure the entire material. In what way should I present the material, in what order should I present different functions and how much should I go into details. To structure the layout was also a big challenge, trying to get the training material as easy to read as possible and at the same time have enough information.

In the training material I wrote about some functions that I was not familiar with. That made some chapters a bit challenging to write, but I learned new things about E3 that are good to know for future purposes.

5.3   Proposal to further studies

Since this training material was made for ABB's IAEN Engine Power department, the further work on this training material is to keep the training material up to date, train new employees and distribute it. Maintaining and updating the training material with new information will be updated by me and my team.

6   References

[1]   ABB, "About ABB," 2021. [Online]. Available:
      https://global.abb/group/en/about..

[2]   ABB, "ABB Oy, Energy Industries," 2021. [Online]. Available:
      https://new.abb.com/fi/abb-lyhyesti/suomessa/liiketoiminnat/power-
      generation.

[3]   Zuken, "About Zuken," 2021. [Online]. Available:
      https://www.zuken.com/en/about-zuken/.

[4]   E3.series, "E3.series," 2021. [Online]. Available:
      https://www.zuken.com/en/product/e3series/.

[5]   Zuken, "E3.cable - Electrical wiring design software," 2021. [Online]. Available:
      E3.cable - Electrical wiring design software.

[6]   Mary L. Lanigan, "How to Create Effective Training Manuals," Third House, Inc.,
      Illinois, 2012.

[7]   P. A. &. E. R. Robinson, Writing and designing manuals, USA: CRC Press, 2000.

[8]   J. T.Hackos, Managing your documentation projects, New York: John Wiley &
      Sons, 1994.

[9]   E. Katzin, How to write a usable user manual, New York: Van Nostrant, 1985.

[10] W. R, A guide to assessing needs, Washington DC: The World Bank, 2012.

[11] E. Weiss, How to write usable user documentation, California: The Oryx Press,
      1991.

7 Appendices (Confidental)

7.1 Appendix 1: E3 training material