

LAPPEENRANNAN TEKNILLINEN YLIOPISTO

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**DEVELOPMENT OF A PROJECT PORTFOLIO MANAGEMENT TOOL:
INCLUSION OF SUSTAINABLE VALUES**

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ABSTRACT

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Name of the thesis: Development of a project portfolio management tool:
Inclusion of sustainable values

Year: 2019

Site: Lappeenranta

Master's thesis. LUT University, Industrial engineering and management.

71 pages, 13 figures and 3 appendices

Inspector(s): Professor Ville Ojanen, Docent Kalle Elfvengren

Keywords: project portfolio management, sustainability, tool development

Project portfolio management is recognized as a key activity within an enterprise project management department. The thesis was carried out for the company Yara Suomi Oy and their site operating in Uusikaupunki, Finland and the tool that was developed along the thesis was tailored to their organizational needs, wishes and visuals.

The thesis' goal was to answer how the sustainable values should be included in the decision-making process that is project portfolio management, and how should the project portfolio with its activities and characteristics of sustainability be communicated to the public. In addition, project portfolio management and tool development as an activity were both defined in detail to give context for the reader.

The theoretical data was collected by conducting a literature review and the tool was developed using the iterative development method.

Project portfolio management was identified as an important way of optimizing the gains from having a competent project organization as well as being useful to make the projects conducted fit into the company's strategy and public image. Sustainable methods of actions both in the level of company strategy and project portfolio management were identified as useful for either ensuring long-term resource use efficiency or shorter-term improvement of public image.

TIIVISTELMÄ

Tekijä: Saku Käsnänen

Työn nimi: Projektiportfolionhallintatyökalun kehitys: Kestävien arvojen huomiointi

Vuosi: 2019

Paikka: Lappeenranta

Diplomityö. LUT Yliopisto, tuotantotalous.

71 sivua, 13 kuvaa ja 3 liitettä

Tarkastaja(t): Professori Ville Ojanen, Dosentti Kalle Elfvingren

Hakusanat: projektiportfolion hallinta, kestävä kehitys, työkalun kehitys

Projektiportfolion hallinta on tunnistettu tärkeäksi toiminnaksi yrityksen projektiorganisaatiossa. Tämä diplomityö on tehty yrityksen Yara Suomi Oy Uudenkaupungin toimipaikalle. Ohjelmistotyökalu, joka kehitettiin työn yhteydessä, on räätälöity heidän yrityksensä tarpeiden, toiveiden ja ulkoasun mukaan.

Työn tavoitteena oli selvittää miten kestävä kehityksen mukaiset arvot pitäisi ottaa huomioon projektiportfolion hallinnassa. Lisätavoitteena oli selvittää, kuinka projektiportfolion hallintaan liittyvät tehtävät, tieto ja kestävä kehityksen mukaiset piirteet kuuluisi viestiä julkisuuteen. Lisäksi työssä määriteltiin projektiportfolion hallinta ja työkalun kehittäminen aktiviteetteina perusteellisesti kontekstin vuoksi.

Teoreettinen tieto kerättiin kirjallisuuskatsauksen menetelmin. Työkalu kehitettiin käyttäen iteratiivista mallia.

Projektiportfolion hallinta havaittiin tärkeäksi keinoksi haluttaessa optimoida pätevän projektiorganisaation aikaansaamia hyötyjä yrityksessä. Lisäksi sen havaittiin varmistavan tulevien projektien sopivuuden yrityksen julkikuvan ja strategian mukaiseksi. Kestävä kehityksen mukainen toiminta sekä yritysstrategian tasolla että projektiportfolion hallinnassa havaittiin hyödylliseksi sekä pitkän aikavälin resurssitehokkuuden, että lyhyen aikavälin julkisuuskuvan muokkaamisen kannalta.

Foreword

I would like to send my heartfelt thanks to the following parties who had a hand in my thesis. Elina Hakala, Tommi Hevonoja and Pirjo Silanto-Helminen of Yara Suomi Oy who came up with the idea of the topic, committed some steadfast testing of the program as well as gave guidance from the company side of things, Ville Ojanen of LUT University who gave me guidance throughout the process and my loving partner Elisa Kolehmainen who supported me in the hours of both morning and evening while I was busy writing.

Saku Käsnänen, Lappeenranta, 31.01.2019

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List of abbreviations

CSR = Corporate social responsibility

DEA = Data envelopment analysis

DMU = Decision making analysis

PPM = Project portfolio management

TOC = Theory of constraints

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1. Introduction

In the introduction chapter the thesis project's background will be covered as well as the thesis' goals and scope of the topic. Execution of the thesis project as well as structure of the report will be represented in this chapter.

1.1. Background of the thesis project

Project portfolio management is seen as a common practice in bigger companies that carry out project work and less common within smaller companies that might not dabble in project activities all that much. The topic has had most of the available related research carried out in the past twenty years. It is reasonable to expect there to always be a need for optimization of the use of scarce resources within companies, as resource scarcity exists in the world as we are still consuming non-replenishing goods and ores have lower concentration of sought-after metal than before. It can be therefore concluded that the topic is quite timely still, even if the twenty years sounds a bit long a time frame in modern world. The other main point of the thesis is the value of nonfinancial corporate values such as sustainability which is here on the frame. With all the talk of climate change and almost irreversible global development towards this malignant change- this aspect of the thesis seems to be at the talk of every table nowadays. The combination of both the topics into a common frame seems an interesting opening that is relatively little researched as of today – especially as they both are identified to be related to company strategy in a tight way, which as a longer-term concept is an interesting topic on its own in the rapidly changing world as well.

1.2. Goals and scope

The goals of the thesis project were both qualitative and quantitative in nature. The thesis is a development work, in which the goal was to develop a better tool for the company as well as to provide insights about project portfolio management and sustainability as a corporate value. The thesis contribution was to give the reader useful knowledge about project portfolio management as well as present one way of creating a software tool for project portfolio management that is visually informative in nature. The scope of the work includes handling of sustainability as a corporate value, how it interconnects with project portfolio management and what implications could be drawn. These are the qualitative goals of the thesis.

The thesis had three research questions that can be divided into smaller sub questions in order to be holistically answered. They are presented in the table 1 below. The qualitative goals will be met by answering the research questions.

Table 1: Research questions and their sub questions

Main research question	Sub questions
RQ1: How should sustainability be valued in project portfolio management ?	<i>What are sustainable values for corporations?</i>
	<i>What is project portfolio management?</i>
RQ2: How can a company gain from promotion of sustainable values?	<i>Why should a company promote sustainable values?</i>
	<i>How should the promotion of sustainable values happen?</i>
RQ3: How should the company's PPM actions be presented to external audiences ?	<i>Why should a company present their actions related to PPM?</i>
	<i>How should the presentation of actions related to PPM happen?</i>

On the quantitative side, the goal was to create a data analysis and have its hypotheses confirmed – i.e. whether or not iterative tool development is a correct way to build the tool for project portfolio management. The data analysis was planned to be conducted through an intranet-mediated survey to the users of the tool as well as the people in contact with the developer in the development phase. The hypothesis for the data analysis include:

- H0 Iterative tool development is inefficient for developing a project portfolio management tool
- H1 Iterative tool development is efficient for developing a project portfolio management tool
- H2 Iterative tool development enables the developer to respond to changing requirements successfully
- H3 Iterative tool development enables the customer to get their fluctuating needs met quickly
- H4 Iterative tool development allows customer involvement in creation of pleasing visuals for the tool
- H5 Iterative tool development ensured that the end result is to customer liking and the sought for functionalities were included in the tool.
- H6 Getting the customer's needs met quickly is positively related to development efficiency
- H7 Successful response to changing requirements is positively related to development efficiency
- H8 Customer involvement in tool customization is positively related to development efficiency
- H9 Customer acceptance of the end result is positively related to development efficiency

This goal however was not met as there were only two qualified users of the system to respond to the survey and this is not enough for reliable and relevant quantitative data analysis. Instead, the author reflects on similar topics in the sub chapter 4.4.

In addition, there were goals related to completion time as the tool to be developed had 3 months and the thesis another 3 months giving a total of 6 months production

time, in addition to the goal of having over 60 pages. The main bordering of the thesis' scope is that the portfolios in question are indeed project portfolios and not their more common counterpart, product portfolios. Another bordering is the tool developed – it is designed for the use of Yara site at Uusikaupunki and may or may not answer other companies, organizations or industries needs nor wishes.

1.3. Execution of thesis project

The target company Yara Suomi Oy and their site at Uusikaupunki had had a previous software for project portfolio management that was seen as underperforming. The local site management had the mindset of improvement and contacted the author with the topic and need for a new software tool at late summer of 2018. After negotiations a deal for the thesis project was struck. This thesis together with the tool developed are the end result. The tool was completed in accordance by the end of October 2018, and the written thesis by the end of January 2019.

The thesis utilizes literature review the method of study in the chapters 2 and 3, and in chapter 4, quantitative data analysis was to be performed on the results of the intranet-mediated survey related to the tool design and use. No analysis could be conducted to verify any of the hypotheses as the number of users to have been surveyed ($n=2$) would not have been sufficient for statistically relevant quantitative analysis.

To give more details on the literature review, a summarized table is presented below with the number of findings, and filters used for a given database. Most of the sources were books or online articles from scientific journals. In addition, target company homepage and a few trade journals were cited as well. It seems that the data is decently recent from the LUT Finna search as most of the data available on the topics fit the time range as is seen in pictures 1 & 2 below. The amount of found items was confirmed on the 27th of January 2019. This bordering still leaves a host of available data, out of which by author's eye-test the chosen sources were selected

by availability, reliability, relevancy and recentness of the data. The data availability is presented in tables 2 & 3 below.

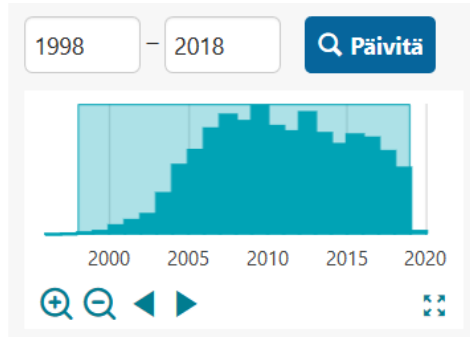


Figure 1: Findings for “project portfolio management” from LUT Finna

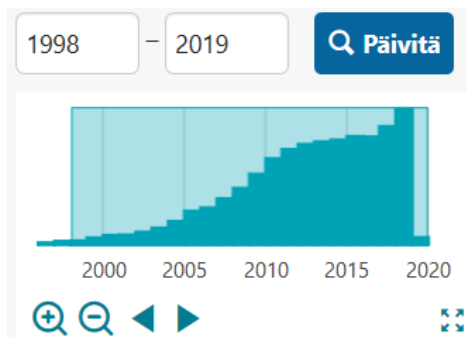


Figure 2: Findings for “sustainability” AND “corporate value” from LUT Finna

Table 2: Findings for topic of project portfolio management

Database	Keywords	Findings	Filters	Findings
LUT Finna	“Project portfolio management”	4495	“1998-2018, online article”	1737
ScienceDirect	“Project portfolio management”	400	“1998-2019, Review articles, Research articles, Case reports, Data articles, Editorials”	324

Google Scholar	“Project portfolio management”	1 640 000	“1998-2019, exclude patents, exclude citations”	904 000
Elsevier	“project” OR ”portfolio” OR “management”	17954	“Books”	12316

Table 3: Findings for topic of sustainability

Database	Keywords	Findings	Filters	Findings
LUT Finna	“Sustainability , Corporate value”	107 178	“1998-2019, “online article”	57
ScienceDirect	“Sustainability , Corporate value”	1049	“1998-2019, Review articles, Research articles, Case reports”	696
Google Scholar	“sustainability corporate value”	1 370 000	“1998-2019, exclude patents, exclude citations”	902 000
Elsevier	“sustainability ” OR “corporate value”	9076	“Books”	6432

1.4. Report structure

The thesis is descriptive and explanatory in nature. Descriptive – as it explains what the topics are and explanatory as it explains how do the topics interconnect and what could be gained from this. The data gathered is secondary in nature for most of the time as is the case with studies performed and reported by other researchers,

primary data is gathered from the author/developer on the tool development as well as the survey data that was to be gathered as primary data.

The report has a coherent structure where at the beginning of a chapter the given topic is discussed and defined in detail. This is to answer the first basic question of any reader: What is the topic about? In the first subchapters of a given chapter the basic reasoning for the topic is presented. This is to answer the second question: Why is the topic important? In the later subchapters the methods of how to accomplish the desired state of the given topic are presented. This is to answer the third question: How should this be done? The result of this structure is a coherent study into the goals, methods, models and activities related to project portfolio management and sustainability as corporate value. This approach supports the answer to the research questions very closely, as it now should be simple for the reader to seek the answer to the research question they are most interested in.

The report began with the introduction chapter where the goal was to shortly introduce the reader to what to expect from the thesis report as well as how the research was conducted. In the second chapter a view into project portfolio management and its goals, activities and challenges were presented. The third chapter withheld the topic of sustainability as a corporate value, and theory behind it as well as models and measurement of this value. The fourth chapter is the chapter related to the target company and the project portfolio management tool that was developed as part of the thesis project. In the fifth chapter the findings are connected into a coherent package where the sustainable corporate values connect into project portfolio management. Further, the research questions find summarized answers in the fifth chapter. In addition, recommendations for future research are given, and implications based on findings are posed.

2. Project portfolio management

In this chapter the project portfolio management, its definition and its key activities, goals and challenges will be discussed. There are various different definitions of project portfolio management. The nuances mentioned in the different pieces of literature help the reader to focus on different parts of the topic at a time to get a clear view about project portfolio management, its goals and actions. These will be presented before diving deeper into the models and methods related to the topic. This chapter is mostly descriptive by nature, yet as some authors seem to disagree on some topics later on, it provides also a discursive approach for these topics that should give the reader valuable insight into different viewpoints to form their opinion on the subject.

There are other tools and theories identified in literature for aiding the management of existing project portfolio: “Portfolio decision analysis”, “Theory of constraints”, “Critical chain scheduling”, “Earned value method”, and “Portfolio risk management”. These beforementioned tools will be gone over later in the chapter 2 in more detail under their relative topics. Each of them is presented to add value for the project management organization in their use as they all propose models which to clearly follow in their given field of project portfolio management.

2.1. Literature definitions of project portfolio management

According to Levine (2005, p. 1) project portfolio management is a “set of business practices that brings the world of projects into tight integration with other business operations.” Petit & Hobbs (2010) define project portfolio management as a “set of processes and practices, which manages a group of projects and programs to achieve strategic business objectives”. Oltmann (2008) defines that “project portfolio management focuses on doing the right projects at the right time by selecting and managing projects as a portfolio of investments.” A slightly older text by Pennypacker & Dye (1999, p. xi) describes that project portfolio management is

“concerned with more than the advanced mathematical modeling of the business, more than the mechanics of formal project planning systems – it is concerned with the role of the top management and key decision makers in creating purposeful project investments and in formulating and implementing goals and objectives.” Artto, Martinsuo & Aalto (2001, p.1) explain project portfolio management as “the management of a multi-project organization and its projects in a manner that enables the alignment of projects to business objectives.” They further explain that project portfolio management is “the art and science of applying a set of knowledge, skills, tools and techniques to a collection of projects to meet or exceed the needs and expectations of an organizations investment strategy.” (Artto et al., 2001, p.9)

All of the literature sources above promote a holistic view of project portfolio management that has many a task and multiple possible viewpoints, yet the one key to PPM is, according to this literature, to align the portfolio with company strategy and create the maximal added value possible with the projects within the portfolio.

It has also been noted in the literature that PPM is more relevant for organizations that are large, or that have most activities organized in projects, or where portfolio management is endorsed as the way to manage activities and implement strategy, where strategy is clear and explicit and there are resources to manage the portfolio effectively. (Artto et al. 2001, p.64) Martinsuo (2012, p.796) brings up a countering viewpoint, and follows to explain that results of project portfolio management as an activity are tied to the managerial commitment to the rules, customs and models of project portfolio management. They also argue that project portfolio management ought not to be seen as just a “rational decision process” – it could be seen as “negotiation and bargaining, and as structural reconfiguration” as well. (Martinsuo, 2012, p.801)

This inclusion of viewpoint of “negotiation and bargaining” according to Martinsuo (2012, p.799) would give space for addressing “emergent and unknown issues”, as opposed to the “rational decision making -view” which is reported to better access issues that “are predefined and known”. (Martinsuo, 2012, p.799)

The “structural reconfiguration viewpoint” on the other hand, could according to Martinsuo enable better highlighting of “inter-project issues, interplay between

projects and the parent organization, and changes that drive reconfiguration” (2012 p.800) Further, they define this interplay among projects to include “technology transfer, knowledge transfer, and inter-project coordination”. These are then stated to be relevant for “structural configuring of portfolios”. (Martinsuo 2012, p.800) In addition, the interplay between projects and parent organization is brought up. It is claimed to be strategic with single projects as parent organization is responsible for “setting project goals”, “offering access to resources”, and “sharing of support systems” which are stated to be important for the portfolio as well. (Martinsuo 2012, p. 801)

2.2. Goals of project portfolio management

Levine defines the goal of project portfolio management to “maximize the contribution of projects to the overall welfare and success of the enterprise” by having projects be aligned with the firm’s strategy and goals, consistent with values and culture, contribute to a positive cash flow within the enterprise, effectively use the firm’s resources and to help position the firm for better future success.” (Levine, 2005 p.23)

Oltmann (2008) says that “the projects must have high return for company investment -- in terms of dollars or other measures that are important to the organization”. The distinction what the other measures could be is left open in this text. Levine (2005, p.35) argues that project portfolio management process should define a “ranking of value and benefits, an appraisal of risk in achieving them, inventory of resource availability and an idea of an optimal or acceptable size of the project pipeline”. This is followed by arguing that return on investment (ROI) cannot be used on its own as a prioritization factor for the projects, and also the alignment with strategic and tactical plans, balance between maintenance and investment projects, allocation of R&D & marketing expenditure and resources, effective use of resources, probability on delivering the project on time within budget and with the designed scope, as well as non-financial benefits should be considered. (Levine 2005, p.36)

Levine (2005, p.61) further describes “prioritization and selection of candidate projects for the portfolio” to be one of two core items of the project portfolio management process. Projects should be evaluated thoroughly before beginning decision is made according to Artto et al. (2001, p.25) They notice that projects should not be evaluated only separately because they are in many cases somehow related to each other.

A recent study and accompanied data analysis by Hadjinicolaou and Dumrak (2017, p. 280) found out that project portfolio management activities result in benefits for project success. These benefits include “increasing cost saving”, “maximizing resources used”, “spending in the right areas” and “repeatable success”. (Hadjinicolaou & Dumrak, 2017, p. 280) Project portfolio management implemented incorrectly is found to cause barriers for project success. These are identified as “difficulty to agree on a common approach to project prioritization”, “impediments caused by existing organization processes and systems”, “unavailability of systems that provide timely data to measure success”, “immaturity of project management processes” and “inadequacy of projects to justify PPM”. (Hadjinicolaou & Dumrak, 2017, p. 280)

They conclude their study by acknowledging the connection between having a capable project management office and portfolio success, and they confirm PPM benefits to relate to “alignment of business strategies, improvements of decision making, maximizing resource usage and organizational risk management” while the barriers are found to be “internal politics, change resistance culture, disagreement on a common project prioritization method as well as lack of organizational management support “. (Hadjinicolaou & Dumrak, 2017, p. 280) In addition, Morton reports in their 2015 paper that portfolio’s projects’ benefits are difficult to measure and this should be taken into account. (Morton 2015, p.789) What Morton implicates seems to collide with Oltmann’s text – benefits may be hard to measure and for example a multi-criteria rubric could be used to better capture and present the benefits.

2.3. Implementation of project portfolio management

Once a company is ready to implement project portfolio management, they face the dilemma of which part to do first- “attack the current portfolio or go straight to analyze new projects” according to Levine (2005, p.31). Further, Levine (2005, p.78) stated that most companies already have a project portfolio in place, and it is good practice to first evaluate it according to PPM principles. This will likely result in defective projects and scratching them out of the portfolio opens up resources that are better utilized in more beneficial projects and opportunities (2005, p.79).

First job of the implementation for the PPM team is mentioned to be the “establishment of decision criteria, thresholds and clarification of responsibilities for the decision.” (Levine 2005, p.80). A scale-up is also recommended by Levine (p.80) where the implementation should first be tried with a smaller sample as a pilot. This should help with increasing the commitment from the governing body as they are more accustomed to the PPM before a company-wide commitment is made. In addition, the importance of the kick-off and resulting positive change in corporate culture are explained to be related. (p.81) The implementation itself is a project and has to be treated as such, including creation of a project charter, distribution of the project plan, responsibility matrix with roles, development of company’s PPM processes, selection of the supporting tools and their integration to company systems, orientation and training plan for personnel as well as mentoring them and audition of the implementation. (Levine 2005, p.81-84)

The alignment of project portfolio with the company strategy is a key activity of PPM. Every project included in the portfolio “must have something to do with the strategy of the organization, and pet projects that don’t have any, are not tolerated” according to Oltmann, (2008). A balanced scorecard- type of system with weighted factors is then suggested for a continuous style of analyzing the projects before committing to them. (Oltmann, 2008) Further, it is acknowledged that it is typical to display value and risk rankings as a “trade-off” on a grid with each other having the best projects in the “low risk, high value” -quarter of the grid. (Levine 2005, p.37) It is later described that “prequalification of projects” is a fine way to

accomplish goals of PPM. In a prequalification process the first gate is self-regulatory, where a person analyzes their idea and if it is “in line with the available resources, sound politically, socially and with business relationships, feasible both economically and technologically, and if its risk levels and type are tolerable.” If a project does not seem to meet these, it should not go into further evaluation. (Levine 2005 p.94)

The management of the ongoing project portfolio is described by Levine (2005, p.61) to be the other main part of PPM process. It is stated that a “project is active as long as it continues to support the criteria that were established for its selection and acceptable performance”. (Levine 2005 p.67) It is also found out that within some industries the project portfolio contents may influence the company strategy in a feedback loop, and therefore the PPM also acts as a re-validation point for the company strategy. (Artto et al, 2001. p. 73) Further, things that a project organization should track are whether the project is still aligned with strategy, the probability of technical and commercial success, performance against the target criteria, performance trends and efficiency of firm resource use. (Levine 2005 p.67) Management of uncertainty within the portfolio is claimed to be one of the most critical challenges that occur already in the implementation phase. It is concluded that the more forecastable the projects are within the portfolio, the more reliable the PPM is to implement. (Artto et al. 2001, p.72)

Dye and Pennypacker (1999, p.46) give also guidelines for the management of the project portfolio. They advise development of a process for “opportunity identification”. It is advised to be simple to use, so people would use it. A template should also be created for “project justification”. This is said to help ensure new ideas to have comparable content and substance. It is also advised to include project sponsor, link to business goals and description of the project, as well as project costs, benefits and risks. Further, they advise a “minimal acceptance criteria”, which should be established for new possible projects. For this, some suggested criteria include “return on investment”, “link to strategic direction” and “cost-benefit ratio”. They also advise that new ideas and suggestions should be rewarded

to gain more of them. Lastly, they state management should ensure that the company strategy and business goals are clear as these are noted as the foundation of project selection. (Dye and Pennypacker, 1999 p.47-48)

There is throughout the literature a mindset that projects should be analyzed in detail as there exists a resource scarcity. Therefore, according to Dye and Pennypacker (1999, p.48) there must be created a model to support decision making. This model is then in turn used to reflect the projects with the same criteria to see how the available resources should be distributed, i.e. where can the investment create the most value. In addition, the management has to make sure there is reliable data for each project, no matter whether it's a new or ongoing project. Projects should be monitored that they continue to meet the expectations. Further, it is noted that this project portfolio management methodology should be used throughout the project organization. There is advised to never be a situation where different methods are applied through the organization. Lastly, they advise the implementation of a process that aims at optimizing the value of the whole portfolio, and this process result should be discussed in portfolio decision meetings where decisions regarding the portfolio are made. (Dye & Pennypacker, 1999, p.49-52)

2.4. Portfolio decision analysis methods

Portfolio decision analysis is according to Morton (2015, p.789) the decision analysis experts apply to evaluate and assess projects and their benefits leading to decisions of initiation, continuation and cancellation of projects. It is said to seek to provide “frameworks for performing portfolio analysis in a way which allows rigorous treatment of issues of value and uncertainty”. (Morton 2015, p.789)

Regarding the portfolio decision analysis methods, Lahtinen, Hämäläinen & Liesiö (2017, p.75) present three figures, which are named as “traditional approach”, “value-cost approach”, and “modern portfolio theory approach”. (Lahtinen et al., 2017, p.75) With the “traditional approach”, portfolios are generated by the

problem-solving team so that they aim to fulfill multiple objectives. These portfolios are then evaluated against each other with a value model, and a ranking is given, which answers which portfolio(s) should be performed. (Lahtinen et al., 2017, p.75) The “value-cost approach” tries to answer the multiple objectives by having “action candidates” and a “cost budget” according to which the actions are rated. This leads to the building of value-cost ratio, and it should be prioritized so that “actions with highest value cost ratio” get done so long as there is gap in the budget that enables to perform said action. This is stated to lead to a portfolio of cost-efficient actions. (Lahtinen et al., 2017, p.75) Finally the “modern portfolio theory approach” takes into account multiple objectives, costs budget as well as the risk level of actions. This is said to enable optimization calculation – as in answering to the question of “how much resources should be allocated to each action” leading to efficient resource allocation and an efficient benefit-risk ratio. (Lahtinen et al., 2017, p.75) Further they state that “when portfolio modelling is used, all action candidates are included simultaneously in the same optimization model which generates the non-dominated portfolios” and “it can mitigate the risk of path dependence and biases”. (Lahtinen et al., 2017, p.75)

As opposed to non-dominated portfolios, dominated portfolios are the ones that could be outperformed by another portfolio, that is better in some characteristics and at least equally good in all others. (Lahtinen et al., 2017, p.74) To help identify these non-dominated portfolios, Lahtinen et al. present again three models. These are named as “multi-objective optimization approach”, “portfolio decision analysis approach”, and “portfolio decision analysis approach with incomplete information”. (Lahtinen et al., 2017, p.76) The multi-objective optimization approach is said to include action candidates and their constraints and interactions. This is followed by finding all feasible non-dominated portfolios, whose overall performances are then compared regarding the multiple objectives. (Lahtinen et al., 2017, p.76) Portfolio decision analysis approach in turn is described as finding the optimal portfolio. Within it, there is a value model created, and action candidates with their constraints and interactions are reflected on the value model which includes goals of multiple objectives. This is said to enable the finding of a feasible portfolio with the highest value, said to be the optimal portfolio. (Lahtinen et al.,

2017, p.76) Lastly, the portfolio decision analysis with incomplete information is described as allowing information that may be incomplete. It is shown to perform by combining the two previous models – constraints and interactions of candidates are reflected on the value model, after which feasible non-dominated portfolios are identified, and their performance in turn is measured against the different objectives. (Lahtinen et al., 2017, p.76)

Morton criticizes the zero-score benefit valuation of some projects as it “makes a strong implicit assumption about the value of not doing the project”. Thus, it is advised to explicitly assign “project specific value scores for not doing particular projects”.

2.5.Theory of constraints and critical chain scheduling in PPM

The theory of constraints, or “TOC” for short, which is related to “operations and single project management”, can according to Steyn be applied to “manage the resources of several concurrent projects” also within the fields of “project risk management and project cost management” which are given as example. (2002 p.75) This approach with several projects simultaneously makes the theory of constraints a tool to be used with project portfolio management. The theory of constraints in PPM is stated to involve five steps which are presented in the list 1 below. Simplified- the theory is used so that system constraints get identified, and effort is spent on resolving the constraints one at a time until there is either no or at least less bottlenecks in the system. Using TOC in PPM according to Steyn (2002, p.77) goes through the following checklist:

- 1: Identify the constraints of the system
- 2: Decide how to exploit the constraints
- 3: Subordinate non-constraints to the decisions on exploiting the constraints
- 4: Elevate the constraints (i.e. take actions to widen the bottleneck)

- 5: Return to step 1. Determine whether a new constraint has been uncovered, rendering the constraint under consideration a non-constraint or less critical

Critical chain scheduling, which according to Steyn (2002 p.75) is a tool to schedule a single project, and bases off the theory of constraints, is later in the study established to be a worthy tool for multi-project environment as well (Steyn, 2002, p.77) There the goal is said to be “to maximize the number of projects that the organization can do concurrently” and the way of performing this is identifying the workload amount. Highest workload is presumed here as the constraint. (Steyn, 2002, p.77-78) Further on, they mention that this holds true with cost management as well, and highest cost can in this case be identified as the constraint. (Steyn, 2002, p.78) A solution for this is presented: should a project go over the limit of approved and estimated spending, they recommend the project-wise necessary extra costs to be renegotiated instead of just approved. (Steyn, 2002, p.78) After all, time and money invested to a project are away from some other project. This is presented as the reason why they advise buffers of workload or money, depending on the situation identified, to be planted into the project queue to avoid time- and cost losses from idling project activities that are deemed as critical, or literally in this paper, “capacity constraining resources”. (Steyn, 2002, p.77) However, Herroelen and Leus argue in their paper that typically buffers chosen are too large and are causing problems with duration optimization in this approach. (Herroelen & Leus, 2001, p.575) Further, they point out several methods of critical chain identification, and mark out that not all of those are optimal. An organization is thus advised to regularly update the baseline schedule to get a “strong beneficiary impact in the final project duration and better intermediate estimates of the final project make span”. (Herroelen & Leus, 2001, p.575)

2.6. Project portfolio risk management

Project risk management is the final activity where Steyn promotes use of the theory of constraints. A model of risk management is presented. (Steyn 2001 p.80) This begins with initial project planning, and on step 1 of TOC the project risks are identified. They are quantified and a ranking of the risks is given next. This is followed by a decision point: are the risks significant? If no, the model ends. If yes, it is followed by TOC Step 2 where a “response plan” is developed for highest risks. Then the “response to lower risks for response plan” is subordinated for higher risks in the step 3. Then highest risks are reduced or avoided. This is followed with another decision point where the organization decides if risks are acceptable or if they need significant risk reduction. If no, the model goes back to step 4 and is instructed to continue from there. If yes, it is followed by TOC step 5 where additional risks are identified. The model guides back to step one where risks are quantified and ranked, and the loop continues until there is no significant risks left. (Steyn 2001, p.80) This model could be applied universally within the portfolio to aid in project risk management, where it “provides a model that ensures systematic reduction of risk”. This is said to “ensure that risks not initially identified as high receive the required attention at the right time. A picture of this use of the TOC model is presented on the following page in Figure 3.

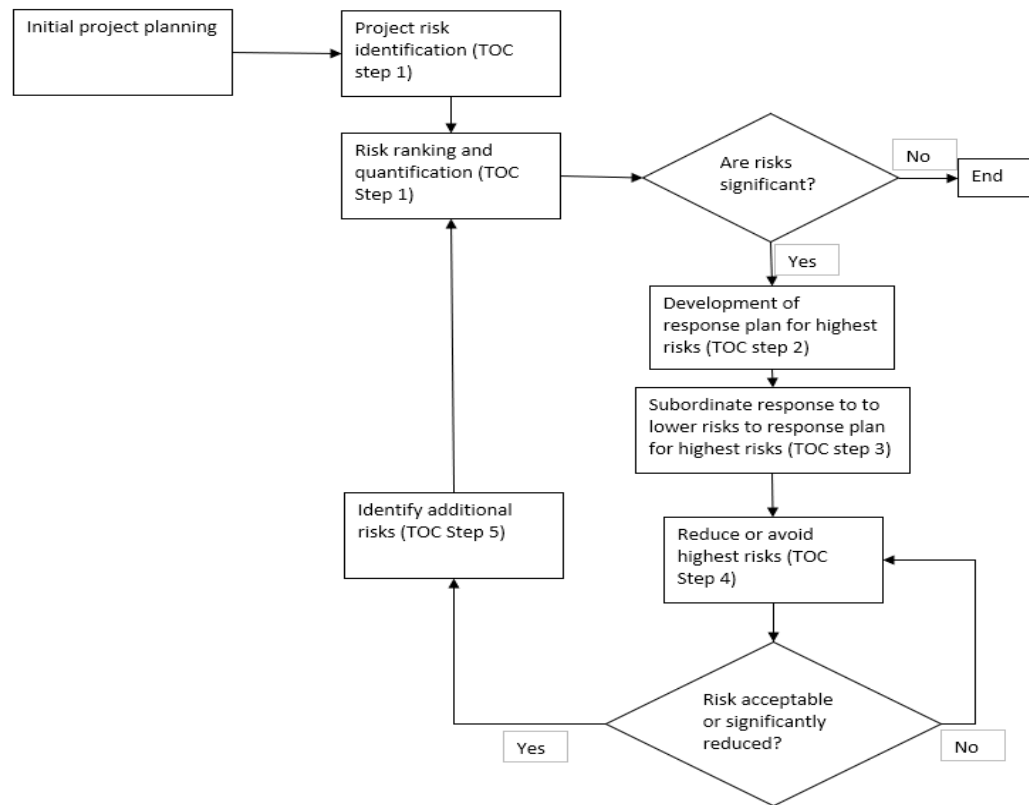


Figure 3: Project risk management model based on TOC (Steyn, 2002).

Teller & Kock advise also for the inclusion of risk management into the project portfolio management. (2013, p.817) This is based on their cited Olsson's and Project management institute's findings from 2008 that note "it is not enough to manage solely the risks of single projects" and "new risks emerge additionally to single projects due to the dependencies between projects". Further, their literature review suggests to "use a portfolio-wide risk management that extends management of all single project risks." This is said to "support alignment and redistribution of resources between the projects and consider additional portfolio risks". (Teller & Kock, 2013, p.817) In addition, they implicate portfolio risk management to enhance "transparency, the revelation of transferences of problems, the capacity to cope with risks and the profoundness of information on which decisions are based on." (Teller & Kock, 2013 p.817) Further, they state that "by connecting information derived from the risk management of single projects, portfolio risk management can identify risks that emerge in multiple single projects simultaneously." (Teller & Kock, 2013, p.817) Portfolio-wide risk management is

said to enable consolidation of risk management activities and prevention of work duplication in such cases. In addition, portfolio risk management is stated to “avoid failure, and increase the chance of portfolio success.” (Teller & Kock, 2013, p.817) They acknowledge that portfolio risk management is costly and time consuming and therefore they advise to investigate if the benefits are worth of the costs. p.817 In addition they report that portfolio risk management is “rarely implemented de facto” and they note that “organizations seem to have a low consciousness of portfolio risks and of the need the view risks holistically”. (Teller & Kock, 2013, p.817)

Their quantitative analysis had findings that validate several of their hypothesis. The validated hypothesis include: “Risk transparency is positively related to project portfolio success”, “Risk coping capacity is positively related to project portfolio success” , Portfolio risk identification is positively related to risk transparency”, “Risk prevention is positively related to risk coping capacity”, “Risk monitoring is positively related to risk coping capacity”, “The integration of risk management into the project portfolio management process is positively related to risk coping capacity”, “The formalization of portfolio risk management is positively related to risk transparency” and “a strong risk management culture is positively related to risk transparency”. (Teller & Kock, 2013, p.820 – p.823).

They reported findings that “risk coping capacity” and “risk transparency” are the factors that contribute to “risk management quality” which in turn “explains why and how portfolio risk management has positive effects on portfolio success.” (Teller & Kock, 2013, p.825) These are illustrated in the Table x below. Concluding their study, they advise “project portfolio coordinators to integrate the risks information from the risk management process into the project portfolio management process since this enhances decision making”. (Teller & Kock, 2013, p.826)

Table 4: Confirmed hypothesis illustrated as a summary (Teller & Kock, 2013)

Actor	Relation	Target
“Risk transparency”	Is positively related to	“Project portfolio success”
“Risk coping capacity”	Is positively related to	“Project portfolio success”
“Portfolio risk identification”	Is positively related to	“Risk transparency”
“The formalization of portfolio risk management”	Is positively related to	“Risk transparency”
“A strong risk management culture”	Is positively related to	“Risk transparency”
“Risk prevention”	Is positively related to	“Risk coping capacity”
“Risk monitoring”	Is positively related to	“Risk coping capacity”
“The integration of risk management into the project portfolio management process”	Is positively related to	“Risk coping capacity”

Fleming & Koppelman (1998 p.19) promote “earned value method” in their paper as a “useful technique in the management of any project” as it helps to manage risks related to costs. The earned value method should according to them be applied to all projects in the portfolio, and the projects within should be fully defined at the beginning to allow lifecycle-long measurement of performance (Fleming & Koppelman, 1998, p.19-20). This is said to enable a setup of warning signals should a project costs sink out of the ordinary so far that it should be cancelled instead of continued. (Fleming & Koppelman, 1998, p.19) They advise that for every project one should define the work scope of the whole project using work breakdown structure, and this they advise to be condensed to a bottom-up plan. (Fleming & Koppelman, 1998, p.20) They further state this plan should include “detailed measurement cells” called “control account plans”, which are to be formally scheduled, measured, followed upon and summarized as the project goes forward.

This is said to enable performance measuring against schedule, as well as costs realized against cost estimated, as well as forecasting final costs on past performance. (Fleming & Koppelman, 1998, p.21-22) Finally, this is said to enable the management of all remaining work and changes to the project mid-project. (Fleming & Koppelman, 1998, p.22) Kim and Ballard however regard earned value method to be counterproductive as it is noted to be “effective tool only under the limiting assumption that every activity or cost account is independent”. (Kim & Ballard, 2000, p.9) They further criticize earned value method as “making it a priority in releasing assignments to the field prevents quality assignments, which results in unreliability of work flow”. (Kim & Ballard, 2000, p.9)

Martinsuo, Korhonen & Laine would include uncertainty management as a managerial concern of project portfolio management. (Martinsuo et al., 2014, p. 732) They state its due to portfolio evolution by “number of internal and external reasons” as well as due to a “variety of changes and unforeseen events, both within the firm, its projects and in its external relations”. (Martinsuo et al. 2014, p.732) They further report three main causes of this: “project interdependencies, environmental uncertainties such as market and technology turbulence, as well as changes on a single project level.”(Martinsuo et al. 2014, p.732 – 733) They make an assumption at their paper that this “uncertainty has implication on project portfolio management, and its effects may fall outside of the sphere of influence of the manager”. (Martinsuo et al. 2014, p.733) They report research findings of uncertainty seen as a threat for most of the time by the managers. (Martinsuo et al. 2014, p.736) This managerial viewpoint is implicated to lead to less innovations as a whole. (Martinsuo et al. 2014, p.736) Further, they report findings where managers are not capable enough to deal with uncertainty, even though correct handling of it is reported to relate to project portfolio success. (Martinsuo et al. 2014, p.736) Learning from dealing with single project uncertainty is promoted as a useful way of enhancing managerial knowledge and experience in the field, yet another finding presents that this is not at all common even though it is found to have been encouraged to in many a field. (Martinsuo et al. 2014, p.736) To help combat uncertainty, Martinsuo, Korhonen and Laine suggest the complementary use of “negotiative and political solutions”, to aid the traditional “normative and

rational, portfolio management framework.” Further, they present how their interviewees rated on a threat level different uncertainties. “Environmental uncertainties, that were labelled as opportunities included environmental values, technology maturation, customer demands, opportunities to become part of some joint development projects”. (Martinsuo et al., 2014, p. 739) Their study further finds out “societal and legal matters” to be “of concern to managers”. (Martinsuo et al. 2014, p.742) They suggest the “long time-range planning tools to identify opportunities from the environment and organization.” (Martinsuo et al., 2014, p. 743)

3. Sustainability as a corporate value

From the previous chapter the reader should now be familiarized with project portfolio management, its goals and activities, as well as some of its models and theories. Now the goal in this chapter is to create a similar understanding of sustainability as a corporate value.

In this chapter the sustainable corporate values will be discussed. There will be identified sustainable values that are nonfinancial and how to properly measure and communicate these values in an attempt to hold the directly financial and nonfinancial values comparable. Therefore, the financial sustainability is not discussed in detail, rather the focus is instead cast on social and environmental sustainability. As put in a conference over thirty years ago, the definition still remains as “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” (United Nations, 1987)

This chapter will create an understanding of how and why to value, communicate or measure these corporate values that may not directly contribute to the bottom line. In detail corporate social responsibility (CSR) will be discussed, as well as ethical consumerism and company environmental management as they are identified to be closely related to achieving corporate goals that are related to sustainable values. This chapter’s key findings will later in the report be reflected with the previous chapter’s findings to create the connection between PPM and the nonfinancial sustainable corporate values. The figure 5 below illustrates the parts of sustainable development. To interpret the figure: Economic development is done on the terms of societal sustainability, and societal development is done on the terms of environmental sustainability.

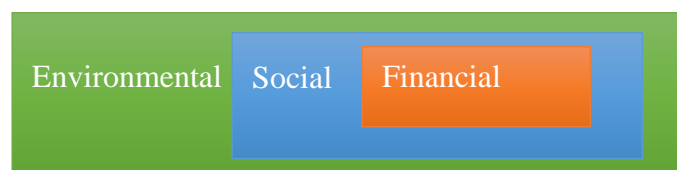


Figure 5: dimensions of sustainability (Thatcher, 2015)

3.1. Social responsibility as a corporate value

Corporate social responsibility is an “argument of economic self-interest for business” and it is said to add value, because it enables firm to better reflect its stakeholders’ needs. Out of this is then implied that value creation is likelier to happen and in greater scale once stakeholders’ interests are better known. (Chandler, 2017, p. 21) Further, integration of the corporate social responsibility perspective with strategy planning and routine operation, company is better suited to adapt to the changing requirements, posed by stakeholders and the world that changes. (Chandler 2017 p.212) Palihawadana, Oghazi and Liu present CSR as a “discretionary commitment from the company regarding its activities to give back to the society where the company operates”. (Palihawadana et al., 2016, p.4964) Park, Kim and Kwon (2017, p.8) see in turn CSR to consist of “legal, ethical and philanthropic responsibilities that represent the company’s concern for society, which also functions as a self-regulatory mechanism that monitors whether the company complies with these responsibilities”. (Park et al., 2017, p.8)

Regarding company policies Chandler further argues that the company can pursue either a “offensive policy” with “corporate social opportunities”, or a “defensive policy” where “corporate social responsibility is seen as a brand insurance.” (Chandler, 2017, p.222) Corporate social responsibility is also divided into two categories: strategic and responsive corporate social responsibility. Out of these the strategic side holds “environmental constraints” and “firm operations” while the responsive side deals with “social issues” and “firm operations” so there can be seen interplay between both sides. (Porter & Kramer, 2006, p.89) In addition, strategic corporate social responsibility is pointed out to be an action common to all companies, as “all business decisions have economic social moral and ethical dimensions”. It is then implied that “all firms do strategic corporate social responsibility whether knowingly or unknowingly – and some companies are better at it than some other”. (Chandler 2017 p.256)

Benn and Bolton argue (2011, p.11) that there is a financial base for implementation of corporate social responsibility. They further report that there are more and more companies who report increased profits from actions towards corporate social responsibility. (Benn & Bolton, 2011 p.10) Hawkins states that corporate social responsibility is a way of risk management, as unethical companies are likelier to face failure. (p.257) Hawkins also suggests that the more CSR is connected, the easier eventual challenges become to tackle. It should be focused on adding value. (p.190) Palihawadana et al. state that “socially irresponsible behavior generates negative moral emotional responses toward companies and their products”. (Palihawadana et al., 2016, p.4964) In addition, they highlight positive CSR associations being a way for a company to enable positive public image in the eyes of the consumers, leading to more revenue and more favorable product reviews from the customers. (Palihawadana et al. 2017, p.4965) To validate this claim, they report similar findings from multiple parts over the world and refer to multiple scientific studies. The finding of association between CSR and positive reviews refers to study by Brown and Dacim from 1997, the positive public image refers to Branco and Rodriques study from 2006, and the similar findings over the world originate from Tain, Wang & Yang’s study from China in 2011, and Dutta and Singh study from India in 2013. (Palihawadana et al., 2017 p.4965) Further they advise a company not to conduct “untargeted promotion of CSR practices” but they should instead “focus on selected issues that closely correspond to their mission, and capabilities as well as public interests”. More publicity, they state, can be gathered by including consumer participation into the social campaigns. This they imply could lead to easier customer attraction and easier job of retaining customers, and companies should “pay more attention to the disclosure of their CSR credentials and incorporate CSR initiatives into branding strategies”. (Palihawadana et al., 2017, p.4967) Park, Kim and Kwon explored the topic as well and found out in their study that “higher corporate ethical standards are found to lead consumers to believe that the company is committed to its CSR activities.” They further state that “when this belief is established, consumers become more satisfied and experience greater trust; as a result they remain loyal to the company”. (Park et al., 2017, p .11) Park, Kim and Kwon also state the that “companies should attempt to draw

consumer attention to their CSR plans and actively communicate with consumers to make it clear that they are committed to achieving their CSR goals.” (Park et al., 2017, p.12) They further suggest benefits from provision of direct, clear, easily available ethical statements and actions to the general public that is related to the CSR goals and their achievement.

Sustainable development is said to “entail the integration of environmental protection, social advancement and economic prosperity “. (Benn & Bolton 2011, p.210) Benn & Bolton (2011, p.63) further see corporate sustainability as a “business approach that creates long-term value for the organization by incorporating economic, environmental, and social dimensions into its core business decisions.” They further argue that corporate sustainability has three elements: economic -, social - and environmental sustainability. (p.63-64) Organization should therefore “be financially viable”, “make adequate returns to investors”, “have a supportive and developmental environment for staff”, “meet the legitimate expectations of key stakeholders”, “eliminate negative impacts on natural environment” and “contribute actively to the health of the biosphere”. (2011, p.64) Eco-efficiency is noted to seek reductions in intake of raw materials and energy as well as emissions and waste. These reductions are noted to have positive implications even financially and are expected to rise with the carbon economy gaining growth. (Benn & Bolton 2011 p.74) They further mention that investments for eco-efficiency can also indirectly pay companies back in some cases as better product quality, lesser need of personnel training or production process efficiency. (2011 p.75) Strange and Bayley (2008, p.33) mention that application of principles of sustainable development is “nothing more than applying principles of sound management to all our resources”. Further, they mention that sustainability could be measured with the “capital approach” (2008, p.105-106) which is said to measure “financial capital, produced capital, natural capital, human capital and social capital”. However, they note that these capital classes may or may not be interchangeable depending on the situation. Exact examples are given that there is little use for financial capital if the local environment is spoiled for further business use, and there is little use for social capital at workplace if the company goes over because of it. (Strange and Bayley 2008 p.106)

3.2. Environmental responsibility as a corporate value

Benn & Bolton report that majority of the world's biggest companies have policies for environmental management and include long-term value creation and competitive advantage within this environmental policy management. (2011, p.53) The companies are said to withhold information regarding the management systems, which they imply indicates potential for business value (2011, p.53) In turn, this leads to the implication that environmental reporting is a way to communicate how the company aligns their efforts for sustainability with their regular objectives. (2011, p.53) Benn & Bolton note out that voluntary disclosure of information is more common within EU and Japan than in the USA, as well as within companies that operate in industries with a higher environmental footprint than in industries with a smaller such footprint. (2011, p.53-54) Benn & Bolton (2011, p.54) are inclined to accept Deegan et al. (2002) study results where it was found out that companies use reporting on social and environmental performance as a means of gaining legitimacy from the public and as a channel to address unfavorable media attention. In an earlier text by Seldner & Cothrel (1994, p.21) objectives for environmental management are given. These are "compliance with existing law and regulation, management of risks both present and future, a remediation of existing sites where contamination has occurred as a result of past or present company activities." In addition, they pose questions that ought to be thoroughly answered to better tie the environmental and financial management together. These questions include "What are the environmental issues impacting price and the availability of materials?", "What are the environmental issues governing price and liabilities of transportation of materials to our plant?", "What are the potential material- and waste handling costs, risks and liabilities with regard to the work force and the environment?" and "What are the regulatory requirements of operation, and what are their associated costs?" (Seldner & Cothrel, 1994, p.218) Further, they state that environmental management is only accurate when the risks of operation are assessed accurately. (1994, p.222)

Handfield et al. promote procurement as an action that deals increasingly much with environmental management activities as well. According to them, this is due to purchasing function partly deciding the amount of waste generated, as they are the corporate function in charge of new material and equipment intake. (Handfield et al. 2002, p.71) They report that the pollution impact can be seen as “direct” and accumulated waste thus measured directly from the products that are being purchased “during the storage, transportation, processing, use or disposal of” said purchased items. (Handfield et al. 2002, p.71) The other viewpoint they present is “indirect”, in which the goods and services bought “consist also the waste streams generated from producing them”. (Handfield et al. 2002, p.71) This is said to increase complexity of the environmental viewpoint of purchasing. Later in the study they present “environmentally conscious purchasing”, which aims at integrating supplier environmental performance into supplier evaluation process. (Handfield et al. 2002, p.72)

3.3. Financial implications of sustainable corporate values

Ethical consumerism is tied to the trend of conscientious consumption in which consumers express a willingness to make dramatic change in their lives to reduce their ecological footprint. This goal is said to be partially achieved by doing ethical consumer choice. People are claimed to make more and more political statements with their wallet, i.e. choosing between two comparable products the one they view more ethical. (Boström & Klintman, 2008, p.1-3) Ethical consumerism is reported by Benn & Bolton as a growing thing, and here it is meant that consumers may prefer ethical choices from companies, such as “only manufacturing or selling products that are relatively environmentally or socially responsible”. (Benn & Bolton 2011, p.97) In addition, Cerri, Testa and Rizzi (2017, p.343) report similar findings of increase in ethical and sustainable consumption in their paper.

Boycotts are reported as an easily visible, harming action, and there has been seen an increasing in their amount in the 21st century. It is reported as “one of the more powerful ways for customers to get their voice heard” and the consumers are

suspected go for that if they experience the company or its products unethical. (Benn & Bolton 2011 p.95-96) An increase in the number of boycotts, and their counterpart, 'buycotts', is also presented by Boström & Klintman. 'Buycott' is the action where people individually and simultaneously collectively prefer an offering that seems very ethical. (2008, p.10) Further, it is reported by Palihawadana et al., in their literature review on the topic is found that "ethical ideology is an important variant in the ethical decision-making process of consumers, influencing their judgments on the socially responsible activities of businesses and affecting their purchases" (Palihawadana et al., 2016, p.4965)

Hawkins in turn argues that if sustainability is used only for public relations it becomes a non-value adding expenditure. Further he mentions that sustainably built solutions can deliver new revenue streams. (Hawkins, 2006, p.276) as well as improve the whole environment the company works on which leads to more committed workforce, local support network, and local acceptance. (Hawkins, 2006, p.193) Further, knowledgeable motivated workforce is said to equal more innovation. (Hawkins, 2006 p.194) Sustainability is then said to not cancel profits, the profits are advised to be sought collaboratively instead of with conflict. (Hawkins, 2006, p.196)

Carbon market is expected by Wells to be a manageable thing for companies in the future. This ought to give companies differing ways of company environmental management related to the carbon market. Companies could, according to Wells, (2013, p.103) continue business without adaptation and be regulated to purchase carbon credit to offset the emissions, or they could manage their internal work so that emissions get lower, to achieve compliance with emissions limits, or they could be proactive and invest in projects that cut emissions so much that the companies can then sell carbon credits, or the company could implement a mixed policy of the previous three possibilities. (Wells, 2013, p.103-105)

3.4. Communication of sustainable corporate values

According to Sadgrove (1992 p.156-158) the enterprise sustainable, or “green values” should not be communicated wrongly, irrationally, or out of date. Examples of wrong communication are “misleading and inaccurate” claims. Irrational claims are the ones that have no meaningful connection to the context. Out of date claims are not acceptable either as new data may unravel leading to a false claim. This behavior is stated to eradicate customers’ trust in the company and its offering. (Sadgrove, 1992, p.157-158) However, if a company actually works in a sustainable, environmentally friendly way, they say it should be promoted heavily in advertisement, promotion and the packaging of the product. (Sadgrove, 1992, p.159) Further, Sadgrove states that all environmental claims have to be so airtight, that they could be presented for a PH.D. in the field without trouble. This assures that claims are valid and won’t pose a public relations risk. (Sadgrove, 1992, p. 161) Cerri et al. regard the availability of environmental information important in their study. (Cerri et al., 2017, p.344) They report that lack of information about how sustainable a product is can hinder people from purchasing environmentally sustainable products. In addition, this information is said to potentially have an instant effect in the store if “provided through promotional strategies”. (Cerri et al., 2017, p.344)

Sadgrove further states how a company should publish the sustainable values. These ways include: “Environmental policy statement”, “case histories on successes”, “article reprints“ if the company and its actions have been presented in good light in a paper somewhere else, “public information leaflets”, “notes on processes” and their safety and other social values that people generally hold in high regard, “product ingredients” and their attributes, and a “fact sheet of company successes” related to sustainability such as reduction in waste accumulated or energy used by the company, reduction of emissions or other pollution, implemented community projects, noise abatement, new interesting and ambitious projects. (Sadgrove, 1992, p. 169)

Sadgrove further states that to receive better reception for the publication of corporate values, the message should be factual, as “journalists like detail, hate waffle”. (Sadgrove, 1992, p.171) The company should thus stick to concrete examples instead of presenting fluffy policies. The message should have

photographs as interesting pictures capture receiver's attention. It should be pre-written if possible, to spare publisher's time in edition. It should be humane, as media prefers to write about people over the factories. It should be controversial, as a story that has tension and drama gets more publicity and concern. Some examples are given as well: a new product story could be given with the terms of "safeguarding the factory's future" or a pollution reduction could have a headline of "saving the fish" (Sadgrove, 1992, p.171)

To get messages across to employer Sadgrove suggests a different method by the name of "educating the diner". In concrete actions, this means to have the message clearly visible in the company dining area. For example, leaflets and blackboards are mentioned as a medium. (Sadgrove, 1992, p.193)

Boström & Klintman suggest there to be different strategies for framing, which is noted as a key activity in establishment and promotion of a green label. (Boström & Klintman, 2008, p.115) These include boundary framing where actions or products are painted in an either-or argument. Goal is to draw a line where an entity is something, or either is not. Frame resolution is presented as a method to "resolve conflicts and turn diverging views into a uniform label" and it is stated be done by opening an additional frame where both conflicting sides of the argument can agree on. Finally, frame reflection is stated to increase clarity and openness of labeling scheme. (Boström & Klintman, 2008, p.115-116) All three strategies are stated to be important as they may interact and co-develop each other. (Boström & Klintman, 2008, p.117)

3.5. Sustainability in project management

Sánchez (2014, p. 319) identifies the social and environmental sustainability to be difficult to include in programs & projects. They advise the use of balanced scorecard- based systems to project review to better measure the success rate of environmental and / or social goals of a given project. (Sánchez, 2014, p. 319) This is suggested to be derived into a "data envelopment analysis" (DEA), which in turn,

“uses all available data to construct a best practice empirical frontier to which each inefficient unit of analysis is compared”. (Sánchez, 2014, p.320) It is reported to be a “non-parametric technique used to measure the efficiency of decision-making units” (DMU) (Sánchez, 2014, p.321) A previous use in “efficiency analysis” is reported for this tool. (Sánchez, 2014, p.321)

Sánchez proposes to include a sustainability analysis into project proposal process. They seek to include within this “the goal and scope definition, inventory analysis, life cycle impact analysis and interpretation of results.” (Sánchez 2014, p.322)

As a way of connecting the worlds of project portfolio management and sustainability, they promote the following viewpoint for portfolio selection: “Formulate it as a DEA problem where DMUs represent portfolios, inputs initial investments, development, operational and disposal costs, and socio environmental impacts derived from sustainability analysis; outputs represent the estimated portfolio contribution to each goal.” (Sánchez 2014, p. 322) This would lead to a ranking of portfolios based on business value, and efficient portfolios are the ones that “support strategic goals with minimal environmental impact”. (Sánchez 2014, p.322)

4. New Wave- a project portfolio management tool for Yara Suomi Oy

From previous chapters the readers' understanding of sustainable values and project portfolio management as well as the communication of information should be taken into account in this chapter that presents the tool development phase for the thesis' target company. Theory of iterative software development is presented as well to give context to the reader on how the tool was done.

In this chapter the developed project portfolio management tool 'New Wave', its use and the development work related to it, as well as the target company Yara Suomi Oy will be discussed in detail. Highlight will be given to the development method, as it has been seen during the project to be a quite cost-effective method for development of software tools of similar scope. Lastly the author will give personal input on the tool performance.

4.1. Presentation of the case company

This thesis was carried out for the Yara Suomi Oy's site at Uusikaupunki. Yara Suomi Oy is a subsidiary of Yara International, which operates from Oslo, Norway. Yara Suomi Oy belongs within the 100 largest companies in Finland rated by annual turnover. Yara Suomi Oy has three production sites in Finland. At Uusikaupunki the site has four production plants, two of them for NPK-fertilizer production and two for nitric acid production. (yara.fi) Yara Suomi Oy at Uusikaupunki alone employs directly approximately 240 people. The site was founded in 1965 by the name of Rikkihappo Oy and the site continues to operate until today as Yara International's second largest NPK fertilizer production plant with approximately 1,3 Mt of annual fertilizer production. (yara.fi) According to Yara, more than 80 different NPK-based fertilizers belong to the production plan at Uusikaupunki site. Safety and environment are stated as the core values of all operations, and continuous development is aimed at lessening the environmental impacts of the

operations. Yara Suomi Oy has also pledged to the energy efficiency agreement in Finland. (yara.fi)

The need for the developed tool was identified in the summer of 2018 in the company as there was little ways of monitoring the project portfolio in the company with previous tools available. An electronic solution was sought to replace the older whiteboard conception of project portfolio. The author was during this time working in the company at another site and thus was contacted with the topic. There was a need for the tool to be visually pleasing, informative for both management and workforce, capable of monitoring planned versus actual realization of benefits in projects. The tool had to be capable to differentiate graphics between different projects, programs and departments and years. This led to a designed system which is presented in Appendix C as a system modeling picture.

4.2. Development of the tool with iterative method

The tool named 'New Wave' was developed by the method of iterative development. Iterative development is a means of development where incomplete versions are released for test use after a known effort has been made. According to Krutchen (2000) iterative development is superior to traditional models because it enables better tackling of changing requirements, distributes the time spent on integrating the system, allows risk detection earlier in the process which in turn leads to easier mitigation of said risks, it enables reuse better, as code parts and patterns can possibly easier be used in new features, it enables better developer learning as there is multiple types of work done at all times. (Krutchen, 2000, p. 4-6) Lastly, Krutchen mentions that also the development process develops along the development itself leading to better quality of work in the later phases. (Krutchen, 2000, p. 6)

Requirements gathering for the development included several development meetings with the company where an iteration of the program was shown, current functionality was presented, and new requirements were then built on top of

existing work. The iterative development was identified by the company as a fitting form of work for a single developer and a project scope such as this which was relatively small. The work continued from early August to late October. Some product maintenance has occurred for quick iterations after the project deadline and testing conducted by the company resulting in a more reliable tool that is easier to use and more secure with the way the inserted data is handled within. At the end of the process the tool code written in Visual Basic has 1001 lines in Visual Studio-code editor, and when copy-pasted to a text editor, the code is 33 pages and 2989 words long.

The project timeline for the developer is described below in Figure 4. As can be calculated from the figure, the total project planned time for the developer adds up to 340 hours of work over the course of 174 days, while the realized workhours included 405 workhours over 173 days. This equals just over 1 hour 57 minutes in planned use of time per day. Realized number rounds up to 2 hours 20 minutes per day. This means a disparity of ~20,0 % between what was expected and how much was exactly done. Worst cases of bad prediction are identified as the workloads of second iteration coding and testing where 39- hour and 16-hour strong disparities were confirmed by the author. It may be suspected that the reason for this hid in the amount (or lack thereof) of work spent in designing the work. All in all, in realized work related to software design is calculated to add up to only 28 hours of work, or 6,9 % of the realized identified effort. This number is somewhat lower than what are estimates in Boehm et al. work (2008) for average software projects. They cite an estimate of 20 to 25 percent of effort for the design/elaboration phase depending on the model chosen. One may suspect development work could have been more efficient and in line with prediction, had there been more work dedicated solely for planning and solely for coding, instead of having some amounts of planning and coding done simultaneously.

The tool development project timeline

Project activity	Type of work	Responsible party	Planned beginning	Planned ending	Estimated work hours	Estimated duration	Realized beginning	Realized ending	Realized workhours	Realized duration	Notifications
Kick-off video call	Requirements gathering	Company	1.8.2018	1.8.2018	3	0	1.8.2018	1.8.2018	2	0	
Pre-planning of tool	Design	Combined	2.8.2018	5.8.2018	10	3	2.8.2018	5.8.2018	10	3	
First iteration coding	Implementation	Developer	6.8.2018	31.8.2018	100	25	6.8.2018	2.9.2018	92	26	
First iteration testing	Testing	Developer	1.9.2018	6.9.2018	15	5	2.9.2018	6.9.2018	20	4	
First meeting	Presentation	Developer	7.9.2018	7.9.2018	1	0	7.9.2018	7.9.2018	1	0	
First meeting	Collecting feedback	Company	7.9.2018	7.9.2018	1	0	7.9.2018	7.9.2018	1	0	
First meeting	Requirements gathering	Combined	7.9.2018	7.9.2018	2	0	7.9.2018	7.9.2018	2	0	
Second iteration planning	Design	Developer	8.9.2018	10.9.2018	10	2	8.9.2018	10.9.2018	10	2	
Second iteration coding	Implementation	Developer	10.9.2018	10.10.2018	75	30	10.9.2018	15.10.2018	114	35	
Second iteration testing	Testing	Developer	10.10.2018	22.10.2018	40	12	15.10.2018	22.10.2018	56	7	
Second meeting	Presentation	Developer	23.10.2018	23.10.2018	1	0	23.10.2018	23.10.2018	1	0	
Second meeting	Collecting feedback	Company	23.10.2018	23.10.2018	1	0	23.10.2018	23.10.2018	1	0	
Second meeting	Requirements gathering	Combined	23.10.2018	23.10.2018	1	0	23.10.2018	23.10.2018	1	0	
Final version planning	Design	Developer	23.10.2018	24.10.2018	8	1	23.10.2018	23.10.2018	8	0	
Final version coding	Implementation	Developer	24.10.2018	26.10.2018	15	2	24.10.2018	27.10.2018	30	3	
Final version testing	Testing	Developer	27.10.2018	31.10.2018	32	4	28.10.2018	31.10.2018	40	3	
Final release	Presentation	Developer	31.10.2018	31.10.2018	4	0	31.10.2018	31.10.2018	2	0	
Final release	Collecting feedback	Company	31.10.2018	31.10.2018	10	0	31.10.2018	31.10.2018	10	0	
Bug fixing	Testing	Developer	1.11.2018	31.1.2019	30	90	1.11.2018	31.1.2019	20	90	

Figure 4: The planned versus the realized project schedule for the developer

4.3. Operation of the developed tool

The tool is operated within Microsoft Office 365 Business Premium environment. Compared to today's standards it is a relatively light tool given the file size of slightly over one megabyte. The tool has three main functions that are seen immediately at the landing page. (Figure 5) These are addition of projects, update of their data and the update of the potentiality – risk matrix.

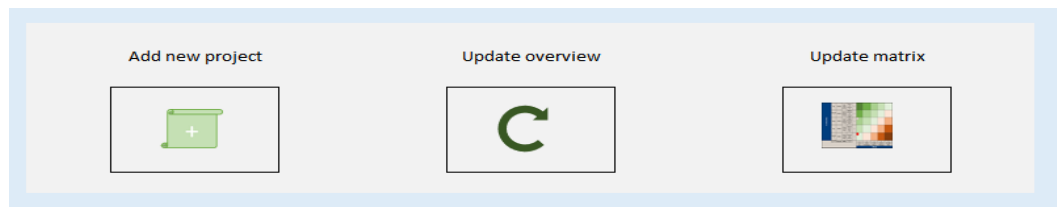





Figure 5. Landing page's main three functions

When adding a new project, they will be entered first by their name, date, current status, Yara site, responsible departments and personnel and whether or not they belong to a bigger program or are linked to key performance indicators. When adding projects, the 'choose' fields indicate a field that has inputs controlled by the admin, and 'insert' fields require novel data. Fields marked as 'Autom.' are self-calculated by the tool and should not be fiddled with. The tool will assess the project by its inputs and retrieve a worded response from a list according to the results. (Figure 6)

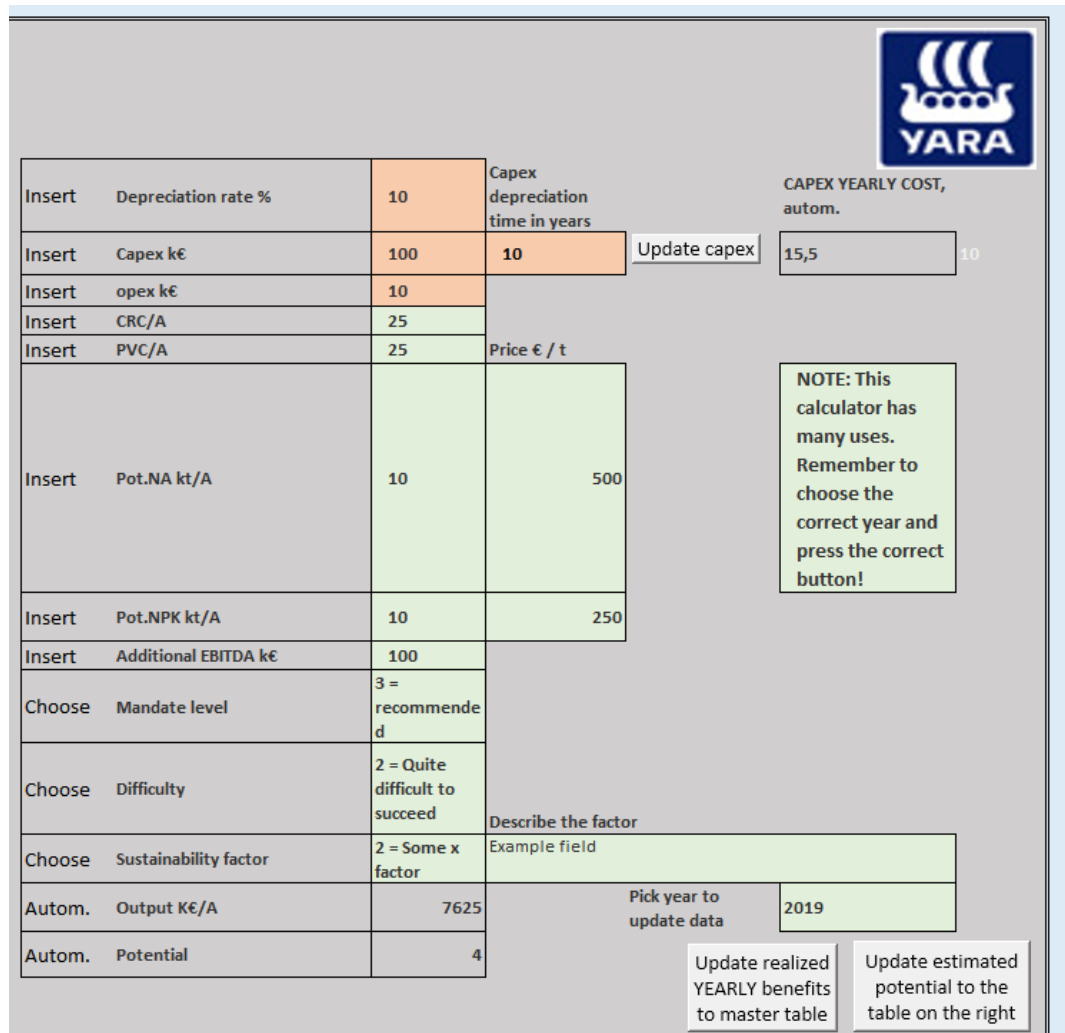
Project assessment for site UKI






Choose	Central category	
Choose	Site	UKI
Insert	Date	04.01.19
Autom.	Project number	33
Choose	Responsible department	
Choose	Status	Started
Autom.	Rating description	Acceptable
Insert	Project title	Example project for the thesis work
Insert	Project Owner	Saku Käsänen
Choose	Linked to KPI	

Figure 6: First steps of the example new project addition, and the rating example.

Secondly, after careful discussion with the responsible persons and experts in the field, benefits and risks of the project are calculated. These can be entered as direct profits, cost savings, increased production, mandate from parent company, or non-financial gains. Risk level is entered, as well as annual operating expenses and capital expenditure. In the case there is capital expenditure entered for the project, one also enters the years and depreciation rate. The same calculator can be used to enter the project's realized yearly benefits. This is done by pressing the left button. (Figure 7) In addition, the correct use of the year in data update is crucial for correct use of the tool.





Insert	Depreciation rate %	10	Capex depreciation time in years	
Insert	Capex k€	100	10	Update capex
Insert	opex k€	10		CAPEX YEARLY COST, autom. 15,5
Insert	CRC/A	25		10
Insert	PVC/A	25	Price € / t	
Insert	Pot.NA kt/A	10	500	
Insert	Pot.NPK kt/A	10	250	
Insert	Additional EBITDA k€	100		
Choose	Mandate level	3 = recommended		
Choose	Difficulty	2 = Quite difficult to succeed		
Choose	Sustainability factor	2 = Some x factor		
Autom.	Output K€/A	7625		Pick year to update data 2019
Autom.	Potential	4		

NOTE: This calculator has many uses. Remember to choose the correct year and press the correct button!

Update realized YEARLY benefits to master table
Update estimated potential to the table on the right

Figure 7: Numeric assessment of the example project

Lastly, the tool has counted annual expected income and costs and weighed them on the given risk level and presented the results as words for the user to see. (Figures 6 & 7) These include short phrases such as “not recommended” and “high priority”. In addition, comments, milestones and their reviews can be entered for each project. (Figure 8)

Project description
YEARLY benefits to master table
potential to the table on the right

This is an example project to point out how does the tool really work. We have inserted now the all the data that is necessary for the tool to work. It calculates the incomes and weighs it against the risk criteria.

Description of current phase of project

The thesis work is well underway

Milestones marked to project

ID	Action	Action owner	Deadline	Status	Reviewer	Review	Date last updated
1	The kick off	Saku Käsänen	1.8.2018	Completed		Adequate	2.8.2018
2	The tool complete	Saku Käsänen	31.10.2018	Completed		Adequate	31.10.2018
3							
4							
5							
6							
7							
8							
9							
10							

Figure 8: Comments & milestones section of the example project addition

The tool also takes input for quarterly and annually realized benefits. Latter option includes a focusing of the input, whether its saved costs, additional income or gained extra production of a given product. The tool can show the realized benefits as a comparison to expected benefits of the project in the quarterly table, (Figure 10) and as a comparison to other types of benefits in the annual table. (Figure 9) The figure is directly cut from the matrix sheet with mere example data.

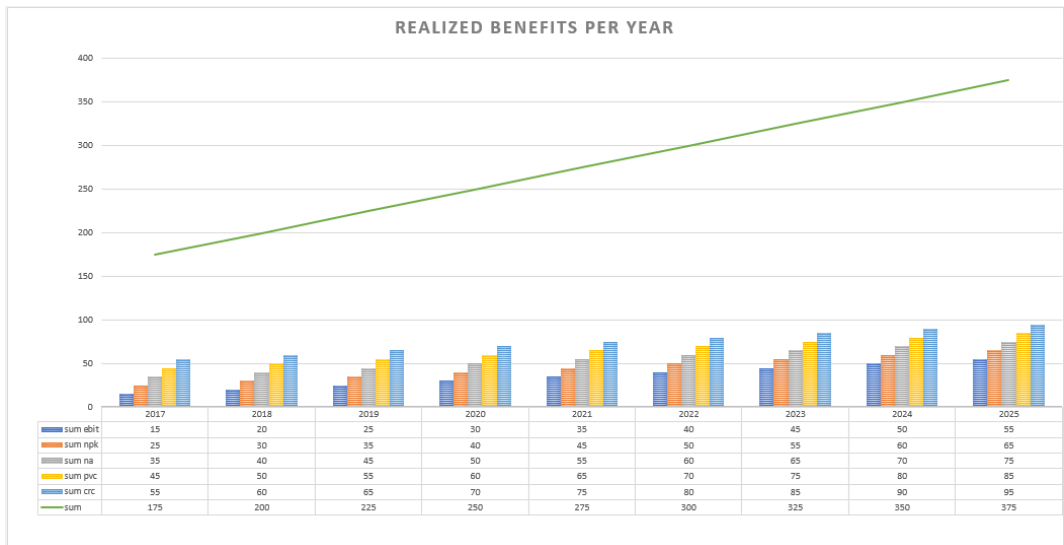


Figure 9: Realized annual benefits with example data

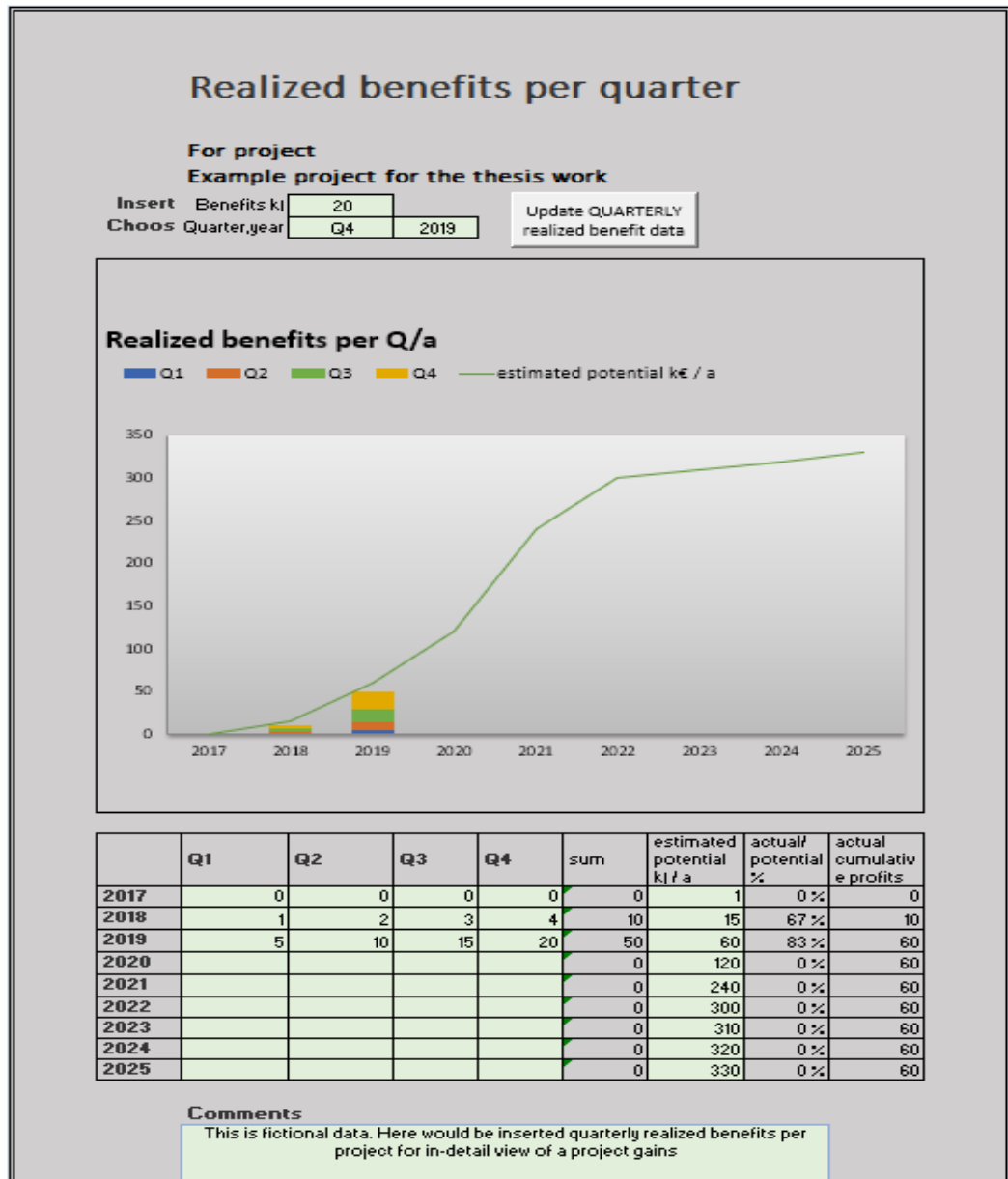


Figure 10. Realized quarterly benefits of the example project

The tool can take in as many projects as the user wishes to add with little difficulty. Most of the actions in the tool were done with macros written with visual basic. Should the user refresh the projects with different data, the tool renames the projects beginning with the largest income potential. (Figure 11) User can limit the number of projects they want visible. In the example pictures, project and portfolio related data is hidden from public view, and some example fields are given to better present

what can be seen from the overview of matrix sheet. (Figures 9, 11 & 12)

ID	TITLE	DEPARTMENT	STATUS	CATEGORY	realized benefits %
1	T	NPK	Ongoing	c	b
2	i	NPK	Started	a	e
3	t	Energy	Started	t	n
4	l	Energy	Started	e	e
5	e	Energy	Ongoing	g	f
6	s	Maintenance	Ongoing	o	i
7		NPK	Ongoing	r	t
8	h	NPK	Completed	y	s
9	i	NPK	Ongoing		
10	d	NPK	Ongoing	h	h
11	d	ROT	Not started	i	i
12	e	NPK	Ongoing	d	d
13	n	NPK	Ongoing	d	d
14		Material Handlir	Ongoing	e	e
15	f	Energy	Completed	n	n
16	r	Material Handlir	Ongoing		
17	o	Energy	Completed	f	f
18	m	Material Handlir	Ongoing	r	r
19		Material Handlir	Ongoing	o	o
20	e	Material Handlir	Not started	m	m
21	x	Procurement	Not started		
22	a	NPK	Not started	e	e
23	m	Material Handlir	Started	x	x
24	p	ROT	Started	a	a
25	l	Procurement	Completed	m	m
26	e	Procurement	Started	p	p
27		HESQ	Not started	l	l
28	p	NPK	Not started	e	e
29	i	Material Handlir	Not started		
30	c	Energy	Not started	p	p
31		HESQ	Started	i	i
32		Energy	Ongoing	c	c

Figure 11. The quick overview of example projects amount, order and status

The visuality of the tool includes a summarizing matrix of potential income versus risks and a table of realized project gains. The tool also has a notice board next to the matrix to show projects that are especially mandated by the parent company or have especially valuable non-financial gains. (Figure 12)

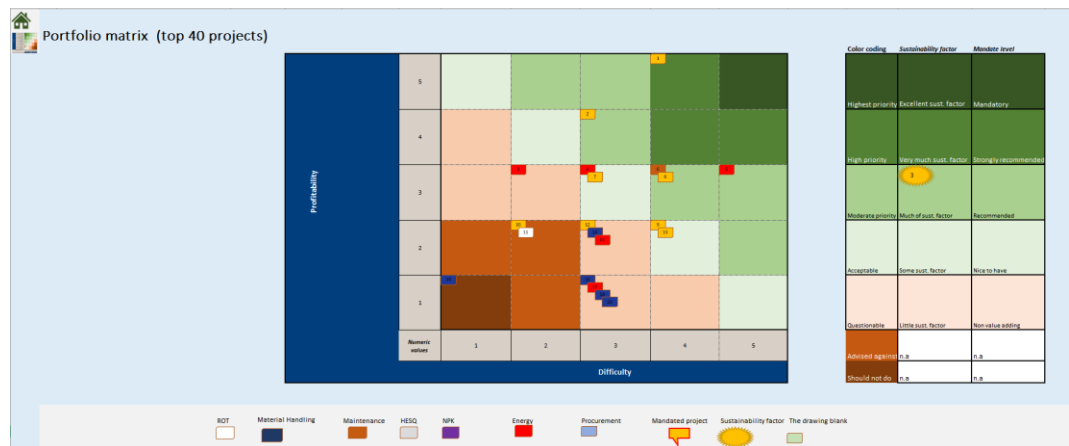


Figure 12. The potentiality-risk and notification matrix

4.4. Results and lessons learned with the tool development

The developed tool seems to be working almost as intended. The author has operated and tested the system extensively with trial numbers and spotted no deficiency in operation themselves. The company reports that one of the macros is not able to self-update a given statistics when the year is changed. The greatest challenges seemed to relate to the data storage. Bug fixes had to be created throughout the thesis writing period. These fixes included better saving of inserted data and recreation of many of the logic paths of the tool macros. The system would almost certainly have been easier to implement by having the first-time use be with the developer present for troubleshooting purposes. This is suspected to lead to a noticeable decrease in the time between problem spotting and fixing. The development was not a costly task for a company, especially for a large one, as it was performed on a small fixed sum contract paid upon tool completion as was the thesis.

The system enables the management to update the portfolio's status and income in reasonable timeframes. It enables middle management to download in similar periods their own version where they may limit the projects so that their own department projects are visible within their copy of the software. It enables the top management to see at one glance how productive has the portfolio actually been, and what are project statuses since last update. It gives for the workers a notification of which projects are the most important, and which projects are good for the quality of life by the mandate from the parent company or either have a noticeable factor of sustainability related to them.

The system developed here does not have the literature review recommended all-encompassing balanced scorecard type of approach. Rather, information is presented to be noticeable by the users and administrators, and the correct results are dependent on the administrator's work quality. This gives a lot of power and responsibility to the administrators of the system. Realistic numbers and descriptions should provide a clear view of the portfolio, its benefits and costs and current status of the projects within.

However according to the author, this power by the administrators has some risks and limitations as well that ought to be discussed. Should bad information be entered, it endangers this tool's reliability. To combat this, pre-made choice selection fields are in the more critical input fields, and these are protected against edition. This limits the damage a malign and / or uninformed user could pose to the system. In addition, should the user put unrealistic numbers, the software has no system to combat against unrealistic expectations – it calculates what it sees. If a realistically worthless project is entered to have a multi-million level income, the tool does not know that this number is unrealistic and will count the project as a huge success. This could pose a risk in some other companies where either the tool use is not authorized or where the numbers are skewed in favor of another party.

A survey was created by the author to be distributed to the company over the internal e-mail. The survey form is presented in Appendix A. The goal of the survey was to find statistically relevant evidence for the iterative development method to be suitable for developing the tool and to find out how suitable the tool actually was for project portfolio management purposes. As there were statistically not enough answers received, all of this sub chapter 4.4 is author's reflection on the usability of the tool only. Regarding the hypotheses, it would seem on personal experience regarding the development, that the iterative method was successful in this case as the chosen method. It indeed did enable rapid customization of the tool and meeting the customer expectations to their standards. However, as the effort overextended the estimates, it could not be argued on empirical findings that the development efficiency was increased by having the iterative methods in use. This could be due to many things, not least the overall relative inexperience of the author in programming, so no satisfying conclusion can be given on the matter based on merely these findings.

5. Discussion

In this final discussion chapter, the findings from literature presented in chapters 2, 3 and 4 as well as the insight from company related work from chapter 4 will be discussed and tied together. Conclusions and implications from all the found and acquired material will be made and summarized in this chapter as well.

5.1. Results

The tying point for the two researched substances, project portfolio management and sustainability as a corporate value, seems to be located at company strategy. If strategy is not sustainable, why would portfolio be? If it is, it should show in the project portfolio as well.

The key activities for project portfolio management were found out in the literature review to be related the common handling of all projects. They should be valued with the same criteria and monitored similarly throughout their lifecycle. Their risks should be calculated and evaluated similarly. This should include analysis of uncertainty within projects, and project interconnection should be thought of as well, as a project input is likely unavailable as a result to another project. Project portfolio is a collection of actions to improve the company and these actions should be ranked based on their impact, necessity and difficulty. The balanced scorecard-type of approach for the ranking was the most favorable one in the literature review.

The literature review suggests there to be a trend in corporate social responsibility that has been increasing as society's values change over time. Where CSR previously was a defensive action to preserve a customer's mental image of company, increasing thought has been given to the offensive use as we move further to the present in the timeline. There did not arise evidence to counter this finding during the literature review or the work performed for the company. This also adds credibility to the assumption that financial value is hidden in the nonfinancial values

- and if that holds true, then the nonfinancial values should be utilized as well as promoted in PPM also.

From the findings it would seem it may be beneficial in the long run, although with careful consideration and only in some cases, to go against the directly financial values in some cases if the results are deemed worthy by the standards of sustainable development. These benefits could include to mention a few, easier new customer attraction, more reliable customer loss prevention, easier prevention of upcoming legal liabilities or more efficient promotion of company's public image.

It could be seen from the findings that a solid defense strategy in CSR puts pressure on competitors on the public image level – a company wouldn't want to be seen as more unethical than the competitor – so it could be argued that a strong defense in this regard can additionally form a way of offense for a company. The findings suggested that this is more useful in the markets where typical consumer behavior is not very ecologically driven, but rather this would act as an additional weight towards a given company or a product, as a way of making the customer feel slightly better and / or more inclined for this given product offering. This was seen due to the finding that more ethically driven consumers are less likely to accept company-based messaging of their ethicality or sustainability and are to be more critical towards said messaging and rather rely on third-party evaluation of company policies.

Socially responsible companies are found to gain more and lose less customers due to their actions, and project portfolio can take this into account by having a more open visibility approach to the project portfolio and its management. For instance, the employees should have a clear way of suggesting improvements for their work life, and they must see how the project is ranking in the project order of the company. Work life quality is measured by the eyes of the employees, but as well by the eyes of surrounding society and more quality here leads to more potentially great and innovative workers in the workplace and more admiration from the society. If there are projects for benefit of the society, company is viewed in a better light. This might also create new customers. Project portfolio is used to do regular business activities and ensuring its ethicality may help win over ethical consumers.

Process improvement is most often a project, instantiated to perform the process in a given way better in the long run after the improvement. Should this process improvement aim at making the process more sustainable, it is yet another tying point for PPM and the sustainable corporate values. If the portfolio is seen as unethical, company may lose money so if the portfolio is going to be visible, company should be sure it then is seen as ethical by the populace. Eco-efficiency is only a single part of the presented indirectly financial values, yet it can create value for a company down the timeline if it is correctly promoted in project portfolio management. This finding supports the defense-as-offense mindset as well. The strategies of framing underlined the importance of having a coherently, thoroughly planned messaging of corporate values. Company environmental management was found out to be in the future even more closely aligned with financial management than today. If environmental management is improved with projects, it then becomes involved with project portfolio management. Project portfolio management thus has to enable environmental projects also, so it should give value and promotion to projects that may or may not immediately contribute to the bottom line if it is deemed by the company to be perceived very well by the large public. Appendix B and the figure within will represent and clarify the connections previously found out into a concise and clear model picture.

It can be concluded from these findings that an increase in company spending towards the indirect gains with sustainable means is lucrative and the key to handle this publicity is showing the world in a grandiose way about the gains and the means and the plans for future in sustainable actions. It can also be concluded that project portfolio management is a key action for larger companies to enable this – a favorable way seems to be a commonly adopted project valuation that takes nonfinancial factors such as sustainability into calculation as well and points out how difficult will it be to reap the benefits, be they financial or nonfinancial.

5.2. Implications

It could be implied from the thesis project that it is not particularly expensive for a company to create project portfolio management activity as a regular action. Instantiation of project portfolio management seems to take less resources than maintenance of it or adaptation to it, if there is already a host of projects underway or planned. It could also be implied from the findings that having low-valued environmentally or socially admirable projects in the portfolio will pay back indirectly in the long run if they are messaged properly to the general public.

It could be implicated that sustainable values in corporations will follow the valuation of sustainable values in the society that surrounds them. It also could be implicated that growth of knowledge in the topic in the local populace brings more civil pressure such as lawsuits, strikes and boycotts towards largely spending, largely emission causing companies if there are little to no actions taken on the company side to prevent such unethical image from happening. It could also be implied that promotion of indirectly financial values will pay back if it stops, hinders or limits a large civil event, such as a boycott, or other actions at the same scale as the investment, from happening.

5.3. Future research suggestions

It would be interesting to see how much weight is given to indirect factors of productivity such as energy efficiency in new equipment purchase in different industries. Also, there would be gap to research how much do companies already engage in carbon market activities. It could be useful for companies to ponder how will new legislation affect the companies that cause most emissions, and for the general public: how is this increased expectation of regulation visible in new equipment or production plant or transportation chain planning? All are valid questions that relate to the area at hand, but the first and last question are most closely aligned with this thesis. Both questions and their answers could provide

valuable insight for plant design engineers and project portfolio managers worldwide. Regarding the aspect of tool development, it would be interesting to find out objectively what is the best method for a smaller company to obtain similar scope tools for their use.

6. Summary

In the summary chapter the main research questions are given concise, compact answers and the thesis gets summarized. The summary is condensed to table form in the table 5 below.

Sustainability was found to be valuable for project portfolio management as it can have indirect gains for the company. Project portfolio management ought to be standardized in the larger companies, and same principles, models and methods done for all projects within the portfolio as well as for new upcoming projects. The use of a dedicated project office that is both motivated and capable helps the implementation of PPM practices.

Ethical aspects of industrial operations were found to have an increasing driving force for customer decisions and the trend was expected to continue. It is in companies' best interests to be perceived ecologically friendly and ethical. The recommended way to accomplish this is to implement projects and programs that alter company processes so that they meet this quota, and then this activity is recommended to be published as much as possible, as well as possible without possible dispute arising. This is found as the tying point between sustainable values and project portfolio management.

The message of sustainability in company operations should be communicated through multiple channels. The workers should receive the message on the actual worksite, and the local residents of the area could be contacted through their local mediums to have the message actually sink in close to their home. Larger audiences should be contacted through national or trade-related newspapers to assure the correct type of message is seen where the correct type of recipient is.

Table 5: The main research questions' summarized answers

Main research question	Summarized answers
RQ1: How should sustainability be valued in project portfolio management ?	<i>Sustainable values should be taken into account in the common project evaluation form. The form is to be applied throughout the whole project portfolio in both monitoring and new project initiation. The portfolio is recommended to have at least some sustainable aspects for future gains - even at the expense of small short-term benefit.</i>
RQ2: How can a company gain from promotion of sustainable values?	<i>The company can gather public acceptance and legitimacy for their operations if the public has the mindset they are operating under sustainable standards and more ethically than their competitors. This should lead to increased revenue and customer flow and easier conformation to the legal boundaries of running an industrial business.</i>
RQ3: How should the company's PPM actions be presented to different audiences ?	<i>The message should be clear, powerful and compact to the extent that the public acknowledges that the company is ethical and sustainable in their regular actions, here namely the PPM actions. Company workforce is recommended to be educated in the dining and pause areas. The external</i>

	<p><i>audiences through local mediums to improve the public image and acceptance close to operation sites as well as through trade- and/or national publications where the focus shifts from smaller scale to larger scale in the message for a wider range of audience.</i></p>
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8. Appendices

APPENDIX 1:

Survey form created for data gathering

Name:	Date:		Role: (user or admin)		
Rate from 1 to 5 how much you agree with the sentiments. If you did not take part in development process, you can leave the first section fields empty.	I disagree completely	I disagree slightly	I neither agree nor disagree	I agree slightly	I agree completely
Tool Development	1	2	3	4	5
<i>I think the development had a clear, logical progression throughout the development period.</i>					
<i>I think my voice was heard throughout the development period.</i>					
<i>I think the different developed versions increased in quality throughout the development period.</i>					
<i>I think there was a lot of changes in requirements for the software throughout the development period.</i>					
<i>I think the development met the changes well throughout the development period.</i>					
Tool Design	1	2	3	4	5
<i>I think the colours are used in an effective way to gather attention to detail.</i>					
<i>I think the shapes are used in an easy way to visualize what can be done.</i>					
<i>I think the way all data is handled within the tool is designed effectively.</i>					
<i>I think the tool is designed to be easily editable by the developer.</i>					
<i>I think the tool is designed well for the aim of communicating information to the audience.</i>					
Tool Use	1	2	3	4	5
<i>I think I can use the tool well in the ways I expected before I had the tool available for my use.</i>					
<i>I think the tool is easy enough for me to use after reading instructions.</i>					
<i>I think physical presence with the developer would have been good for the first time of using the tool.</i>					
<i>I think the tool enables me to monitor and value projects in greater detail and quality than previously</i>					
<i>I think the tool gives me a clear vision of the current project portfolio</i>					
<i>I think it is easy for me to see which projects are lucrative and which should be reconsidered</i>					

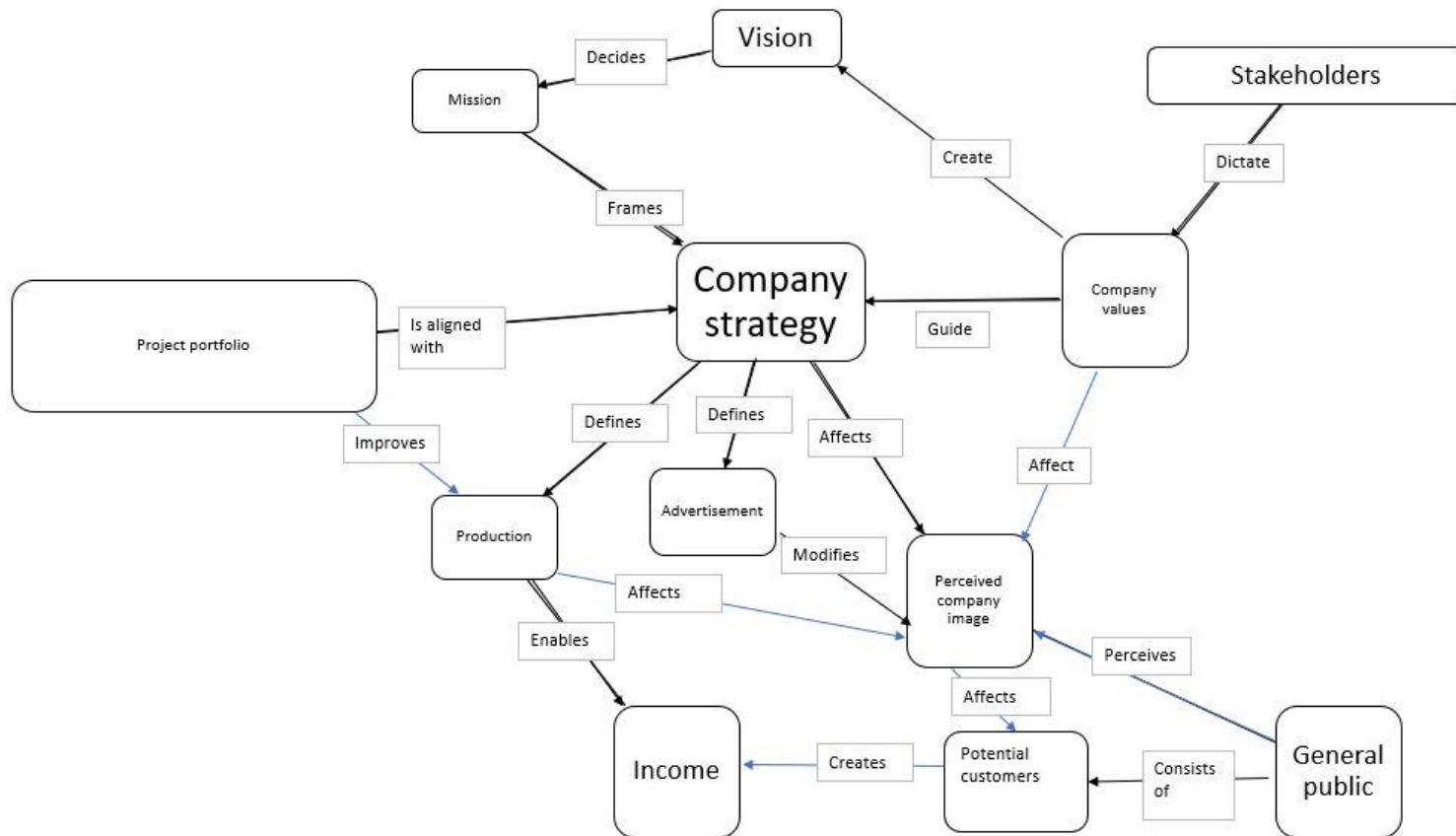
Disclaimer: Names will not be published. The answers might be published within the thesis without names. The data collected is used for quantitative analysis of the tool, its development, design and its use.

Thank you for your time!

Questionnaire created by Saku Käsänen, 05.01.2019 at Lappeenranta

APPENDIX 2

Company strategy and income as the tying point of project portfolio and company values



APPENDIX 3

The developed tool as a modeling diagram

