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Project Management Framework for Implementing Artificial Intelligence Enhanced Data Analytics Projects

A Case Study of Virnex Group Oy

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This is written at the end, as the very last written element in the thesis process.

The preface is a short personal introduction combined with a humble/kind acknowledgement to anyone who has helped you in the Thesis process (regardless of support type, whether constructive or critical, whether you liked it or not), starting from the case company, acknowledging all interviewees, gate-openers, workshop participants, key stakeholders, Metropolia faculty and students, and end with family, friends and peers.

This becomes a public document in Theseus so do be mindful and tactful in your writing. Reading a thesis Preface is a good way of testing a student’s maturity. Please avoid over-positive or over-critical emotions to overtake you at the end of the Thesis. The Preface shows your diplomatic skill in acknowledging the role of others in making you succeed - it sets the ground for you to build long-term bridges and your ‘personal brand’ in the case company, industry at large and toward Metropolia. Notice that in the small, global world in which we live in, everyone is connected, thus you cannot afford not to acknowledge someone who has visibly helped you.

Keep the tone personal, yet professional and mindful. This is your moment. Remember to sign this text below.

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May 1, 2024

|  |  |  |
| --- | --- | --- |
| **Abstract** | | |
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| **Guide to Abstract writing:**  In the abstract, please succinctly address the following themes and keep to one page:   * description of the thesis objective and context - 1 paragraph * how the study was conducted (research methods, data) - 1 paragraph * what the key parts contained (theoretical and practical) - 1 paragraph * what was the outcome & what was the business impact (significance for the company) - 1 paragraph.   DO NOT refer to the structure of the 7-GATES here. | | |
| Keywords | | Data analytics, Artificial Intelligence, Project Management, Change management |

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Glossary

IT Information Technology

AI Artificial Intelligence

ML Machine Learning

DBMS Database management system. Software for maintaining, querying and updating data and metadata in a database.

XXXX

# Introduction

Current businesses are more and more data oriented as data are generated from myriad of places and comes in many from and in large volume (Inmon, Levins, & Srivastava, 2021) .This large data volume has been a major transformative force for internal process optimization and data driven decision making for a company. More and more company are investing heavily to understand own data, and solutions like data-lake, data-warehouse, data analytics offering possible solutions to the company needs. With this push towards greater insights from data, a relatively new field has evolved where Artificial Intelligence (AI) is integrated with data to obtain better understanding of existing data as well as possible future insights to data (for example for sales forecasting or identifying potential customers). These factors have led to a surge in data analytics projects which are relatively different than a traditional Information Technology (IT) projects.

An IT project has two main activity dimensions: engineering and project management. The engineering dimension deals with building the system and focuses on issues such as how to design, test, code, and so on. The project management dimension deals with properly planning and controlling the engineering activities to meet project goals for cost, schedule, and quality (Jalote, 2002). Project management, like other branches of knowledge, has changed since the development of computer science and informatics. Organizations are advancing digital transformation and adopting enterprise architectures through which they have improved processes and information systems simultaneously (Pérez, Pérez, & Kacprzyk, 2022). However, AI enhanced data analytics projects significantly differs from traditional IT project because of their iterative nature, technical complexity, need of inter domain collaboration as well as uncertainty in outcomes. These challenges require efficient and systematic project management approach that can potentially mitigate risk, enhance efficiency, and ensure successful implementation. Additionally, AI and Machine Learning has become buzzword for executives who expect to solve the problems in an organization with successful AI implementation so managing executive expectations has become a major part of IT project Managers day-to-day work. Understanding organizational structure, it’s change management process is another issue that an IT project manager must constantly familiarize or reiterate to accommodate AI in an organizational process.

With all these additional components to project management, a traditional approach to project management is not considered optimal with one analysis suggesting that about one-third of projects have cost and schedule overruns of more than 125% (Jalote, 2002).

A study conducted in USA in relation to project failures of software projects, it was found that only 17 percentage meet their original targets, 50 percentage must have target changed due to factors like time constraints, budgets or reduced performance requirements and remaining 23 percentage are cancelled. With average spending of 250 billion dollors in software development, approximately 20 billion dollars are completely lost in cancelled projects

With better understanding of overall process, a project manager is better equipped to handle these challenges. Proper management of people, social and cultural aspect of organization, change management and process management is needed to overcome these challenges and mitigate risks. Additionally, very few research has been done in these field as it is evolving phenomenon, and no standard approach is available for a project manager to implement.

The primary focus will be on investigating the optimal project management frameworks that can effectively navigate the unique challenges posed by AI projects. By evaluating and understanding the existing frameworks and their applicability within the context of AI and data analytics projects, this research aims to provide insights into project management approaches that best suit the complexities of AI and data analytics projects. This research aims to explore how frameworks such as Agile, Waterfall, Scrum, and other established project management methodologies can be adapted, augmented, or combined to better suit the dynamic, often experimental nature of AI project development. Understanding and proposing effective strategies for project management could significantly contribute to enhancing project success rates, meeting stakeholder expectations, and optimizing resource utilization.

## Business Context

The case company of this thesis, **Virnex Group Oy** is an Information Technology company operating in Finnish Information Technology Sector with two distinct areas of operation: **Digitalization consulting** and **Business software solution.**

Both areas of operation are directed towards improving organizational performance, completing IT projects, automating business process and data driven visualization of big/small company in different industrial sectors including public, government, finance, energy, forestry and so on. The main solution provided by the company are consulting experts in different field of technology who can help customer company in solving their day-to-day problems related to information technology be it as simple task of visualizing daily sales of the company or as complex as creating completely new tailormade software solution in cloud environment. (Virnex Group OY, 2023)

Operation themes in general includes transitioning business to new business model using agile methodologies, help clients find, build, or adapt systems and tools that best serve their current business, enabling client’s business decision to be based on right, relevant data and understanding of data, provide best experts in related field to be a part of building a better, smarter, and sustainable world. (Virnex Group OY, 2023)

Virnex main office is in Lahti, Finland and has around 100 employees and revenue generated during 2022 was approximately 10 million Euro. Thus, the company is relatively small compared to other IT technology companies but has seen a massive growth during past three years as it was only officially founded before four years. Past few years, the number of employees has grown from 20 to about 100 and has served more than 200 different customers since its establishment.

Virnex Group is planning for major shift in implementing Artificial Intelligence into its internal processes as well as creating new solutions using AI so that it could streamline own internal processes as well as generate additional revenue by selling solution to other companies at same time. There are multiple ongoing projects to enhance data analytics process of the company as well as “ready-to-deploy” processes that could be implemented in a customer organization with minimal customization.

## Business Challenge, Objective and Outcome

Case company has invested in developing Virnex Intelligent Business Automation (VIBA) which is an automation solution that reduces manual work by using analytics, AI, Machine Learning, and data integration to make automated decisions. However, the use of AI in the process is currently quite limited. The company clearly wants to benefit from implementing AI to its data analytics offering but a systematic approach/framework that could be implemented in the projects is currently missing specifically in domain of data security, compliance, risk management and change management.

Part of these issues are not only limited to technical aspects but also to management processes of the company and AI projects. On other hand, AI implementation projects are comparatively new for the company and project managers in general. These processes have not been well standardized, so that traditional IT Project Managers have all faced different level of challenges in successfully implementing these projects.

This study focuses on Project Management aspect of Artificial Intelligence implementation in the field of data analytics. The Objective is:

To define a systematic approach / framework to improve project management process for AI enhanced data analytics projects based on identifying project management challenges in AI implementation projects.

The outcome is a systematic approach / framework to improve project management process for AI enhanced data analytics projects.

## Thesis Outline

The scope of this thesis is limited to project management aspects of AI enhanced data analytics projects.

The thesis is written in XX sections and will start with the introduction of the topic and case company along with business challenges of case company. Next section will describe about research design, approach, data collection and analysis methods. Third section of the thesis will focus on analyzing current state of case company in relation to thesis topic and identify focus area for next steps. This will be followed by description of relevant existing knowledge and creation of conceptual framework of the thesis. Fifth section will focus on creating initial project management framework for the case company. The last XX sections will emphasize on validation of proposal and creating final proposal for the company.

## Project Management

A project is defined as “Time and cost constrained operation to realize a set of defined deliverables up to quality standards and requirement” (IPMA, 2006). While organizations set goals and develop strategic plans to enhance performance, projects give effect to strategic plan. (Zwikael & Smyrk, 2019) page 3. These planned works are often referred to as processes which comprises a sequence of steps that should be completed for a given task. (Jalote, 2002)

The Project Management Body of Knowledge (PMBOK) defines project management as “*application of knowledge, skills, tools, and techniques to project activities to achieve project requirements. Project management is accomplished through the application and integration of the project management processes identified for the project*”. (Project Managememt Institute, 2017)

In relation to software project, processes specify how to perform activities like requirement specification, design, testing and so on. The project management process, specify how to set milestones, organize personnels, manage risks, monitor progress and so on. (Jalote, 2002)

Although there are different aspects of project management that are applicable for any given project, this thesis will only focus on following aspects of project management in relation to implementation of AI in data analytics process.

### Change Management

Adapting AI and data analytics process is a significant change to digitization initiative within an organization thus require a robust change management process to optimize the benefits of such changes.

Change management is a special management technique where human factor is at the forefront of all considerations as implementation of change is highly dependent on the active support of employees (Lauer, 2021) page 3

These human factors within an organization can primarily be categorized to three categories as illustrated in Figure XX below.

A diagram of a culture and culture

Description automatically generated

1. Starting points for change management (Lauer, 2021) page 7

In relation to individuals, change management includes adapting skills to new challenges, promoting necessary positive attitude towards goals and participation in change. Corporate structure includes formal structural and process organization as well as strategies and resources. Corporate culture is an informal structure which are responsible for attitudes, values, and informal rules of behavior largely independent of individual (Lauer, 2021) page 7. Thus, for a successful change implementation within an organization it is imperative to address all three important factors.

Change management is therefore a complex task that not only starts at different levels, but also has to constructively bring together the most diverse interests of those involved. (Lauer, 2021) page 8

Addressing these human factor in project management is thus necessary for successful outcome of AI implementation projects.

### Risk Management

Risk can be defined as an uncertainty about the achievement of a project’s target worth. It is a phenomenon of the future, and so a prospective project will have measurable level of risk, for a completed project this will be zero or “close to zero” (Zwikael & Smyrk, 2019) page 105. Risks can be expressed as specific instances of an event-impact model as visualized in figure XX below:

A diagram of a risk process

Description automatically generated

1. The event-impact model of a project risk. (Zwikael & Smyrk, 2019) page 106

A threat is a form of triggering event (like project manager resignation) which triggers the chain of subsequent events and have a consequence. These consequences then further lower the worth of project.

Since, implementing AI in a project has a very high uncertainty, the risk in the project is rather significant where a threat like data accessibility could have potentially very high impact on overall project. (Zwikael & Smyrk, 2019)page 106

Risk in an AI implementation projects can be proactively recognized and mitigated using risk mitigation process. Risk mitigation process involves threat identification which is the process of identifying and describing the events that could harm the project. These identified threats are then analyzed by setting a value for parameter of a threat like likelihood, severity and expected damage. Finally, a mitigation process is formulated that lowers the expected damages for the given threats. These mitigation processes are usually “Preemptives” which reduce the likelihood of emerging threats and “Contingencies” which reduces the severity f the damaging impact of realized threat. (Zwikael & Smyrk, 2019) page 110-114

### Cloud Financial Management

Description of project management issues relevant for the thesis (change management, risk management, cloud financial management, financial transparency) will be described here. To be completed together with Existing knowledge section.

## Artificial Intelligence

Description of Artificial Intelligence (data governance, possible some legal and ethical issues) relevant for the thesis will be described here. To be completed together with Existing knowledge section.

## Data Analytics

Description of Data analytics (data security, compliance, issues) relevant for the thesis will be described here. To be completed together with Existing knowledge section.

# Method and Material

This section describes the research approach and the materials used in this thesis. It also introduces the research methods used of the thesis work and the next section presents a research design and the data collection that were used for this study.

## Research Approach

Start by creating a short general description of research families and research approaches that can be used (based on sources/references), pointing to the core features of every research approach, and *without* mentioning your study yet (max. 1 page).

First, tell about *research families* by comparing basic / applied; qualitative / quantitative / mixed; field study / desk study.

Second, tell about the most typical *research methods* / techniques used in the applied research family (interviews, surveys, observations, document analysis, etc).

Third, continue by relating to your study. “In this study, *the xxx research strategy* was selected….” Tell which is selected for your study and why.

-------------------------------------

Note, when writing Section 2.1 Research approach, about your selected *research strategy* above*,* consider these TIPS when arguing for the use of Applied action research in your study (you will find these points and more in: Kananen, 2013, scans of his Sections 1-3):

* In the background of Applied action research “there is phenomenon, process or situation that one wants to be improved after development of change” (Kananen 2013, 13).
* It combines research and development parts which typically relates to continuous enhancement and improvement in organizations (p.20). The result of this enhancement of improvement is typically a change to the better (p.20).
* Applied action research “is not own methodology but a group of different research methodologies that are used according to a situation or an objective for development” (p.20).
* Applied action research is close to development work that is being conducted in organizations on order to improve operations” (p. 21). Objective of Applied actions research in working life may be: processes, activities, products, services, situations as subjects to continuous improvements in organizations (p.21). In this arrangement, the development work becomes research work since it is conducted according to the research conventions: data is carefully collected, documented, and analyzed using research methods, which means the methods that produce reliable and novel (for this context) results (p.22).
* Applied action research makes difference with Action research as it has fewer iterations (often, only one iteration), and is less focused on researching the change process while implementing the change. It is mainly concerned with the practical result with improvement to the better.

## Research Design

This section will describe different phases and process used in this thesis to reach the outcome – project management framework for AI enhanced data analytics process.

To propose the framework, a questionnaire will be created based on the studies for different stakeholders. Based on these relevant questionnaires, interview will be carried out to determine current state of project management in AI and data analytics related projects in case company. These interviews will provide information about company processes in place and challenges that different stakeholders are currently facing in relation to implementation of AI. Once the development areas are identified, focus will be to analyse those areas and create framework around these areas. Further, existing project management approaches in AI and data analytics projects along with existing best practices in the field will be studied with special focus on the identified development areas. This would be followed by studying company internal documents on AI implementation, project management and data analytics.

Based on these current state findings, a conceptual model of project management framework will be suggested. Finally, the suggested framework will be evaluated by the related stakeholders.

This approach is summarized in Figure 1 below. (CHANGE FIGURE BELOW!!)

*A diagram of a research process

Description automatically generated*

1. Research Design

## Data Collection and Analysis

Different data required for the thesis are described in research design and study involves three stages of data collection. These different stages and corresponding data are described in table below.

1. Details of Data collections 1-3 used in this study.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Participants / role** | **Data type** | **Topic, description** | **Date, length** | **Documented as** |
|  | ***Data 1, for the Current state analysis (Section 3)*** | | | | |
| 1 | Chief Technical Officer | Face-to-face Interview | 1. Current state 2. Organization Strategy  3. Current Management practices |  | Recordings & Field notes |
| 2 | Data-team Lead | Face-to-face Interview | 1. Data analytics process  2. Data governance  3. Data Security and compliance |  | Recordings & Field notes |
| 3 | Process Owner | Face-to-face interview | 1.Strength and weakness  2. Risk management strategy  3. Change management strategy |  | Recordings & Field notes |
| 4 | Project Manager 1 | Face-to-face interview | 1.Strength and weakness  2. Current risk management strategy  3. Change management strategy |  | Recordings & Field notes |
| 5 | Project Manager 2 | Face-to-face interview | 1.Strength and weakness  2. Current risk management strategy  3. Change management strategy |  | Recordings & Field notes |
| 6 | AI Expert | Face-to-face interview | 1.Implementing AI in data related projects  2. Issues related to AI implementation |  | Recordings & Field notes |
| 7 | Sales Manager | Face-to-face interview | Identifying customer requirements |  | Recordings & Field notes |
|  | ***Data 2, for Proposal building (Section 5)*** | | | | |
| 8 | AI Expert, Process Owner, Data-team Lead, Project Manager | Workshop and interviews | Qualitative feedbacks & idea formulation |  | Internal report |
|  | ***Data 3, from Validation (Section 6)*** | | | | |
| 9 | CTO, Process Owner, AI Expert, Project Manager | Group interview/ presentation | Validation, evaluation, final improvements |  | Recordings & Field notes |

As visualized in Table 1, first set of data was used for current state analysis, and included interviews with different stakeholders, discussion with internal team members, analysis of existing documents within the case company. Questionnaire for the interview was prepared beforehand for each participant based on responsibilities and the responses were documented as electronic field notes. The questions for interviews can be accessed from appendices.

The aim of interview was to identify the current state of project management, AI implementation and data analytics projects in the case company. The outcome of this stage was to familiarize with current practices in the company and identify the areas of strength and weakness in the field of project management, AI and data analytics. Further, the development areas were identified and prioritized for next stage. These outcomes along with existing knowledge related to identified development areas were further used to create the conceptual framework of the research.

Second set of data included workshop and group interview with selected stakeholders to build the initial proposal based on the outcome of first dataset. The aim of workshop was to address identified development areas and discuss different ideas on project management framework, industry standards and best practices.

Final set of data was used for validating initial proposal. Selected stakeholders were involved in group discussion and initial proposal was refined to create final proposal.

During current state analysis, internal documents were also analyzed which is mentioned in Table X below.

1. Internal documents used in the current state analysis, Data 1.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Name of the document | Number of pages/other content | Description |
| A | Case company’s IT Governance  Handbook.doc | 22 pages | IT Governance,  Operational Processes, Sourcing |
| B | ARIS – Tool | 13 diagrams | Diagrams for Operational  Processes |
| C | Specific information security  requirements for cloud services.doc | 5 pages | Security requirements for cloud provider |
| D | Group Information security  manual.doc | 25 pages | Information security principles,  Information security classification |
| E | New Server and Software  Order.doc | 2 pages | Process description |
| F | New Server and Software Order  Diagram | 1 diagram | Process diagram |

Most of the documents included existed…………

The findings from the current state analysis are discussed in Section 3 below.

# Current State Analysis of Project Management, AI and Data Analytics at Case Organization

“This section discusses the results from the current state analysis”. Note, your Thesis may have Literature review and best practice first. Adjust the sequence of your sections so that they will reflect your Research design.

## Overview of the Current State Analysis

This short section (1-1,5 pages max.) contains a brief description of *how* your current state analysis was conducted. This section helps the readers see how you planned and implemented your current state analysis, in a systematic way.

Start by telling what was the goal of your CSA and how many steps the current state analysis included. Continue by presenting what and how it was done, step by step (First, … Second, … Third…), explaining the rationale guiding this choice. Aim to clearly present the logic, procedures and choices in your CSA before diving into the substance of your analysis.

Important. Avoid any repetition with data collection descriptions in Section 2. Instead, focus on presenting *the logic* of your current state analysis. This short description helps to avoid contaminating your report with details of your data collection, analysis procedures and other technicalities. Starting from Section 3.2, the text should focus on reporting *the results* of your current state analysis.

Report on the results of the current state analysis typically starts with *a description* of the process / issue being investigated. This description “sets the scene” and explains the context of the process / issue at hand in sufficient depth. The description is followed by the presentation of *the analysis results*.

It can be a good idea to divide these parts into separate section, for example: Section 3.2 Description of the Current Resource Planning Process, and Section 3.3 Analysis of the Current Research Planning Process (as an example).

The description typically starts as a text introducing the process / issue / organizational context to the reader. It typically contains either *a process map* (existing in internal documents or created by yourself based on your investigation),or otherwise presenting the results of your analysis in a systematic manner (in *tables, diagrams, figures, calculations*) in such appropriate level of detail that make drawing reliable conclusions possible. Split this description into sub-section, if needed:

Your description of the process of issue being investigated may be split into several pars, for example, (a) description of the process, (b) roles and responsibilities, (c) available tools, (d) interfaces to other units etc.

## Analysis

This text is often **divided into relevant categories / findings** (visible in sub-sections) that present the analysis results by groups/categories of findings. **Utilize data/evidence** to illustrate your analysis and ground your findings.

### Project Management

Which categories you choose, you will decide based on the results of your analysis. The data will “tell” you through the most frequently raised themes, topics, issues, complaints, etc. that will come into light as a result of your analysis. Here, it is important to keep a logical approach to grouping your findings, so that your categorization will be reliable.

Importantly, remember that your analysis should be based on data. Therefore, remember to refer to the sources of data (internal documents, surveys, interviewee 1, respondent X, etc.) The data should evident in both, its “raw” format (as citations) and also in the processed form (in tables, charts, graphs).

Every time when you use a table of a figure, introduce it in the text by saying: “Table 1 below shows xxxxx.” Notice the place of the table heading (*above* the table).

1. Virtual studies completed by Metropolia students in the academic year 2018-2019 (based on the analysis of internal documents). Copy-paste this heading above your next table! Numbering will continue automatically.

|  |  |
| --- | --- |
| Field of study | Studies completed, ECTS |
| Culture | 131 |
| Technology, Communication and Transport | 552 |
| Health Care and Social Services | 175 |
| Business and Administration | 52 |
| Not bound to a field of study | 18 |
| Metropolia total | 928 |

“As shown in Table 1, xxxxx.” Always add the explanatory text after a figure or table. It should guide the readers through the key elements of a table of figure and help the readers to understand why you use this illustration.

### Artificial Intelligence

Use the Quotation style for an indented quotation. In the last sentence immediately before the quotation, introduce this quotation (as you introduce a table of a figure). “This is illustrated in the following quote by Interviewee 1”:

If a direct quotation is several lines long, indent the quotation and use single (1.0) line spacing. Do not use quotation marks then. Always provide a reference to the source. If the direct quotation is shorter than two lines, include it in the body of the text in quotation marks, and provide a reference to the source. *(Interviewee 1)*

After an indented direct quotation, continue the text. There must always be text between the quotation and a new heading.

### Data Analytics

Continue with a reasonable number of sub-sections to make your report on the analysis results structured and systematic. Follow the guidance above for the layout of your text.

Next sub-section ends the current state analysis by providing an overview of the main strengths and weaknesses identified in the current state analysis in Section 3 (or any other type of relevant conclusions on your findings).

## Key Findings

There must always be text or a new subheading below each heading. This section summarizes the results of the current state analysis pointing to the main strengths and weaknesses (as an example) identified in the process/issue under investigation. (You may use another approach to summarizing your results; choose it according to your goals and analysis methods).

### Strengths and Weaknesses

Start by pointing to the strengths identified in the process / issue being investigated. Create a structured text (First, … Second, … Third,…) where the identified strengths will be summarized and presented in a systematic, logical manner, and explained in sufficient detail.

Continue to creating a similar summary of weaknesses (First, … Second, … Third,…). Prioritize when presenting both strengths and weaknesses and explain which perspective you take (organizational, departmental, etc).

Note, noting new should appear in this sub-section (nothing that was not discussed above in detail)! Here, you just summarize all the findings that were discussed above.

It can be also helpful to make **a table** **with all the identified strengths and weaknesses** at the end of this section.

### Selected Focus Areas

End this section by identifying which 1-3 weaknesses are those one(s) that you intend to hereafter focus on in your study. **This selection of weakness(es) informs your choice of literature in Section 4** and the kind of proposal you will build in Section 5.

In other words, you make a vital choice here, by selecting your focus areas! It should result in a strong fit between the main sections of your thesis: **your selected focus areas from SCA** should inform > **the main themes selected for ´available literature & best practice´** and should inform > **the main elements of your proposal**.

End with a link to Section 4.

# Available Knowledge and Best Practice

“This section discusses xxx.” (Write 1 paragraph of meta-text telling what this section is about).

Tip: It is good practice to structure Section 4 according to your Conceptual Framework. Refer to the same terms in sub-headings of this Section as you have used in your Research design and use them also later in your Conceptual framework. This makes your structure and reasoning more transparent.

Remember to create a strong fit between the main sections of your thesis: **your selected focus areas in SCA** should inform > **the main themes selected for ´available literature & best practice´** and should inform > **the main elements of your proposal**.

## Project Management

### Change Management

#### Change Management Models

#### Successful Change Management

### Risk Management

<https://learning.oreilly.com/library/view/quality-software-project/0130912972/ch18.html#ch18lev1sec5>

#### Risk Management Models

#### Determining Project Risks

#### Risk Management Plan

### Cloud Financial Management

These sections contain discussion on the existing knowledge (available knowledge, theory, best practice) on your selected CF topics/CF elements.

Whenever you take up new issues, follow **a** **DDA approach**:

1. **Define** the term (e.g., digitalization / user experience, etc) by comparing 2-3 definitions from high quality (scientific) sources. **Start with** **defining** your concept/phenomena!

2. **Describe** its features, give examples. Discuss what is known on the issue and present a merged, coherent view on this concept/phenomenon.

3. **Analyze** *in relation to your* topic (this is the place for your opinions, evaluations.   
NOTE that all your recommendations (“should” and “must”) are done only at the end (!) of your thesis based on your own results and completed study, in **the final sections** (Proposal and Recommendations). Not in Section 4. Not based on literature (without conducting own study).

Reference the content accurately to the source (Grönroos 2012, 25).

Link every subsection to the next one. Build a ‘bridge’.

## Artificial Intelligence

## Data Analytics

The style of the text in Section 4 is an *academic* text based on processing scientific texts, business literature and best practice sources (standards, white papers, blogs, etc) with necessary references to point to the origin of the cited / paraphrased / indicated sources (Yin 2009, 25; Jack and Jones 2020, 35; Saunders at al. 2016, 31).

The style of the text is *not* repetition of the sources, but a focused *discussion* (based on the sources) about the latest available knowledge of Element 1, Element 2, Element 3… In this discussion, your goal is to update the current level of knowledge (dispersed across various sources) into a condensed picture of **selected** *best* available knowledge, for use as a **relevant** guidance in building your Proposal.

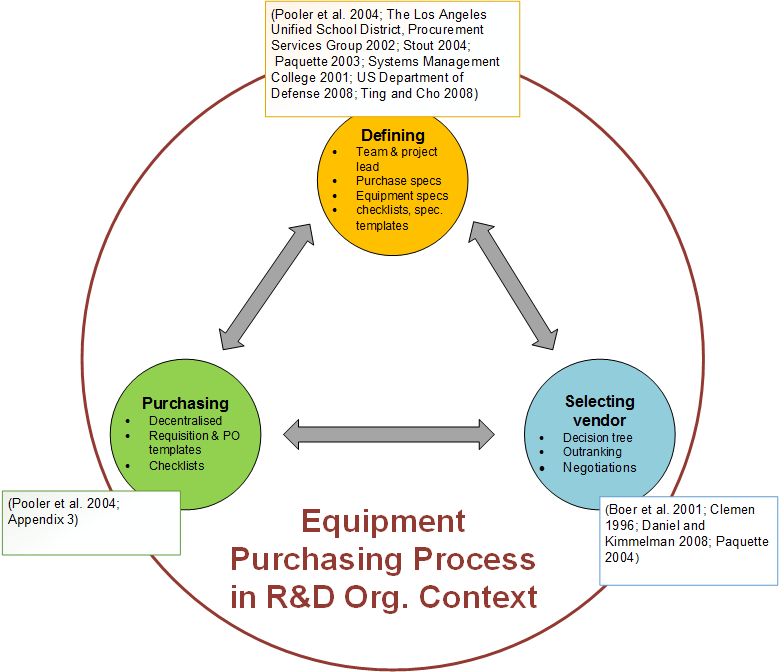
Here is some **general advice** for writing Section 4 (from: Huhta and Grabovskaia 2017, “Guide for Writing a Master’s Thesis”):

* First, decide your **focus** (remember, it should link well with your CSA results/Objective)
* Develop **your own ‘story line’/logic** how you present and discuss these topics and their details (and follow *your* logic, not the sources)
* Select only **relevant ideas** which would prove/support/ illustrate your logic (do not repeat the sources/ do not report all the ideas from them). **Discard** and **minimize all the other elements!**
* **Merge these relevant ideas** (mix them) to present your logic, but keep references visible to sources, to indicate where the most significant ideas come from. This will create “discussion” between the sources.
* Start with **definitions** and proceed to detail.
* Finally, always check yourself: ***Does my text/logic******link to my topic?*** *Or I am diverging to some other direction?*

## Conceptual Framework

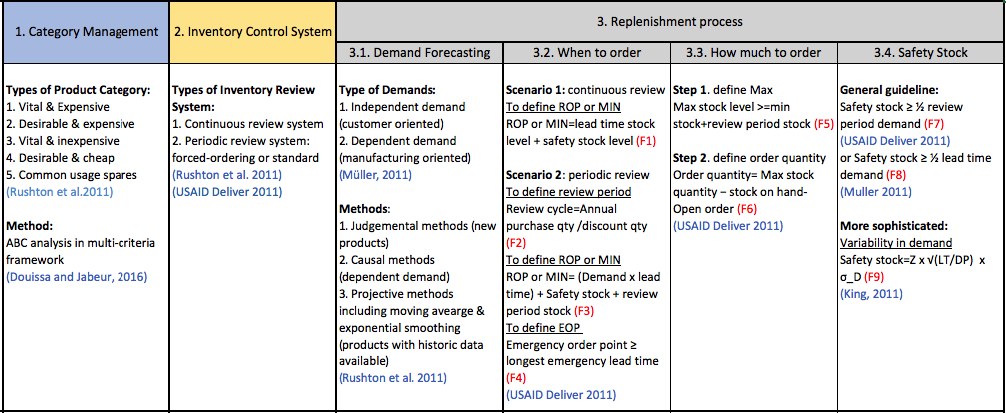
This sub-section should contain **a visual/picture/table** representing your Conceptual framework including: (a) the 1-3 key *themes* discussed above in Section 4, expanded with (b) the *selected tools, concepts and other sub-elements* relevant for your study, and finally (c) clear *references* to the key sources that contributed to your conceptual framework.

These three levels of the Conceptual framework (main themes; selected tools & sub-elements; and key references) are visible in the example by Satu Ryhänen (2015) below.



1. Conceptual framework (example from: Ryhänen 2015. Defining the Equipment Purchasing Process for R&D Organization. Metropolia UAS).

For a process building with many relevant details, the Conceptual framework can have a form of a table, as in this example from Zhing Chang (2017) below.



1. Conceptual framework (example from: Zhang 2017. Proposing the Inventory Management Framework for Make-to-Stock Products. Metropolia UAS).

In the example shown in Figure 3, the new Inventory management process is presented as having three steps: first, the Category management, second, the Inventory control system, and third, the Replenishment process (with 4 sub-steps inside), according to best practice and literature suggestions. This logic is visible in the three parts of the Conceptual framework (each part containing relevant concepts and tools that may be helpful for creating the Proposal, in Section 5).

After giving the visual, add a structured text describing your conceptual framework (First, … Second, … Third element… of the conceptual framework).

End with a link to Section 5.

# Building Proposal for [Relate to Your Objective] for the Company

This section merges the results of the current state analysis and the conceptual framework towards the building of the Proposal based on internal co-creation and discussions (which make Data collection 2).

## Overview of the Proposal Building Stage

Remind the reader of the goal of this section and its contents. “This section presents the steps in the Proposal building for this study.” Tell what is the focus for the improvement / development efforts in the proposal building (1 paragraph).

Remember to create a strong fit between the main sections of your thesis: **your selected focus areas in SCA** should inform > **the main themes selected for ´available literature & best practice´** which should inform > **the main elements of your proposal**.

Make links to Sections 3&4 showing that the Proposal relates to and builds from: (a) selected focus areas from the Current state analysis and (b) the Conceptual framework. Tell briefly that relevant best practice was found from available literature (1 paragraph).

Continue by giving a brief description of how the proposal building was conducted, step by step (First, … Second, … Third…) and what was the rationale guiding this choice. Aim to clearly present the logic, procedures and choices in your Proposal building before diving into the substance of your Proposal.

Important. Tell that the stakeholders were involved in the proposal building (co-creation). Tell that they came up with suggestions for the proposal (discussed in Section 5.2, below). Avoid any repetition with Section 2. Instead, focus on presenting *the logic* of your proposal building.

Keep this to 1 page maximum.

## Findings from Data 2 (pulling together CSA, CF and Data 2)

Here, focus on reporting the main *inputs* from your stakeholders (Data 2). The main inputs for the proposal building will include: (1) Data 1 (findings from CSA, *very briefly* repeated form earlier reporting), and (2) CF (input from literature, *very briefly* repeated form earlier reporting), as well as (3) Data 2 (from this co-creation round; reported in detail). Inspired by these inputs, your Proposal will be built.

Data Collection 2 concentrates on identifying suggestions from the key stakeholders. What your key stakeholders propose **should be done to develop/fix these issues**? Report the input from stakeholders (as a summary of key points). Relate these inputs, first, to the selected focus area from CSA and, second, to the inputs from literature and best practice. Table 4 below shows the inputs for the proposal (example).

1. Key stakeholder suggestions (findings of Data 2) for Proposal building in relation to findings from the CSA (Data 1) and the Conceptual framework.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | *Key focus areas from* ***CSA*** *(from* ***Data 1****)* | *Inputs from literature (****CF****)* | *Suggestions from stakeholders for the Proposal, summary (from* ***Data 2****)* | *Descriptions of their suggestions (in detail)* |
| 1 | No return policies are defined in the current contract document. | Here you briefly summarize what literature & best practice suggest to be done. | a) Revise the return policies internally and define them clearly in the current contract. | The CEO of the case company suggested to revise the return policies first, and add their clear description to the contract (also check them legally); and suggested that the sales person should be made responsible for presenting the terms for the consignment warehousing clearly, and ensuring understanding, when making a contract with the customer *(Example of description).* |
| b) Assign as responsibility to the Sales at the contract signing stage | SCM department stakeholders suggested to assign the responsibility for revising the return policies to Sales |
|  | TIP. (When discussing with the stakeholders, come back to CSA and check what weaknesses and improvements were mentioned/can be found from their earlier data/ criticisms, and check them again with the stakeholders) |

“As seen from Table 4, xxx.” Briefly summarize the inputs from stakeholders for each selected focus area (identified in CSA). It will demonstrate how they were addressed in the proposal building. Add details in the description column to open up the key suggestions, in relation to the CSA focus areas or/and the CF elements (use a few ‘juicy’ citations to illustrate the stakeholders’ suggestions, when appropriate. This is recommended in order to continue as evidence-based research, in line with CSA).

Alternatively, this summary of inputs from Data 2 can be presented separately, under each element of the Proposal.

When the key inputs are made visible, the Proposal is pulled together as the Proposal draft.

## Initial Proposal / Proposal Draft

You can either present each element of the proposal separately, or present one picture of your Proposal. In any case, create good, detailed texts for each element.

Remember to create a strong fit between your main thesis sections: **your selected focus areas in SCA** should inform > **the main themes selected for ´available literature & best practice´** and should inform > **the main elements of your proposal**.

### Element 1 of the Initial Proposal

### Element 2 of the Initial Proposal

### Element 3 of the Initial Proposal …

## Summary of the Initial Proposal

Summarize your proposal in a 1-page visual/picture/table showing all the elements of your Proposal clearly. Add a structured text (summary) describing it.

End with a link to Section 6.

# Validation of the Proposal

This section reports on the results of the validation stage and points to further developments to the initial Proposal. At the end of this section, the Final proposal and xxxx (recommendations, action plan, etc) are presented.

## Overview of the Validation Stage

This section reports on the validation results of the proposal developed in Section 5. Validation refers to e.g. piloting, testing, try-out, or other evaluation, e.g. expert judgement of your proposal (this input makes your Data 3). There are different degrees of maturity in your validation, i.e. validation can be weak or strong. Aim at the strong validation (testing/piloting/try-out, or evaluation by several experts with best knowledge).

Remind the reader of the goal of this section and of its contents. Consider structuring Section 6 using the same logic as Sections 3.1 or 5.1. Make a clear description of how the validation phase was conducted, step by step (First, … Second, … Third…) and what was the rationale guiding this choice.

Avoid any repetition with the description of Data 3 in Section 2. Instead, focus on presenting *the logic* of your validation. Ensure that you make a link to Section 5, i.e. you are validating the proposal developed in Section 5 **in detail.**

Keep this to 1 page maximum.

## Developments to the Proposal (based on Data Collection 3)

Data collection 3 concentrates on identifying improvements / developments that resulted from testing/piloting/try-out, or proposed by the validation experts/ key stakeholders to the Initial proposal in Section 5. What the experts say should be further developed in the Initial proposal? Data Collection 3 is strictly focused on the Proposal contents and seeks to finalize it based on the expert/company feedback.

Start with a table summarizing *the inputs* from the experts / key stakeholders (Data 3) collected in the validation stage, similar to the table in Section 5 that summarized inputs for the proposal building. Or otherwise demonstrate the inputs from stakeholders (in the evidence-based manner, including at least 2-3 citations from Data 3). Table 4 below shows the inputs from the validation round (example).

1. Expert suggestions (findings of Data 3) for the Initial proposal.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | *Element 1 of the Initial proposal* | *Parts commented in Validation* | *Description of the comment/ feedback by experts (in detail)* | *Development to the Initial proposal* |
| 1 | Return policies to be defined in the current contract by Sales at the contract signing stage, with the main focus on the bulk consignment contracts (based on 3 templates). | a) Revise the return policies internally and define them clearly in the current contract. | The experts suggested to make the final round of revision of the return policies with the lawyer. | Here you briefly summarize what was changed/ added. |
| b) Assign as responsibility to the Sales at the contract signing stage | The experts suggested to assign the responsibility for signing the contracts to those Sales reps who work with consignment contracts. | Here you briefly summarize what was changed/ added. |
| b) Key attention is paid to the bulk consignment contracts (based on 3 templates). | Confirmed. |  |
| d) create 3 ready templates for use. | The experts suggested to check the proposed templates with the lawyer. This is to ensure legality before making the first contract with the customer*.* | Here you briefly summarize what was changed/ added. |

“As seen from Table 5, xxx.” Summarize the inputs from the experts. Add details in the description column to open up the key developments (use a few citations to illustrate the experts´ comments, when appropriate. This is recommended in order to continue as evidence-based research, in line with other sections).

Alternatively, inputs from experts can be discussed separately for each element of the Proposal. The logic of presenting these inputs can be the same as in Section 5, Proposal.

As an example, see how Artur Uttu (2018) has presented his proposal elements and validation: <https://www.theseus.fi/handle/10024/147906>

### Developments to Element 1 of the Initial Proposal

### Developments to Elements 2 of the Initial Proposal

### Developments to Elements 3 of the Initial Proposal …

After discussing the developments to the Initial proposal, this section ends with the Final proposal presented in one overview.

## Final Proposal

## Recommendations /Action Plan, etc (if relevant)

# Conclusion

1-2 sentences of meta-text, telling what Section 7 contains.

## Executive Summary

This is a critical sub-section in the thesis. Many readers *only* read the abstract and the executive summary. Remember that your CEO and most readers will start with this section. Focus on your results (mainly) vs. repeating what you have done (briefly).

Start by reminding the reader of **the objective** of the thesis. Continue with the key, relevant information about the business context, i.e. why this topic is important.

Move onto the key steps in the research process and the thesis logic. Tell what the thesis analyzed and found **from the CSA** and what it explored and selected **from the available knowledge and best practice**. Tell how **the proposal** came about.

Remember to devote at least 0,5 good page to **the detailed description of your** **proposal/ results**. Notice that this makes *the main part* of your Summary.

Tell briefly, and in modest terms, that the proposal was validated/ tested/ piloted... and approved for implementation.

Conclude with an overall, ultimate contribution to the case company in one succinct paragraph with one key point that ties the Thesis together.

---------------------------------------------------------

In brief, the idea with the SUMMARY is that it is very similar to your ABSTARCT but with a deep focus on RESULTS, for example:

1. paragraph: objective and business challenge, context of the thesis

2. paragraph (briefly!):  how done, methods and data,

3. paragraph: CSA results + conclusions, areas for literature search, outcome

4. IMPORTANT: here goes a good half page on your results/proposal. Notice that this part makes the main part of the Summary!

5. paragraph: validated, tested, feedback (in humble terms)

6. paragraph: business impact (what good it makes for the company, if implemented)

= Altogether, the Summary makes maximum 2 pages.

## Managerial Implications (Next Steps and Recommendations toward Implementation)

Write *either* the Managerial implications here in Section 7.2, or give Recommendations as part of the proposal in Section 6.4. Here, you can also suggest ‘Next steps’ towards implementation of your proposal.

For writing Managerial Implications, think from the company perspective, what should be done to put this proposal into practice? Avoid giving orders to the company, avoid calling the company "they" (it puts you in a sad opposition immediately). Produce a structured text: First,.. Second,.. Third... Beyond a few paragraphs, you can show your practical wisdom: what is it, in practice, what the managers should consider in relation to this proposal.

For writing ‘Next Steps’, briefly argue why next steps are needed. Introduce some tangible next steps/ recommendations how to put your proposal into practice. State them clearly (First,.. Second,.. Third...).

Consider to support your reasoning with argumentation. Use a professional, neutral tone. Make sure that whoever reads this section is onboard with your recommendations.

## Thesis Evaluation

Start by evaluating the Thesis vs. its initial objective. Reflect on how this Thesis addresses it. We expect a critical and honest evaluation of your thesis. Avoid telling us how great your thesis is and why this is so. This might well be the case, but we expect a realistic and neutral reflection of your thesis process, its limitations, and what might have been done better *(please DO NOT mention the time as your key constrain).* Evaluate the quality of this work. Mention also the areas that should have been done differently.

IMPORTANT. More than the study outcome, we look here for the maturity and transparency of your reasoning and reflection. **In Section 7**, though you showcase your results and make your thesis shine as advised, you should do this **humbly.**

Avoid any sign of arrogance, vanity or ego-centricity in the thesis (e.g. "This project was a success", “This thesis reached its objective”). This easily slips in at the final stages, as authors are proud of their outcome. Instead, **tell *the substance* about your results**, others will evaluate you based on your outcomes. Please take special care of this section and take all such disturbing signs out so that the final product is excellent in terms of content & attitude. Remember that this text will serve as your reference point for years.

Finally, please spend time (at least one-two weeks) **reading through the entire thesis!** Polish your **Reference list.** Finalize your **proof-reading of the entire thesis, in its integrity.** If you do not understand yourself, no one else will. Check your **clarity**, make sure you produce **well-structured** descriptions of your analysis. This is the time to be ruthless to your own text. Remember grades are not out yet, thus this is your moment to grab the final moments of the Gate process.

## Closing Words

Consider ending with 0,5 page of e.g. closing words. If you end with Section 7.3, the thesis ends with a discussion on thesis quality. Consider making it more attractive. A fine dinner does not end with a spoon, but with an espresso that closes the dining experience. Think of that expresso for your thesis.

References

Inmon, B., Levins, M., & Srivastava, R. (2021). *Building the Data Lakehouse.* New Jersey: Technics Publications.

Jalote, P. (2022). *Software Project Management in Practice.* O'Reilly. Retrieved November 2023, from https://learning.oreilly.com/library/view/software-project-management/0201737213/

Pérez, P. Y., Pérez, R. E., & Kacprzyk, J. (2022). *Studies in Computational Intelligence Artificial Intelligence in Project Management and Making Decisions* (Vol. 1035). Springer International Publishing AG. Retrieved from https://link-springer-com.ezproxy.metropolia.fi/book/10.1007/978-3-030-97269-1

*Virnex Group OY*. (2023). Retrieved from Virnex Group OY: https://virnex.fi/en/about-us/

# READING LIST

project management

Quality Software Project Management: <https://learning.oreilly.com/library/view/quality-software-project/0130912972/?sso_link=yes&sso_link_from=metropolia-university>

Fundamentals of Project Management: <https://ebookcentral.proquest.com/lib/metropolia-ebooks/reader.action?docID=3001873>

PMBOK: <https://learning.oreilly.com/library/view/a-guide-to/9781628251845/?sso_link=yes&sso_link_from=metropolia-university>

Here, you provide full bibliographic details of the references **used and quoted** in your thesis. Note, the Reference list does not count in the main body of your text; it starts with page 1. Use the “author-date” referencing system (**Harvard referencing style**, APA) either in its “international” variant, or in a “simplified” Finnish version.

**Examples v.1 (this is the “simplified” Finnish variant of Harvard Referencing style. RECOMMENDED. Check the first link for more examples!):**

HUMAK University of Applied Sciences 2020. HUMAK Citation Guide: Examples of different sources. Retrieved 15/09/2021. <https://humak.libguides.com/citationguide/examples>

Ojasalo, Katri & Moilanen, Teemu & Ritalahti, Jarmo 2018. Development work methods. New skills in business. 5th edition. Helsinki: Sanoma Pro.  - Example of a reference to a paper book.

Hiltunen, Elina & Hiltunen, Kari 2014. Techno Life 2035. How does technology change our future? (e-book). Helsinki: Talentum. Retrieved 22/09/2020. <https://www.cambridgescholars.com/download/sample/62480> . - Example of a reference to an e-book.

Statistics Finland 2018. A fifth of the companies exploit big data (online publication). 30.11.2018. Retrieved 22/09/2020. <https://www.stat.fi/til/icte/2018/icte_2018_2018-11-30_tie_001_fi.html> .   
- Example of a reference to a web-site.

**Examples v.2 (this is the “international” variant of Harvard Referencing style. It os also possible to use this variant. Check the first link for more examples!):**

UWE Bristol Harvard (2016). Referencing Guidance. Bristol: University of the West England. Available from: <http://www1.uwe.ac.uk/students/studysupport/studyskills/referencing/uweharvard.aspx#blogs> (Accessed 25 October 2019).

Fliess, S. and Kleinaltenkamp, M. (2004). Blueprinting the Service Company: Managing Service Processes Efficiently. *Journal of Business Research.* Vol. 57, Issue 4, pp. 392-404. - Example of a reference to a journal article.

Grönroos, C. (2000). *Service Management and Marketing: A Customer Relationship Management Approach*. 2nd ed. Hoboken, New Jersey: John Wiley & Sons. - Example of a reference to a paper book.

Rouvinen, P. and Ali-Yrkkö, J. (2013). *Implications of Value Creation and Capture in Global Value Chains.* ETLA Reports No 16, 19 August 2013.Helsinki: ETLA, The Research Institute of the Finnish Economy. Available from:<http://pub.etla.fi/ETLA-Raportit-Reports-16.pdf> (Accessed 25 October 2019). - Example of a reference to an e-book.

Case Company. (2019). Case Company web-site. Title of the web-page. Available from: [www.casecompany.com](http://www.casecompany.com) (Accessed 5 April 2019). - Example of a reference to a web-site.

**In-text references (how these referred to in the text, similar in both variants):**

…text text text. These development work methods can also be applied to other types of projects, for example, to service development projects (Ojasalo, et al. 2018, 240). Similar methods are also known to gain insights into the future (Hiltunen & Hiltunen, 2014, 100-110).

**Title of the Appendix**

The contents of the appendix are placed here. Below are the instructions for removing and adding appendices in a way that maintains the headers and footers in their correct form.

Instructions for removing an unwanted appendix:

1. Select the entire page(s) that form the appendix and delete the contents by hitting the Delete key.
2. As you are in the beginning of the empty appendix page (see the image below), double-click the header of the empty page and press Link to Previous button in the ribbon. The following dialogue window opens:



Click Yes.

1. If necessary, make hidden format information visible by pressing .
2. Delete the section break immediately before the appendix to be removed (see image below).



Instructions for adding a new appendix:

1. Place the cursor at the end of the last appendix.
2. Select Page Layout from the menu bar. From the ribbon, select Breaks/Section Breaks/Next Page. This causes a new appendix to appear, but the appendix number in the header is not yet correct.
3. Double click the header of the new appendix with the wrong appendix number. If the option “Link to Previous” is selected, click the corresponding button to deselect it.
4. Replace the appendix number with the correct number.

Note that the appendices need to be updated in the table of contents manually.

**Title of the appendix**

The contents of the appendix are placed here.