

CHALMERS



Green Lean

**How sustainability can be integrated into projects through
lean concepts.**

Master of Science Thesis in the Master's Programme International Project Management

AJDIN PEZIC

Department of Civil and Environmental Engineering

Division of Construction Management

CHALMERS UNIVERSITY OF TECHNOLOGY

Göteborg, Sweden 2012

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Examensarbete / Institutionen för bygg- och miljöteknik,
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ABSTRACT

Sustainability in projects and project management are a diffuse and abstract topic, there is no major literature or information available. The objective of this research was to provide a clear relation between sustainability (green) and projects by using concepts of lean and to demonstrate how lean concepts can be used to integrate 'green' aspects into projects. By secondary data relations between the categories (green, projects and lean) was made where a conceptual model of 'green lean' was provided. The concept was further supplemented by interviews.

From the conducted interviews environmental aspects was highly dependent on industry and organization where requirements was the primary driver for implementing environmental requirements in projects. Value was primary considered at 'use & service' level of the project outcome, global value (social) was very dependent on type of industry and organization. Environmental impact of activities within projects is not being questioned which makes room for being able to use parts of conceptual model as an framework of mapping activities. The conclusions for this research is that parts of the conceptual model can be used as a framework, sustainability (green) in projects consists of three components, green at methodology level, green at process level and green on product level. It is however of further investigation of its practical application since environmental aspects in projects are highly at organizational level.

Keywords: Project Management, Project, Projects, Green, Sustainability, Lean

Grön Lean

Hur hållbarhet kan integreras in i projekt genom lean koncept

Examensarbete inom International Project Management

AJDIN PEZIC

Institutionen för bygg- och miljöteknik

Avdelningen för Construction Management

Chalmers tekniska högskola

SAMMANFATTNING

Hållbarhet på projektnivå är ett diffust och abstrakt område, det finns inte något större utbud av litteratur som behandlar området. Målet för detta arbete är att ta fram en klar koppling mellan hållbarhet och projekt genom att använda koncept från lean och demonstrera hur dessa koncept kan användas för att integrera hållbarhetsaspekter och 'grönt' in i projekt. Genom sekundär data har koppling mellan grönt, lean och projekt tagits fram där en konceptuell modell är framtagen. Denna teori är sedan supplerad av intervjuer.

Från intervjuerna gavs indikationer på att hållbarhets aspekter i projekt var mestadels influerat beroende på vilken typ av industri man var verksam inom samt organisationen i helhet. Krav och specifikationer var dem mest drivande faktorerna när det gällde implementering av hållbarhet på projektnivå. Aspekter som att leverera värde var primärt fokuserat på 'användning och service' i produkt-delen (utkomsten) av projekten och att leverera globalt värde var mest influerat av industri samt organisation kultur. Aktiviteters miljöpåverkan inom projekt var ej ifrågasatta vilket gör att möjlighet finns att använda delar av den konceptuella modellen som ett ramverk för att kartlägga aktiviteters miljöaspekter.

Slutsatsen för detta arbete är att delar av den konceptuella modellen kan användas som ett ramverk där hållbarhet (grönt) på projektnivå består av tre delar, grönt på projekt metodologi nivå, grönt på projekt process nivå samt grönt på projekt produkt nivå. Eftersom miljö aspekter mestadels ligger på organisations nivå är det av intresse att bestämma den praktiska tillämpningen av den konceptuella modellen.

Nyckelord: Projektledning, Projekt, Grön, Grönt, Hållbarhet, Lean.

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Preface

Sustainability (green) in projects is a relatively new topic and area, although sustainability in general is a widespread topic its application on projects is still at its birth. There is no major literature to support sustainability and ‘green’ at project level. The research wishes to provide a stronger relation between sustainability (green) and projects by using some concepts of lean. The primary purpose of this research is to provider stronger connection between green and projects with concepts of lean. Sustainability in this research is defined as ‘green’ and environmental friendly. This research is aiming to provide a conceptual model that can be used to integrate ‘green’ into general projects with concept of lean.

Göteborg April 2012

Ajdin Pezic

1 Introduction

'Green Lean': How sustainability can be integrated into projects through lean concepts.

Although sustainability is a heavily debated topic sustainability or 'green' as described in this research is a relatively new concept in project management. There is no major literature on the subject and when having conversations with project managers it is a relatively diffuse and abstract topic. Requests have been made to the Project Management Institute to include 'green' project management into their work of the PMBOK Guide 5 (Open letter to authors of PMI PMBOK Guide V5 regarding Green PM, 2011) but are there a broader application of sustainability and 'green' in projects? This research is aiming to clarify the abstract topic of sustainability in projects, by using concepts of lean this research is aiming to provide a model of how 'green' can be incorporated into projects.

1.1 Background

There is no question about the fact that climate change is happening right here and now, climate change indirectly effects biodiversity, sea levels etc. The world does not have unlimited resources, we (human) consume more resources than the world can provide. And all evidence is pointing on the fact that human activity is responsible for the climate change (Dessler and Parson, 2006)

During studies at Chalmers University of Technology and the International Project Management course one semester was spent at Northumbria University in Newcastle upon Tyne (United Kingdom). The semester included the module 'Project Sustainability' and during this module a video clip was presented with Ray Anderson who is a chairman for Interface Inc. which is one of the largest manufacturer of modular carpets. Ray talked about 'Mission Zero', 'Mission Zero' was a goal to eliminate any negative impact on the environment that Interface Inc. had. The surprising part however was that even during economic crisis sales and profits went up for Interface Inc. (TED, 2009).

So there was a demand for 'green' products?

In Interface Inc. case they had delivered value, the sales and profit during the crisis is a clear indication. But isn't value a core concept of lean?

The connection between lean and sustainability was clear, if 'green' generates value then why do not more organizations and companies adapt some of the principles?

Along the way in the module ('Project Sustainability') sustainability was integrated into project management and projects, but the connections were unclear. There were no major literature and clear connections and parallels between 'green' and project

management did not exist. Although ‘Mission Zero’ witnesses of successful outcome, how could this be translated into project environment?

It is through some core concepts of lean this dissertation aims to clarify the connection between ‘green’ and project management.

1.2 Scope

- This dissertation is primary aiming on providing a conceptual model for integrating sustainability (green) into projects (project lifecycle) throughout lean philosophy (value).
- Sustainability in this dissertation is defined as environmental friendly and green.
- A short section on the drivers of sustainability will be presented.
- This study is aiming of developing a framework for ‘green lean’ in projects.
- The provided conceptual model of green lean will be supplemented by interviews.

1.2.1 Additional scope

- All interviews will primary be conducted in Sweden, facto to face or virtually. Other interviews outside the country will be done virtually.
- The ‘green lean’ concepts are aimed for general projects.

1.2.2 Limitations

- The interviews studies are valuable addition to the dissertation, however depending on the willingness of participation may limit the study. Other limitations are the amount of information available.
- Other aspects such as in depth analysis of ISO 14001 certifications in organizations will not be conducted in this dissertation.
- There are limitations of in depth analysis since the study is aiming for general projects which give to many variables to address.

1.3 Objectives

The overall objectives of this dissertation aim to:

- Briefly address the drivers for sustainability.
- Deliver a connection between sustainability and projects through concepts of lean.

- Identify how green relates to projects.
- Deliver a framework for ‘green lean’ in projects.

1.4 Problem Discussion

The problems with integrating sustainability into project management and projects is that the topic is at its first stage. It is diffuse, abstract and unclear although the concept of sustainability is widespread it has not yet been applied into the field of project management. By sustainability this research is aiming for the environmental field of sustainability.

Many organizations such as Interface Inc. (mentioned earlier) and Apple Inc. have progressed in the field of sustainability with profitable results at organizational level. It is a further question of how sustainability could be translated into project management and projects.

It is from an ethical standpoint clear that sustainability should be included in all areas of companies and organizations, However the business case for doing this may not meet the specific criteria’s for implementing sustainability, this is the projected image of sustainability many organizations and companies have (He 2010, p209). However some articles have pointed out the fact that in reality ‘green’ does not cost a thing but rather the opposite, ‘green’ cuts costs.

One of the core concepts of lean is to eliminate waste and deliver value, it is through this concept sustainability should be integrated to address the issues with the associated costs in the implementation of sustainability. This dissertation does not aim for delivering a complete ‘green’ standpoint towards project management but rather ‘green’ where it makes sense.

1.5 Purpose

The main purpose of this dissertation is to contribute to clear connections between projects and sustainability through concepts of lean and to demonstrate how organizations and companies can integrate sustainability thinking into their projects.

1.6 Research Question

In relation to the objectives the research questions (RQ) are:

- RQ1: What are the drivers for sustainability?
- RQ2: What are the connections between sustainability (green) and projects?
- RQ3: How can ‘green lean’ be integrated into projects?
- RQ4: What are the benefits of implementing green into projects?

- RQ5: Is it possible to generate a framework for the identified concepts of ‘green lean’?

2 Theoretical Framework

This section provides the theoretical framework for fields of this research. By theoretical framework the researcher means an equivalent to literature review. According to Biggam (2008, pp. 51-52) a good literature review (in this case theoretical framework) is characterized by relevancy to the conducted research, in-depth critical evaluation, highlights pertinent/emerging issues and cites a variety of relevant sources properly.

Since the research topic is new (see introduction) major literature specifically aiming for the objectives of this research do not exist. Due to this the literature review for this research is done by categorize each field of the research. A relation of the fields is further presented in the conceptual model/theory in later section.

2.1 Organizational culture, strategy and projects

This section is an introduction towards organizational culture, strategy and its relation to projects and the topic of sustainability.

2.1.1 Organizational culture

Organizational culture is a debated field, there are various definitions of the word ‘organizational culture’ and there is no agreed meaning of ‘organizational culture’ (Alvesson 2002, p.3). On national level of culture Bhagat and Steers (2009) describes the theory of cultures as the culture theory jungle and acknowledges the differences amongst theory of culture which suggests the broad complexity of the topic.

Organizational culture can be seen as everyday reality of the organization (Schabracq 2007, p.8). According to Schabracq (2007, p8-9) the everyday life of an organization is what happens and what its employees, managers, owners shareholders, clients, suppliers and all other involved do and experience. Johnson, Whittington and Scholes (2011, p.173) presents the Figure 2.1 below which describes the organizational culture, in other words “how things are done around here”.

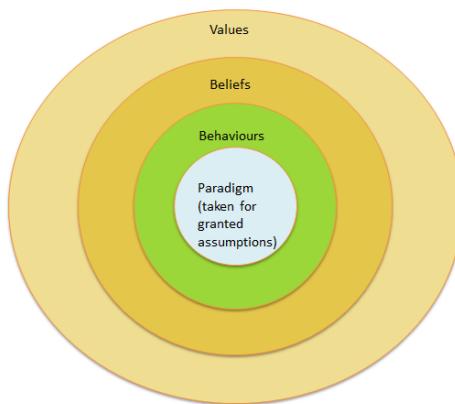


FIGURE 2.1 - ORGANIZATIONAL CULTURE

The complexity of organizational culture is however wider spread, according to Maylor (2010, p. 279) culture is not homogeneous within the organization and different cultures co-exists within the organization, in other words subcultures.

2.1.1.1 Project Culture

A case study done by Beshay and Sixsmith (2008) compared project culture and the organizational culture in two types of projects, one from an oil company and the other from a bank. Beshay and Sixsmith (2008, p.83) used Hofstede's six dimensions of culture when measuring the differences which are:

- Process oriented vs. Result oriented
- Employee oriented vs. Job oriented
- Parochial vs. Professional
- Open system vs. Closed system
- Loose control vs. Tight control
- Normative vs. Pragmatic

Beshay and Sixsmith (2008) concluded that the bank company project had aligned culture with the organization whilst the oil company had the most differences. A mentioned factor to the findings are when the project consists of employees from the organization the culture will be based on the organizations whilst when parts of the project team consists of consultants the organizational culture and the project culture are more diverse. It however shows differences at the level of project culture and organizational culture.

According to Suda (2007) project managers can however create their own project culture, but often it has to be in alignment with the organizations overall culture. But the project managers often deal with several cultures at once, the organizational culture, other subcultures within the organization and external customers (clients) culture, by communication with the surrounding cultures there is an big opportunity to find out what their values within the organization and beliefs are in order to not violate their specific values (Suda, 2007).

2.1.1.2 Sustainability and culture

From a sustainability point of view Linnenluecke and Griffiths (2010) points out that a pathway for corporate sustainability principles the organizational culture should move towards a sustainable-oriented organizational culture. This however have implications depending on different type of organizational culture (Linnenluecke and Griffiths 2010, pp.326-364). If organizations want to move towards the direction of sustainable organizational culture leaders have to move towards more social environmental values, but there are subcultures within the organization that could hinder the implementation of the particular culture (Linnenluecke and Griffiths 2010, pp.326-364). In Dalton's (2005) article a consultant Randy Harringt comments on

organizational culture; “Whatever it is you are trying to accomplish, if the culture doesn’t support it, the culture will always win”.

2.1.2 Strategy

By strategy we mean organizational strategy, strategy is “the long-term direction of an organization” (Johnson, Whittington and Scholes 2011, p.3). Long-term strategies can be illustrated in what Johnson, Whittington and Scholes (2011, p.4) calls the ‘three horizons framework’ which is illustrated in Figure 2.2 below (Johnson, Whittington and Scholes 2011, p.4).

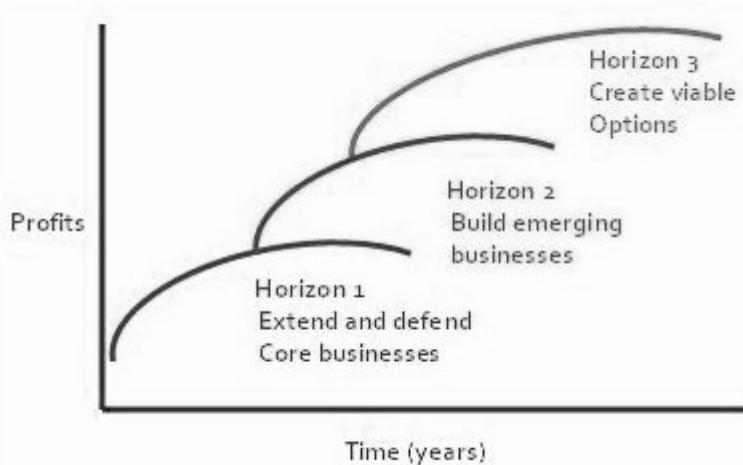


FIGURE 2.2 - THREE HORIZONS FRAMEWORK

According to Johnson, Whittington and Scholes (2011, p.5) there are different levels of strategy within an organization. These levels are:

- **Corporate-level strategy**
Overall scope of an organization
- **Business-level strategy**
Individual businesses
- **Operational strategies**
At operational level (e.g. operational decisions linked to business-level strategy)

2.1.2.1 Project Strategy

Projects are often related to strategy as means of implementing the organizational strategy, this however may be a big confusion (Morris and Jamieson 2005, p.5). Turner (1999, cited in Morris and Jamieson 2005, p.7) provides the linkage between organizational business level strategy and project strategy in Figure 2.3 below.

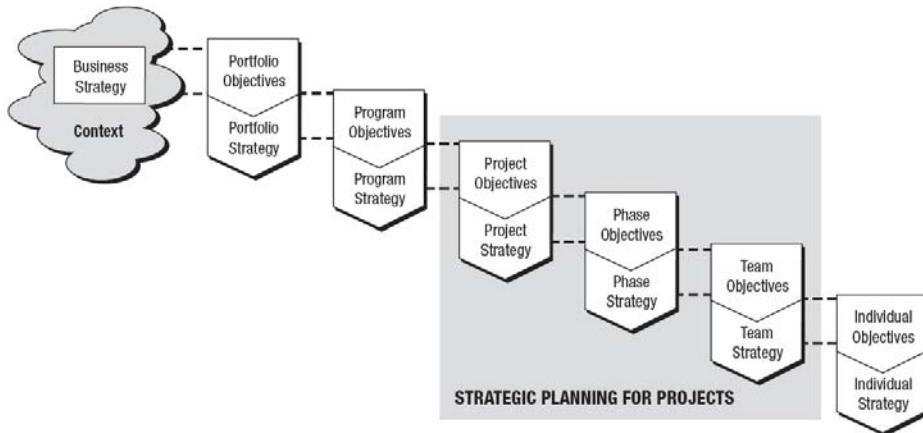


FIGURE 2.3 - LINKING ORGANIZATIONAL BUSINESS STRATEGY AND PROJECT STRATEGY

Artto et al. (2008, p.8) defines project strategy as “Project strategy is a direction in a project that contributes to success of the project in its environment”. Artto et al. (2008) concludes in their article that project strategy should not only be limited to serving the single organizational strategy but should acknowledge the projects autonomy. The project strategy should reflect and take into account on the project as an autonomous organization to fit within its complex environment. Morris and Jameson (2005, p.16) also conclude that we expect strategy to be aligned with and translated from organizational level down to portfolio and projects but project strategy should be managed dynamically.

2.1.2.2 Sustainability and strategy

Esty and Winstone (2006) describe how companies use environmental strategy to improve business and how companies should be in front when it comes to environmental strategy working proactively rather than reactive. Esty and Winstone (2006, p. 10) say following on not having an environmental strategy: “Environmental missteps can create public relations nightmares, destroy markets and careers, and knock billions of the value of a company. Companies that do not add environmental thinking to their strategy arsenal risk missing upside opportunities in markets that are increasingly shaped by environmental factors.”

2.1.3 Connection between organizational culture, strategy and projects

Tom Mochal (2003) comments on the fact that organizational culture plays a big role on delivering successful projects, training of project manager, roles and responsibilities, organizational structure etc. are fields that could play a big role on the success rate of projects. Project Management Institute (2008 p.27) also concludes that culture, style and structure influences projects and that an organizations degree of project management maturity and project management systems influences the project.

Isadore Sharp, CEO at Four Seasons Hotels further comments on the relation between strategy and organizational culture:

“If you don’t understand the culture of your company, even your most brilliant strategies will fail. Your vision will be resisted, plans won’t get executed properly, and all kinds of things will start going wrong.” (Cited in Burns 2008, p.1)

Aligning strategy with organizational culture is a ground for organizational success in following fields (Burns, 2008):

- Creates distinctive advantage
- Delivers mission
- Builds productivity
- Creates breakthrough performance results
- Manages risks
- Maintains sustainability (not in ‘green’ terms).

2.2 Project Lifecycle

This section provides the theoretical framework approach for the project lifecycle in this research. A distinction is made between traditional project lifecycle and the ‘true project lifecycle’ as described by Maltzman and Shirley (2011).

2.2.1 Traditional project lifecycle

Maylor (2010) describes the project lifecycle with the 4D model. Define, Design, Deliver and Develop. The 4D model and the traditional project lifecycle and some of its components (from Maylor, 2005) is illustrated in figure 2.4 below.



FIGURE 2.4 - PROJECT LIFECYCLE

There are several other models of the project lifecycle, some organizations have their own definition of their specific project lifecycle. These lifecycle are however similar to the presented lifecycles and the Project Management Institute (2008) provide a similar project lifecycle as Maylor (2005) does. See figure 2.5 below (Project Management Institute 2008, p.19). It should be noted that the project lifecycle presented in the figures fall under the category as ‘waterfall’ lifecycles and should be

distinguished from ‘Incremental’ and ‘Agile’ project lifecycles (*Which lifecycle is best for your project?*, 2008).

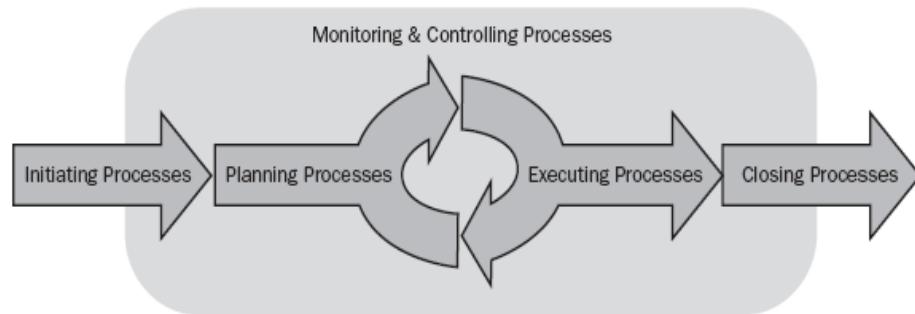


FIGURE 2.5 - PMI PROJECT LIFECYCLE

There are also phase-to-phase relationships amongst projects either a sequential relationship or an overlapping relationship see Figure 2.6 and Figure 2.7 (figures and examples from Project Management Institute (2008, p.21))

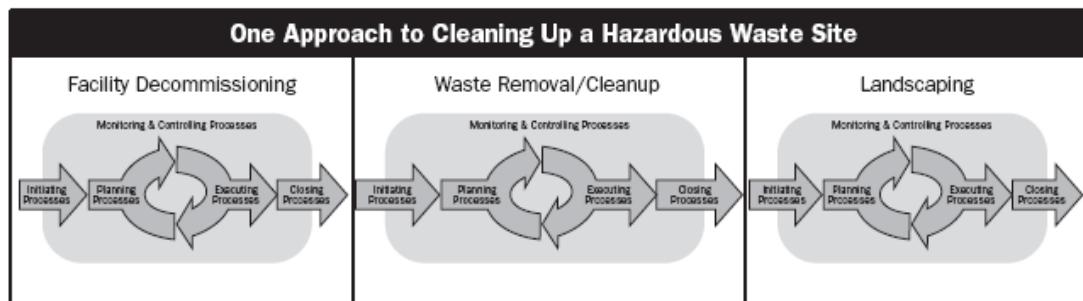


FIGURE 2.6 - PMI PROJECT LIFECYCLE; SEQUENTIAL RELATIONSHIP

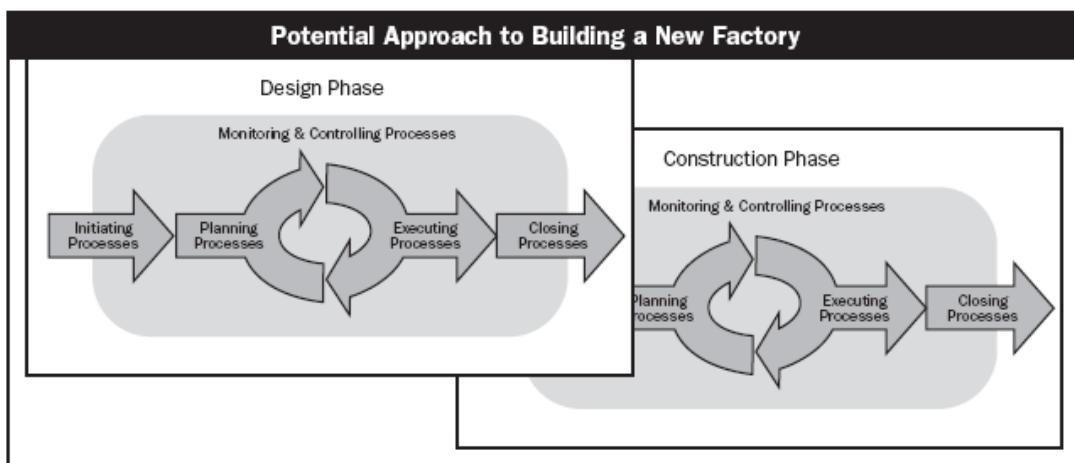


FIGURE 2.7 - PMI PROJECT LIFECYCLE; OVERLAPPING RELATIONSHIP

2.2.2 The true project lifecycle

The difference between the traditional project lifecycle and the true project lifecycle is that it stretches beyond the deliver (handover) phase (Maltzman and Shirley 2011, p.49). Dave Shirley divides the whole project lifecycle in processes and the product (Softwareprojects, 2010), the processes aims for the traditional project lifecycle whilst the product aims for the lifecycle not included in the traditional project life cycle which is the outcome (product, service etc.) and this is illustrated in Figure 2.8 below.



FIGURE 2.8 - TRUE PROJECT LIFECYCLE

If we consider the phase-to-phase related project traditional project lifecycle from the ‘true project lifecycle’ it would have its own ‘product’ part. Figure 2.9 below illustrates how the potential approach to build a new factory from Figure 2.7 lifecycle would look like.

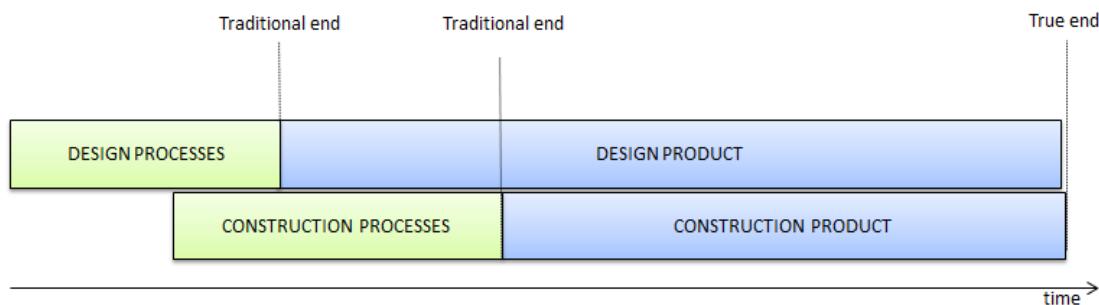


FIGURE 2.9 - TRUE PROJECT LIFECYCLE; OVERLAPPING RELATIONSHIP

2.3 Project success

Amongst practitioners and academics there is both internal and external disagreement between what constitutes project success (Prabhakar 2008, p.3). There is a distinction made between project success and project management success (Prabhakar 2008, p.3). De Witt (1998, cited in Prabhakar 2008, p.3) describes project as a measure against overall objectives whilst project management is measured towards the iron triangle. In alignment with the distinction between project success and project

management success there are differences in types of success criteria's between project success and project management success (Prabhakar 2008, p.3).

However Baker, Murphy and Fisher (1998, cited in Prabahakar 2008, p.7) describes a projects 'overall success' (both project success and project management success) as if "the project meets the technical performance specifications and/or mission to be performed, and if there is a high level of satisfaction concerning the project outcome among key people on the project team, and key users or clientele of the project effort".

2.4 Lean

In this section the fundamentals of lean is presented followed by a section on value and waste.

2.4.1 Fundamentals of lean

One of the most recommended books about Lean is *The Toyota Way* written by Liker, J. (Miller, 2007; Lean Production Systems, 2012; Toyota, 2012). Liker (2004) presents 14 management principles and provides a feel for the "lean philosophy". Melendez (2009) describes lean as "Lean is the relentless pursuit of adding value for the customer, waste elimination, and continues improvement from a standard at the point of activity by everyone, everywhere, everyday!" Adding value and removing waste are two components in lean presented by Liker (2006) as well. Value is the activity or whatever it may be that the customer is willing to pay for (England, 2010). Waste on the other hand can be shortly described as the opposite, what the customer is not willing to pay for (Thomas Group, 2012).

The 14 principles described by Liker (2006) are listed below:

- Base your management decisions on a long-term philosophy, even at the expense of short-term financial goals.
- Create continuous process flow to bring problems to the surface.
- Use "pull" systems to avoid overproduction.
- Level out the workload.
- Build a culture of stopping to fix problems, to get quality right the first time.
- Standardized tasks are the foundation for continuous improvement and employee empowerment.
- Use visual control so no problems are hidden.
- Use only reliable, thoroughly tested technology that serves your people and processes.
- Grow leaders who thoroughly understand the work, live the philosophy, and teach it to others.
- Develop exceptional people and teams who follow your company's philosophy.

- Respect your extended network of partners and suppliers by challenging them and helping them improve.
- Go and see for yourself to thoroughly understand the situation.
- Make decisions slowly by consensus, thoroughly considering all options and implement decision rapidly.
- Become a Learning organization through relentless reflection.

2.4.2 Value and waste

In the beginning of this section waste was described as what the client is not willing to pay for, Sassenberg (2008, p.36) summarize lean as the only value that a company can provide by looking through the customer's eyes. There are originally seven wastes in lean philosophy (defects, over processing, transportation, motion, waiting, inventory, overproduction) (McBride, 2003) there are however two more wastes that can be added. The additional wastes are the underutilization of creativity of employees and the environmental waste (Vinodh et al. 2011, p.469). A list of the combined wastes is presented below:

- Defects
- Over processing
- Transportation
- Motion
- Waiting
- Inventory
- Overproduction
- Underutilization of creativity
- Environmental waste

Value on the other hand as defined earlier is what the customer or client is willing to pay for. Value however is not easy to identify since it is subjective and in projects value is perceived differently amongst clients and stakeholders and there are several types of value (Kerzner and Saladi 2009, p.63). In relation to projects completing a project within the iron triangle does not guarantee that value has been provided (Kerzner and Saladi 2009, p.36).

Salvatierra-Garrido and Pasquie (2011, p.14) advocate that value (in construction) should move from customer to global context looking to satisfy society. Salvatierra-Garrido and Pasquie (2011, p.15) provides Figure 2.10 below that shows where the traditional understanding of value lie.

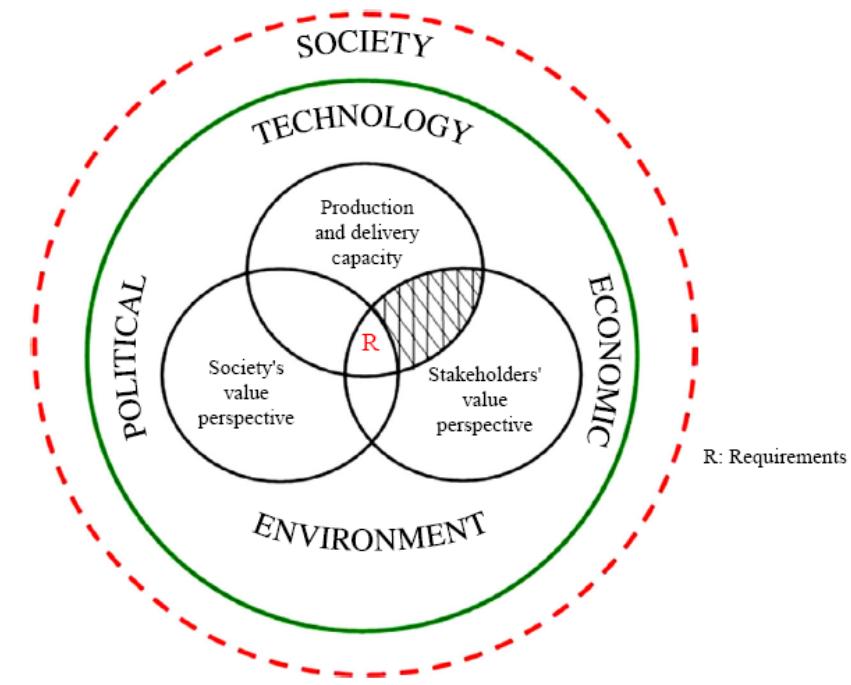


FIGURE 2.10 - TRADITIONAL UNDERSTANDING OF VALUE

Salvatierra-Garrido and Pasqure (2011, p.16) conclude that society should be included in the client focus.

2.5 Sustainability

In this research the green in 'Green Lean' is the synonym for sustainability, and by sustainability this research have an environmental perspective. This section describes the underlying drivers for sustainability and what sustainability in project management is.

2.5.1 Definition of sustainability

As earlier described green and sustainability should be interpreted as doing things that are only beneficial for the environment but it should rather be seen as doing things more environmental friendly. Doing things sustainable is doing things with aspects on the economic side, the social side and the environmental side. This is presented by Elkington (1997, pp.74-92) as the 'triple bottom line'. 'The triple bottom line' is illustrated in Figure 2.11below (Ernest & Young, 2012). The common definition of sustainable development is the definition presented in the UN Conference 1987 which is 'Developments that meets needs of the present without compromising the ability of future generations to meet their own needs' (The World Bank Group, 2006). From the figure 2.51 we can see that true sustainability is reached when what we do, the activities etc. is within all three boundaries.



FIGURE 2.11 - TRIPLE BOTTOM LINE

2.5.2 Drivers for sustainability

A summarization of Dessler and Parson (2006) of drivers is the climate change, the temperature is changing and this has an effect on sea levels, biodiversity etc. But what drives organization towards sustainable thinking? According to McKeown (2010, p.24) CEOs of corporates is seeing sustainability as a critical business driver, and in a study made by United Nations Global Compact amongst CEOs following factors have been identified as drivers for taking action on sustainability issues (McKeown 2010, p.24).

1.	Brand, trust, and reputation	72%
2.	Potential for revenue growth/cost reduction	44%
3.	Personal motivation	42%
4.	Consumer/Customer demand	39%
5.	Employee engagement and recruitment	31%
6.	Impact of development gaps of business	29%
7.	Governmental/regulatory shareholders	24%
8.	Pressure from investors/shareholders	12%

*(Respondents identified each factor in their top three choices)

Pedersen, D (2010) lists based on his judgment nine top drivers for corporate sustainability.

- Investors.
- Non-governmental organizations.
- Business customers.
- Resource shortages.
- Consumer preference.
- ROI Projects.

- Local, state and national laws.
- Employee recruitment and retention.
- Brand equity.

Figure 2.12 below from Corporate responsibility drivers (2012) also illustrates the different drivers for corporate responsibility and sustainability.



FIGURE 2.12 - DRIVERS FOR CORPORATE RESPONSIBILITY AND SUSTAINABILITY

2.5.3 Benefits and barriers

He (2010 pp.205-206) describes the benefits of implementing environmental management principles which are cost saving, competitive advantage, media recognition minimization of risk, recognition of environmental efforts by stakeholders etc. Although there are benefits, some barriers to implement environmental management which are increasing cost, lack of trained staff and expertise, lack of subcontractor cooperation, lack of stakeholder awareness and that it is time consuming (He 2010, p.209).

Esty and Winstone (2006, pp.239-249) have identified some pitfalls when implementing green or sustainability into organizations, some of the pitfalls is presented below:

- Seeing the tree but not the forest (Missing the real issue)
- Misunderstand the market
- Expect price premium.
- Misunderstanding customers.
- Middle management squeeze (Green initiatives ignored by middle management)
- Silo Thinking (only focusing on small parts)
- Eco-isolation

2.5.4 Sustainability and green in projects

Tom Mochal who is a project manager at TenStep, Inc. is one of the familiar with the concept of green project management (TenStep, Inc. 2009) and he acknowledges the fact that ‘green’ in project management is relatively new area and during his research on the topic he found that there were not much material on the field of green in project management (Sfutterer, 2008).

According to Maltzman and Shirley (2011) all project can be divided into four categories which are:

- Green by Definition
Projects that are about sustainability (e.g. Wind power).
- Green by Project Impact
Have not green outcome but have positive impact on the environment (e.g. Electric car).
- Green by Product Impact
Where the product of the project is not directly aiming for energy savings etc. (e.g. expansion of a factory).
- Green in General
Projects with no green (e.g. software development, movie making etc.)

The project managers role is depending on the type of project is presented below in Figure 2.13 (Maltzman and Shirley, 2011, p.66) where the less focus is on green, the project manager have to play a stronger role in order to have an positive affect on sustainability.

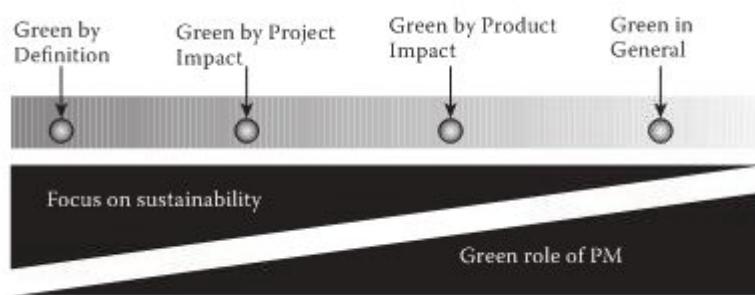


FIGURE 2.13 - PROJECT MANAGERS ROLE

In Maltzman and Shirley’s (2011) book there are several ways of a project to become green, some of the ways are listed below.

- **Using the environmental lens**

Projects viewed through an environmental lens which means that the processes and the product (described in the part of project lifecycle) is viewed in such a way that what can be done to increase green will be done.

- **Cradle-to-cradle**

Take, Make, Waste	
Cradle to Grave	Cradle to Cradle
Take	Closed Loop
Make	Technical "Nutrients"
Waste	Eco-effectiveness

FIGURE 2.14 - DIFFERENCE BETWEEN CRADLE-TO-GRAVE AND CRADLE-TO-CRADLE

Instead of cradle-to-grave thinking in projects use cradle-to-cradle concept, see Figure 2.14 above (Maltzman and Shirley 2011, p.22). Cradle-to-cradle is the concept of only using materials that are non-harmful to the environment and recyclable in a continuous cycle of use ('Cradle-to-cradle design', 2012).

- **Using renewable energy**

Only using renewable energy resources in the project.

- **SMARTER Objectives**

Going from the traditional SMART objectives to SMARTER objectives which add E for 'Environmentally' and R for 'Responsible'.

- **Reducing non-productive output**

First step is to redesign process or product so that all of the raw material (including human resources) are used to a maximum.

Second step is to reduce the usage of raw materials that produce waste.

Third step is to reuse.

Maltzman and Shirley (2011, p.39) provides the concept of greenality which is an equation. Greenality stands for Quality + Green which mean that earlier theory upon quality is now supplemented with an element of green. Maltzman and Shirley (2011, p.39) also argues that green must be designed in and not inspected in. Maltzman and Shirley (2011, p. 43) provides the Figure 2.15 below to illustrate similarity between Juran's (1998, cited in Maltzman and Shirley 2011, p.42) traditional approach to quality planning and 'greenality planning'.

Quality/Greenality Trilogy ^a	
Quality Planning	Greenality Planning
Identify who are the customers.	Identify who are the customers.
Determine the needs of those customers.	Determine objectives.
Translate those needs into our language.	Translate those objectives (SMARTER). ^b
Develop a product that can respond to those needs.	Develop a plan to address those objectives (SMARTER).
Optimize the product features so as to meet our needs and customers' needs.	Optimize the green objectives so as to meet our needs and customers' needs.
Quality Improvement	Greenality Improvement
Develop a process that is able to produce the product.	Develop a process that addresses the greenality issues.
Optimize the process.	Optimize the process.
Quality Control	Greenality Control
Prove that the process can produce the product under operating conditions with minimal inspection.	Prove that the process can produce a product with high greenality with a minimal inspection.
Transfer the process to Operations.	Ensure product is environmentally responsible in the future.

FIGURE 2.15 - SIMILARITY BETWEEN QUALITY PLANNING AND GREENALITY PLANNING

2.5.5 Green project management

Green project management can be summarized as thinking green throughout the project and having environmental criteria in the decision making process (Mochal 2008a, p.2). According to Maltzman and Shirley (2011, p.74) a project should be initiated from the beginning with the perception of that a green project is the right thing to do. An important factor though according to Mochal and Krasnoff (2008, p.3) is not to make every decision as green as we can but take the environment into account. In relation to earlier definition of sustainable development the definition of corporate sustainability can be redefined as “meeting the needs of a firm’s direct and indirect stakeholders (such as shareholders, employees, clients, pressure groups, communities etc.) without compromising the ability to meet the needs of future stakeholders as well” (Dyllick and Hockerts 2002, cited in Hulspas and Maliepaard 2011, p.4).

Krasnoff (2008) have aligned following areas of knowledge in the PMBOK Guide (Project Management Institute, 2008) with green project management.

- Integration management

The environment as an aspect in change.

- Scope management

Environment as scope and environmental impact of scope change.

- Time management

Project schedule should define any project activities in support of environmental policy or environmental management system.

- Cost management

Incorporate environmental costs.

- Quality management

Gather green requirements from stakeholders.

- Human resource management

Train staff in environmental policies.

- Communication management

Communicate environmental actions that are project-related, look how the actions align with the corporate environmental policy.

- Risk management

Environmental risks taken into account of project.

- Procurement management

Educate vendors on the company's environmental management plan, vendors can take environmental impact into account.

At the IPM expert seminar ‘survival and sustainability as challenges for projects a checklist was provided for project managers and projects to translate sustainability into practical application (Silvius and Schipper 2010). The environmental part of the triple bottom line and its practical application is presented below in Figure 2.16 (Silvius and Schipper 2010).

Environmental Sustainability	Transport	- Local procurement - Digital communication - Traveling - Transport
	Energy	- Energy used - Emission / CO2 from energy used
	Waste	- Recycling - Disposal
	Materials and resources	- Reusability - Incorporated energy - Waste

FIGURE 2.16 - ENVIRONMENTAL SUSTAINABILITY IN PROJECTS

Silvius and Schipper (2010) also comment that “Maturity models are a practical way to ‘translate’ complex concepts into organizational capabilities and to raise awareness for potential development”. Silvius and Schipper (2010) provides a conceptual model of sustainable maturity in projects (see figure 2.17) which describes at what

level (resources, business process, business model, product/services) the aspects of sustainability is considered.

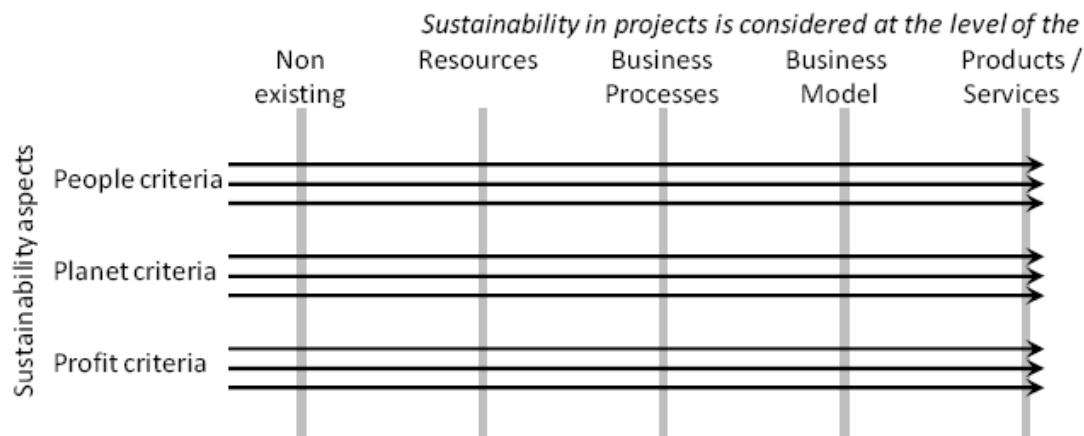


FIGURE 2.17 - SILVIUS AND SCHIPPER'S (2010) MATURITY MODEL OF SUSTAINABILITY

Silvius and Schipper (2010) are using a questionnaire with four sections and in total 31 questions. The example questions from Silvius and Schipper (2010) for environmental sustainability in projects (not full questionnaire) are presented below in Figure 2.18.

In which way does the project try to minimize its waste?

- | Actual
situation | Desired
situation | | | | |
|---------------------|----------------------|-----|--|--|--|
| A. | [] | [] | No specific policies on this point. | | |
| B. | [] | [] | Waste in the project is separated in recyclable and non-recyclable and collected by the local waste handling companies. | | |
| C. | [] | [] | The project has policies (e.g. double sided printing) to minimize waste and waste in the project is separated. | | |
| D. | [] | [] | The project is designed to minimize waste and necessary waste is as much as possible recycled in the project itself. | | |
| E. | [] | [] | The project and the result it delivers are designed to minimize waste and necessary waste is as much as possible recycled in the project or result itself. | | |

FIGURE 2.18 - QUESTIONS FROM SILVIUS AND SCHIPPER (2010)

2.6 Examples from the real world

This section provides examples from the real world of organizations and companies that have adapted sustainable thinking, however specific information on particular projects within the organizations are not available.

2.6.1 Apple Inc.

Apple Inc. is a multinational corporation which provides consumer electronics, computer software and personal computers. The star products of Apple are Macintosh, iPod, iPhone and the iPad. Apple was according to Fortune magazine the most admirable company in the world from 2008-2011 ('Apple Inc.', 2012).



FIGURE 2.19 APPLE INC (APPLE INC, 2012)

Apple calculates their environmental footprint by estimating their total carbon footprint, see Figure 2.20 below (Apple Inc, 2012).



FIGURE 2.20 -APPLE'S TOTAL FOOTPRING (APPLE INC, 2012)

But Apples revenue growth is continuously rising (Apple Inc, 2012) in Figure 2.21 below revenue grow and CO₂ emission growth is illustrated.

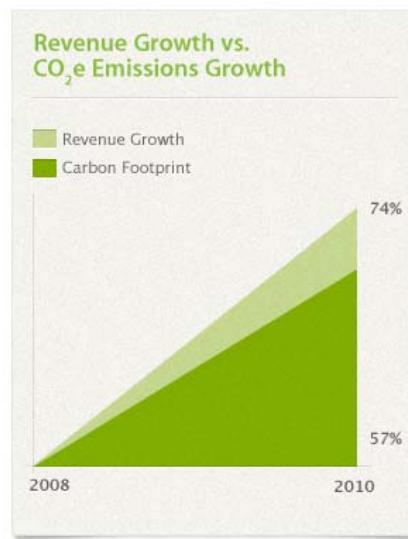


FIGURE 2.21 - REVENUE GROWTH VS. CO₂ EMISSION GROWTH (APPLE INC, 2012)

At manufacturing level Apple have reduced carbon emissions (see Figure 2.22) at several product lines and removed toxic materials, carbon emissions during

manufacturing have been decreased by for example using less material but still increase the products performance (Apple Inc, 2012).



FIGURE 2.22 - REDUCTION IN CARBON EMISSION AT MANUFACTURING LEVEL (APPLE INC, 2012)

At product use Apple have concentrated on energy efficiency, Mac mini for instance is the most energy-efficient desktop computer in the world. Apple is also the only company in the industry that has the energy star qualification in all of their products. Figure 2.23 below illustrates CO₂ emissions per hour of product use for Apple's products.



FIGURE 2.23 - CO₂ EMISSIONS PER HOUR OF PRODUCT USE (APPLE INC, 2012)

Apart from the previous described incentives by Apple in the field of environmental concerns facilities, transport and recycling are also areas where Apple are improving. Apple is making reduction in packaging in order to decrease use of material and transport more units per plain. Apple are aiming towards weight recycling 70% in 2010-2015 compared to 6.1% in 2005 and facilities are using renewable energy whilst over 900 employees of Apple ride biodiesel commuter coaches to work (Apple Inc, 2012).

2.6.2 Timberland

Although bad economy, green companies like timberland continue to grow, and when other stores closed down timberland opened an eco-friendly store in New York (Maltzman and Shirley 2011, p. 15). Timberland provides clothes, watches, leather good and footwear for outdoor activities such as hiking, mountaineering and casual wear.

Timberland have over the years reduced their carbon footprint and saved over one million dollars per year since 2006 (Timberland 2012a). Figure 2.24 below from their goals and progress (Timerbland 2012b) illustrates Timberlands reduction of carbon footprint.

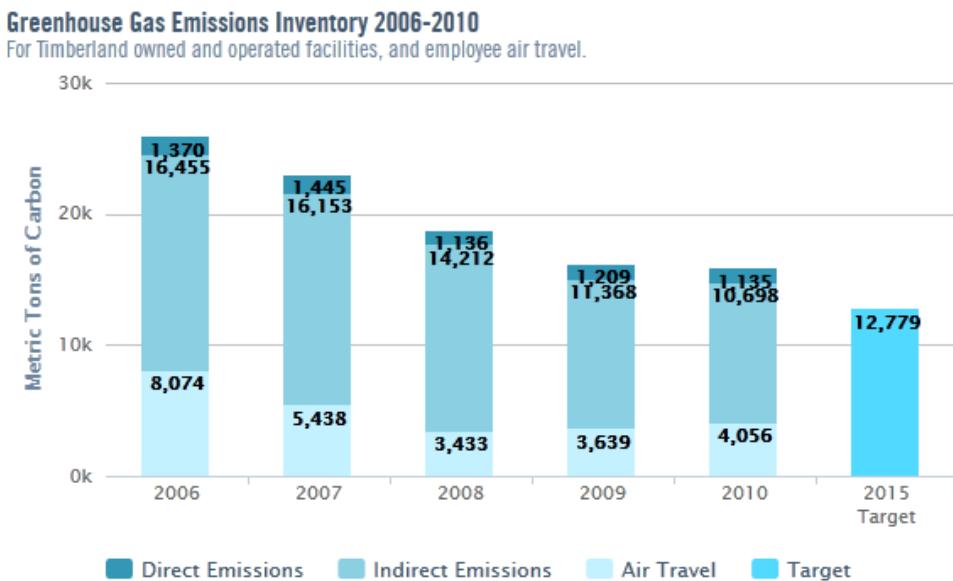


FIGURE 2.24 - TIMBERLANDS REDUCTION OF CARBON FOOTPRINT FROM 2006 TO 2015 (TARGET)

Timberland have also used cradle-to-cradle thinking in their footwear products, most of the products are recyclable and reusable, Timberland also use almost only silver or better rated tanneries as suppliers (Timberland 2012c). Figure 2.25 (Timberland 2012c) below illustrates the eco-conscious materials used in their footwear collection.

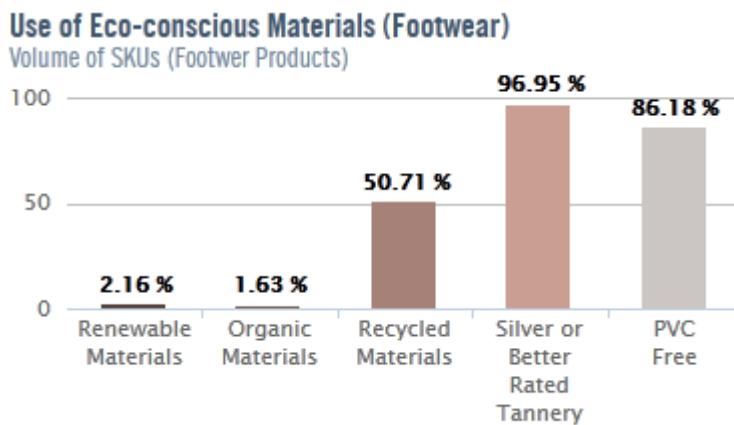


FIGURE 2.25 - USE OF ECO-CONSCIOUS MATERIALS

2.6.3 Project ‘Hammarby Sjöstad’

‘Hammarby Sjöstad’ is Stockholm’s largest construction project in modern times, when completed it will be home for over 20 000 people in 9000 apartments, since the start it has been internationally recognized as role model for sustainable development (White, 2012). White which is an architectural bureau have been responsible for some of the development within the project. White have provided energy-efficient solutions (e.g. solar panels) and environmental friendly construction material and also provided guidelines for material choice within the project (White 2012).

2.6.4 Ford and the River Rouge plant

While Ford at the moment was struggling with losses their chief executive decided to provide the River Rouge complex with a new roof (Schneider 2002). Ford put sedum which is a rugged plant as roof on their complex, the sedum absorbs heat and water which means that the roof is cooling the factory during the summers and warms during the winter (Schneider 2002). Its estimated to save Ford about 35 million dollars (the investment included) (Schneider 2002). Except the heating system the roof works as a rainwater treatment system which saves Ford from a 50 million dollar mechanical treatment system ('Ford River Rouge Complex' 2012). Figure 2.26 below shows Ford's River Rouge plant (Patton, 2010).



FIGURE 2.26 - FORD'S RIVER ROUGE PLANT

3 Methodology

The research methodology is conducted to address the main objectives of this dissertation which is; ‘Delivering clear connections between sustainability and project management throughout concepts of lean’ and ‘Identifying how integrating green lean into project management affects the project lifecycle’, all of the objectives can be found in the introduction section of the dissertation (section 1.0). Analysing the theoretical framework (section 2.0) brings to the conclusion that there is a gap between sustainability and project management due to the fact that it is a new topic and clearer connections and parallels need to be drawn in order for sustainability in project management to make sense. This section will provide the research strategy, data collection, framework for data analysis and limitations and potential problems. The structure of this section is provided from Biggam (2008) book succeeding with your master’s dissertation.

3.1 Research strategy

This section describes the research strategy and the justification for using the research strategy.

3.1.1 Qualitative research and inductive approach

This research uses qualitative research methods in favor over quantitative research methods since the concepts of integrating lean and sustainability into project management is a relatively rare combination. “Qualitative research is more likely to explore processes....than outcomes” (Vanderstoep and Johnston 2009, p.165). The qualitative research will also use an inductive approach which starts with observations, then followed by theory, hypothesis and interpretation (Vanderstoep and Johnston 2009, p.168). A qualitative research methodology is also favored over a quantitative because quantitative is concerned with quantities and measurements and answer the question ‘how’ whilst qualitative is answering the question ‘why’ (Biggam 2008, p.86). In relation to the objectives the ‘why’ questions is why there are connections between lean, the project lifecycle and sustainability. Why ‘green lean’ lean can be implemented in project management and etc. It should however be pointed out that drivers for sustainability is done by looking at quantitative presented data in favor over qualitative to get the ‘why’ answer.

As mentioned earlier an inductive approach is used because “the inductive cycle results in new theory or elements that could lead to a theory” Jonker and Pennink (2010 p.79). The inductive cycle is presented in Figure 3.1 below (Jonker and Pennink 2010, p.78). (Same as inductive approach provided by Vanderstoep and Johnston (2009) previous).

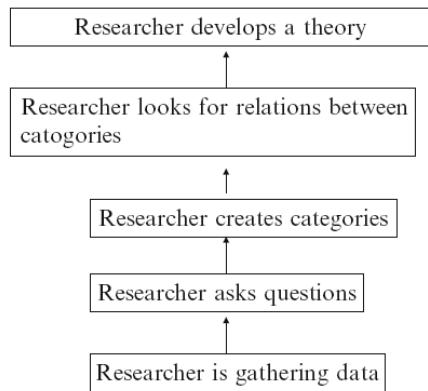


FIGURE 3.1 - INDUCTIVE APPROACH (JONKER AND PENNINK 2010 P. 79)

3.1.2 Methodology

This research will be done by using similar methodology to the grounded theory methodology which is mainly used in qualitative research ('Grounded theory', 2012). The purpose of grounded theory is to study processes with the intention of developing a theory or a model that explains a phenomena (Grounded theory, 2012). Grounded theory involves the generation of theory from data ('Grounded theory', 2012). "The data material is used to search for categories, characteristics of these categories and relationships between them" Biggam (2008, p. 84).

There are two levels of theory building, the first one is substantive theory and the other one is formal theory. The core differences between the two levels are that formal theory is a theory that are applicable across a range of situations and substantive theory is more suited for a specific type of situation (Goulding 2002, p.46). Although most researches avoid formal theory (Goulding 2002, p.46) this research aims to generate a formal theory. Grounded theory has its origins from sociologists, but the principles of grounded theory have diffused into other disciplines and one of them is management (Goulding 2002, p.38).

The justification for using a grounded theory methodology (parts of it) for this specific research is because the initial objective is to deliver a framework (theory) for the concept of 'Green Lean'. It is a relatively new concept and in order to fully understand the phenomena a grounded theory approach is used because it allows the researcher to be creative and fully explore the phenomena due to the fact that in grounded theory everything is data ('Grounded theory', 2012).

The distinction made between this research and grounded theory is coding. Coding is an essential part of grounded theory (Goulding, 2002). This research however aims in some extend towards coding due to the fact that there are categories (sustainability, lean and the project lifecycle) and that the research aims towards identifying connections and parallels between these categories. This research is therefore not grounded theory but rather using elements from the methodology and using grounded theory as an inspiration.

Conceptual models and grounded theory may at first glance be incompatible, however according to Soulliere, Britt and Maines (2001) conceptual models can be used as a valuable tool supplementing grounded theory. As this research uses parts of grounded theory a conceptual model will be conducted, from Jonker and Pennink (2010, p.48) there are three functions of a conceptual model:

- Relating the research to the existing literature and indicates in what way the researcher is looking at the phenomena in his research.
- Helps structuring the problem.
- Conceptual models is linked to system theory, it helps to identify the elements of the system, the relations between the elements and etc.

In this research the phenomena is the ‘green lean’ concept, since sustainability (green) is a relatively new area in project management. The justification for using a conceptual model to supplementing the grounded theory approach is to earlier described functions of an conceptual model. To describe how the phenomenon is viewed for audits, helps structuring problems and identify relationships between elements.

When constructing the conceptual model elements of the approach described by Jonker and Pennink (2010, p.55) will be used such as:

- Relevant models of the specific fields.
- Try to see how people involved see the problem.
- Show relations between the concepts.

The conceptual model which helps structure the problem will be used in later stages as a ground for interviews to verify/clarify the conceptual model.

3.2 Data collection

As described earlier this research uses an inductive approach by first gathering data. Sampling technique of gathered data is described in the later section of sampling whilst the type of data is described in this section.

Using more than one technique to collect data allows for triangulate results (Biggam 2008, p. 101). This research is primary focusing on interviews and secondary data. Although some data can be hard to categorize according to Creswell (2007, p. 129) data can be categorized in four types:

- Observation
- Interview
- Documents
- Audio-visual material

In this dissertation interviews, documents and audio-visual material will be included because it fits the research strategy and doing observation does not contribute to reach the objectives in part 1 of this dissertation.

Types of data in specific category:

- Interviews:
Interviews either in person or virtually (according to chosen sampling method and approach described in next part).
- Documents:
Documents from journals, books, open sources (internet) etc.
- Audiovisual material:
YouTube and other audiovisual sources available online.

3.2.1 Interviews

According to Rugg and Petre (2007 p.138) There are three types of approaches during interviews.

Structured: *Topic, questions etc. are predetermined.*

Semi-structured: *Some predetermined structure of interview but room for creativity.*

Unstructured: *No predetermined structure in the interview.*

Rugg and Petre (2007 p.139) provides another classic distinction in interviews which are open or closed interviews.

Open: *Unlimited set of response.*

Closed: *Limited set of response (yes/no) questions.*

The approach used in this research will be semi-structured with a mixture of open/closed questions. The justification for using semi-structured interviews is to keep focus on the topic but still being able to make room for possibly undiscovered information that could contribute to the research. A mixture of open and closed interviews is based on the same principle, some questions have to aim for verification whilst other questions make room for creative answers and can contribute to the research.

3.2.2 Sampling

Miles and Huberman (cited in Creswell 2007, p.127) provides following table (See Table 3.1 below) as an illustration of sampling techniques in qualitative research.

Type of Sampling	Purpose
Maximum variation	Documents diverse variations and identifies important common patterns
Homogeneous	Focuses, reduces, simplifies, and facilitates group interviewing
Critical case	Permits logical generalization and maximum application of information to other cases
Theory based	Find examples of a theoretical construct and thereby elaborate on and examine it
Confirming and disconfirming cases	Elaborate on initial analysis, seek exceptions, looking for variation
Snowball or chain	Identifies cases of interest from people who know people who know what cases are information-rich
Extreme or deviant case	Learn from highly unusual manifestations of the phenomenon of interest
Typical case	Highlights what is normal or average
Intensity	Information-rich cases that manifest the phenomenon intensely but not extremely
Politically important	Attracts desired attention or avoids attracting undesired attention
Random purposeful	Adds credibility to sample when potential purposeful sample is too large
Stratified purposeful	Illustrates subgroups and facilitates comparisons
Criterion	All cases that meet some criterion; useful for quality assurance
Opportunistic	Follow new leads; taking advantage of the unexpected
Combination or mixed	Triangulation, flexibility; meets multiple interests and needs
Convenience	Saves time, money, and effort, but at the expense of information and credibility

TABLE 3.1 – SAMPLING TECHNIQUES

The sampling approach used in this research will be a mixture of theory based sampling or also known as theoretical sampling and random purposeful sampling. Theoretical sampling is samples that are theory driven (Marshall 1996, p.523). Random Purposeful sampling is when the researcher selects a random productive sample to answer the research question (Marshall 1996, p.523).

The theoretical sampling approach will be used when building up the conceptual model whilst random purposeful sampling will be used when conducting interviews. The justification for using this approach is because the researcher wishes to have a theory based conceptual model that helps structuring the problems and by random purposeful sampling contribute further to the concept of ‘Green Lean’.

- Theoretical sampling

Glaser and Strauss (1967 cited in Robert Wood Johnson Foundation, 2008) describes the sampling technique that is based on emerging theoretical concepts. The theoretical sampling in this research will be done by categorize the following identified topics of the research:

- Organizational culture, strategy and projects.
- Project lifecycle.
- Sustainability.
- Lean.

The samples will be taken depending on relevancy, appropriateness and reliability based on the researcher's judgment.

- Random purposeful sampling

The sampling of the interviewees is random purposeful sampling, in Figure 3.1 random purposeful sampling is preferred when purposeful sampling is too large. The sampling approach is similar to the theoretical sampling described above the interviewees will be chosen by relevancy towards the area of this research, especially focused on the field of sustainability in project management.

3.3 Framework for data analysis

Biggam (2008, p. 118) provides an approach (se Figure 3.2) on how to analyze data, a modification of this approach will be used during this research as a framework for the data analysis (se Figure 3.3).

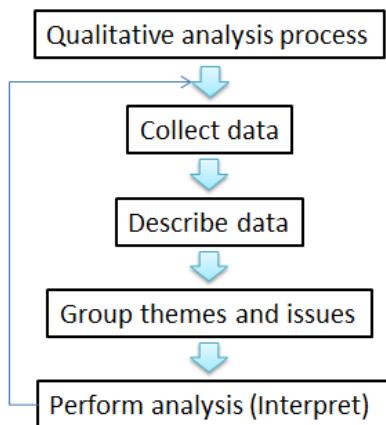


FIGURE 3.2 - FRAMEWORK FOR DATA ANALYSIS BY BIGGAM (2008, P.118)

Figure 3.3 below presents the data analysis framework for this research (Modification of Figure 3.2 from Biggam (2008)).

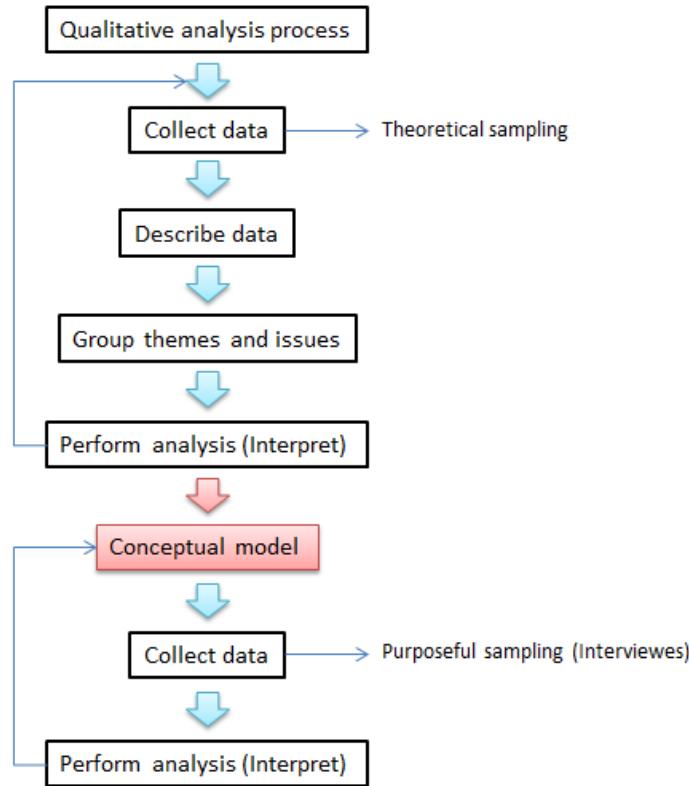


FIGURE 3.3 - DATA ANALYSIS FRAMEWORK FOR THIS RESEARCH

3.4 Limitations and potential problems

The identified limitations and potential problems for this dissertation are presented below.

- **New Topic**

Since the concept of sustainability in projects is a relatively new topic in the field of project management this can set limitations and problems when doing this research. Adding further concepts (lean) into the research makes the topic rarer. This new type of phenomena has therefore limitations in available data.

- **Wide topic**

The topic is wide and complex, since there are many variations in type of projects and businesses there are not room to address all factors that can affect the concept of 'Green Lean'.

Following actions during this research has been taken to address the limitations and problems.

- **Conceptual model**

The limitation and problems discussed above regarding the research have been addressed by the conceptual model. The aim for this is to structure the

problem and so that audits of the research can see how the concept is viewed from the researchers' point of view. It is however from the researchers' wishes that this dissertation has potential for further research in the area of sustainability and project management.

3.5 Summary of research procedure

The initial phase of this research started with reviewing literature and data to determine the relevancy to this research. The data was primary extracted from:

- Journals
- YouTube
- Internet
- Books
- Conferences

The relevancy and credibility was determined before using the context, the criteria's used for determine credibility and relevancy was following:

- Contribution to topic
- Relation between categories in topic
 - Green
 - Lean
 - Sustainability
 - Project
 - Project Management
- Subject
 - Hidden agendas (Political aspects such as climate change etc.)
 - Sensibility of topic
 - Etc.
- Author/Organization
- Authors relation to subject
- Year of publication

This following data was ground for the conceptual theory provided in chapter 4.0.

The conceptual model was ground for the upcoming interviews. The sampling technique used for the interviews was random purposeful sampling which means that the participants were chosen based on criteria's. The criteria are used to determine participants in the interviews were.

- Experience in projects.
- Type of industry (need for mixture of industries).
- Experience in project management.

Figure 3.4 below illustrates the targeted areas of the interviewees.

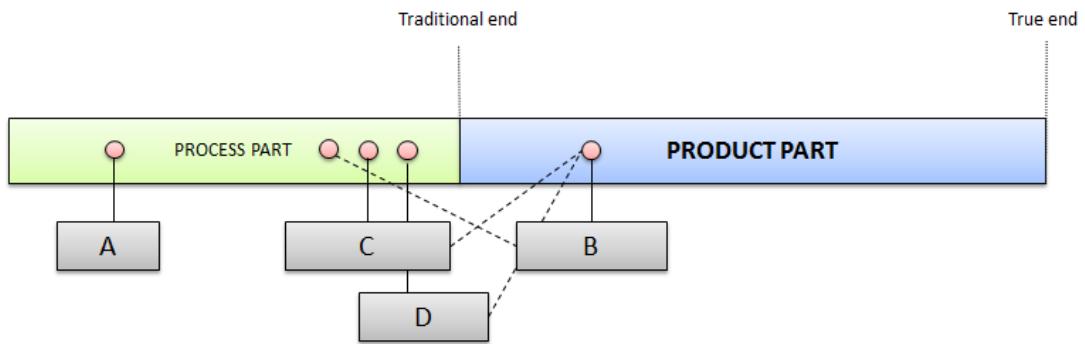


FIGURE 3.4 - TARGETED AREAS OF INTERVIEWEES

After the conducted interviews data was analysed and compared with each other and the conceptual model.

4 Conceptual model

This conceptual model is a ground for the upcoming interviews of this research. As described by the methodology section (chapter 3.0) of this research this conceptual model/theory is provided to:

- Indicate how the researcher is looking at the phenomena of ‘green lean’.
- Helps structuring problems, (ground for questions in the interview).
- Help identify relations between the different elements (sustainability, projects, and lean).

4.1 Green Lean – the fundamentals

The fundamentals of green lean can be described by initially using three definitions.

Definition one, Project Success: When “the project meets the technical performance specifications and/or mission to be performed, and if there is a high level of satisfaction concerning the project outcome among key people on the project team, and key users or clientele of the project effort” (Baker, Murphy and Fisher 1988, cited in Prabahakar 2008,p.7).

Definition two, Value: Value is what the customer or client is willing to pay for, in order to deliver maximal value a there needs to be a minimization of the nine wastes (defects, over processing, transportation, motion, waiting, inventory, overproduction, underutilization of creativity and environmental waste), included in the value aspect the iron triangle needs to be considered, to really deliver value the project needs to be on time, within budget and within acceptable performance/quality.

Definition three, Sustainable development: “Meeting the needs of a firm’s direct and indirect stakeholders (such as shareholders, employees, clients, pressure groups, communities etc.) without compromising the ability to meet the needs of future stakeholders as well” (Dyllick and Hockerts 2002, cited in Hulspas and Maliepaard 2011, p.4).

Combining these definitions gives the definition of the green lean concept.

Green Lean is the concept of delivering **value** in a **sustainable development** manner so that **project success** is fulfilled.

4.1.1 Further aspects on the fundamentals of green lean

This section provides further aspects of investigation that is of interest regarding the presented chapter.

- How does value, sustainability and project success relate to each other?
- Is it necessary to make a distinction between project management success and project success?

4.2 Green Lean project lifecycle

The project lifecycle in the green lean concept stretches beyond the true project lifecycle. The true project lifecycle as described earlier (chapter two) is equal to the green lean project lifecycle, it is a component of the process part and the product part (See figure 4.1 below).



FIGURE 4.1 - GREEN LEAN (TRUE) PROJECT LIFECYCLE

The product part of the project needs to be considered in the concept of green lean because the product part of the lifecycle stands for the majority of the environmental impact (Maltzman and Shirley 2011, p.49).

4.3 Organizational culture

If we choose to use the approach presented by Suda (2007) that our project culture have to be in alignment with the organizational culture sustainability in project management would be very dependent on the type of organizational culture which the projects are running in. This means that the organizational culture or “how we do things around here” sets some of the boundaries for how things are done within the project and to which extent the project manager can affect the project culture. However in Beshay and Smith’s (2008) study there is a difference in organizational culture and project culture depending on type of business the project and organization are running in.

In Dalton’s (2005) article a consultant Randy Harrington organizational culture; “Whatever it is you’re trying to accomplish, if the culture doesn’t support it, the culture will always win”. The project manager may change the project culture to some

extent, but in order to fully change how things are done (towards greener) the organizational culture plays a big role. Linnenluecke and Griffiths (2010) comments that if organizations want to implements sustainability, the organizational leaders would have to move towards more sustainable values this means that if organizational cultures are surrounded by ‘green’ (illustrated in Figure 4.2) all through values, beliefs, behaviors and how we do things, project managers have the organization culture as a force rather than a barrier when implementing green culture into their projects. Also Kurland and Zell’s (2011, p.49) first principle is for managers to establish green company values in order for the organization to become more green.

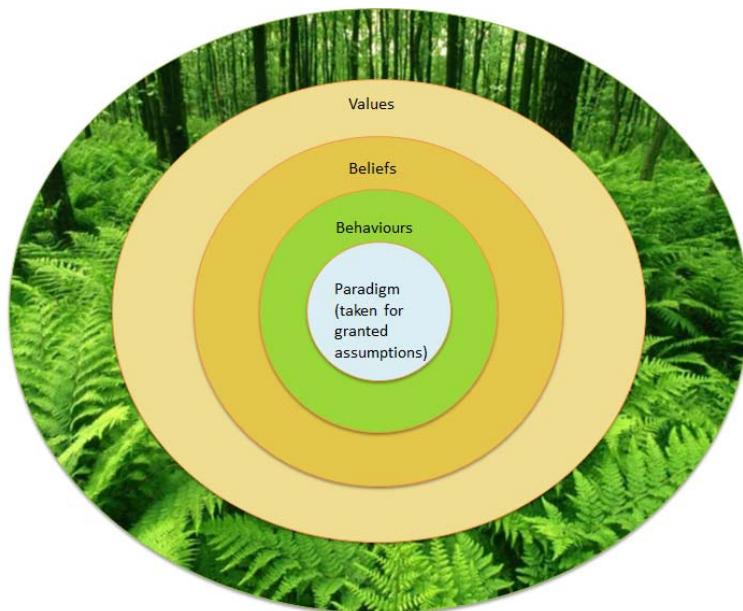


FIGURE 4.2 - SUSTAINABILITY AND ORGANIZATIONAL CULTURE.

However according to Beshay and Sixsmith’s (2008) study the project culture can be seen as a sub-culture to the overall organizational culture which is heavily linked with the process part of the true project lifecycle because the project culture in this sense is “how we do things” within the project and can according to Beshay and Sixsmith (2008) differ from the organizational overall culture.

Whilst project culture is linked with the process part of the true project lifecycle the overall organizational culture influences both the process part and the product (outcome) of the project since overall organizational culture can set the strategic direction of the organization (Turner, 2012). And according to Johnson, Whittington and Scholes (2011, p.4) strategy can be illustrated by the ‘three horizons framework’ which contains the different long-term levels of strategy although there are different opinions wherever projects are means of implementing organizational strategy or that projects strategy should be managed dynamically (Morrison and Jamieson 2005, p.7; Artto et al. 2008, p.8) there is still a linkage between organizational business strategy and project strategy (Turner 1999, cited in Morris and Jamieson 2005,a p.7).

Figure 4.3 below illustrates the true project lifecycle and the overarching cultural perspectives on the process and the product of the project.

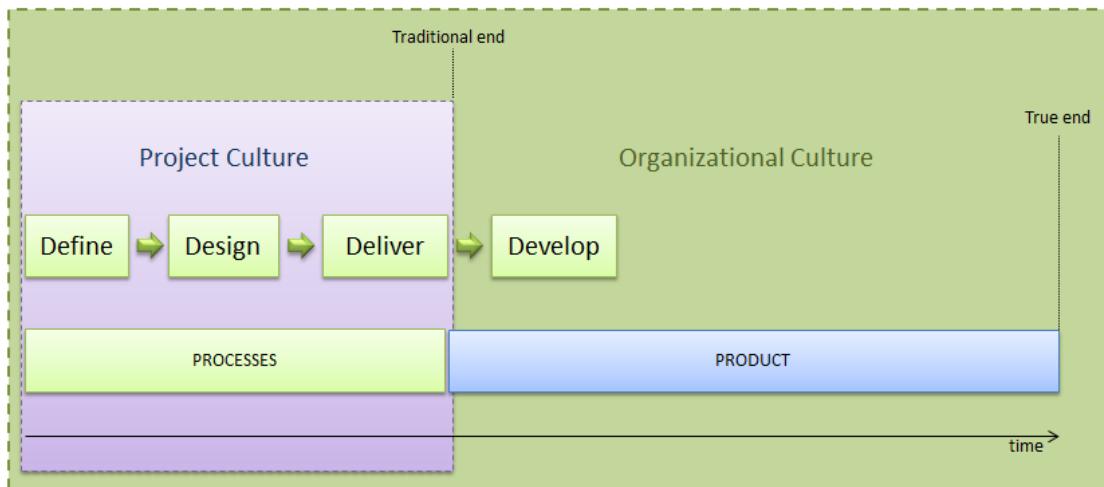


FIGURE 4.3 - OVERARCHING CULTURAL PERSPECTIVES ON THE TRUE PROJECT LIFECYCLE

4.3.1 Further aspects on organizational culture

- Is the projected image of organizational culture and project culture correctly related to the project lifecycle?
- What are the different variables in the projected image? (Type of business etc.)
- To what extend can the project culture vary from the organizational culture when implementing sustainable development?

4.4 Organizational strategy

Another important factor to consider is the alignment of strategy with organizational culture (Burns, 2008). From a strategic point of view implementing green in our organization or project as a strategic move has to align with the organizational culture in order to have a bigger chance of success, it is however not stated that they two are dependent when implementing ‘green’.

4.5 The project

The project in the conceptual model of green lean is divided into the two parts of the project lifecycle, the process and the product part.

4.5.1 The process part of the project

The process part of the project has earlier been defined by the 4D-model by Maylor (2010), Define, Design, Deliver, and Develop. By process part this section is aiming for every activity and process that may occur within the project.

Sustainability and the project processes have already been related by (Silvius and Schipper 2010), Figure 4.4 illustrates the identification done by Silvius and Schipper (2010) and the relation to the 4D-model by Maylor (2010).

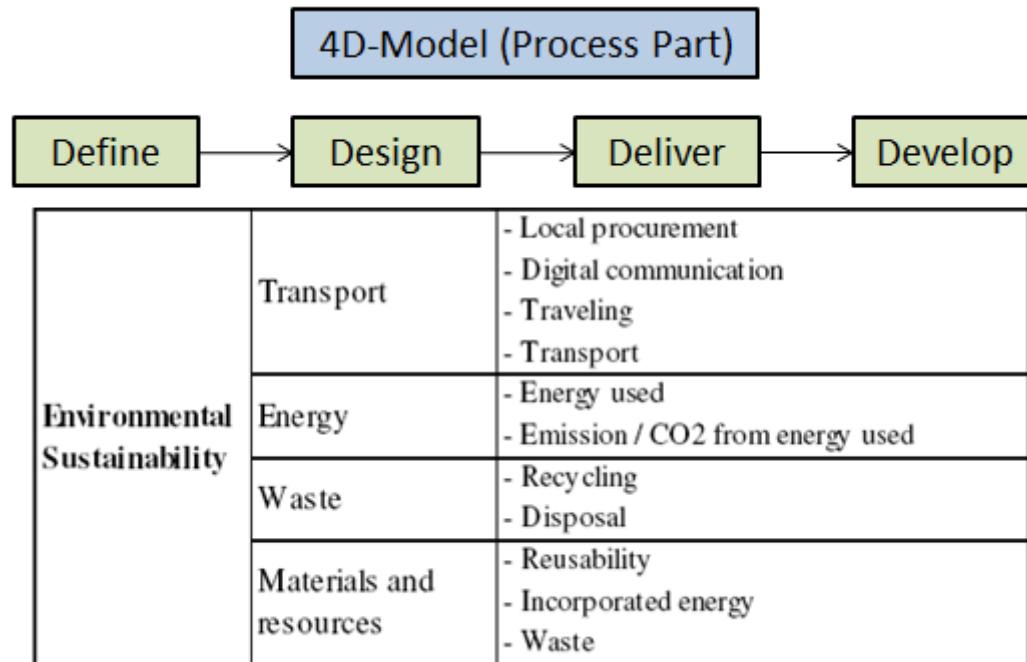


FIGURE 4.4 - THE PROCESS PART AND ENVIRONMENTAL SUSTAINABILITY

Kurland and Zell (2011 p.50) provides some examples of sustainable principles, one of the provided principles is to formulate green goals such as green company facilities, green products/services, thinking in terms of product lifecycles and to figure out what can be measured etc. Translating this into projects and the relation made by Silvius and Schipper (2010) the given fields of environmental sustainability (transport, energy, waste, materials and resources) is related to one of the components of the principles provided by Kurland and Zell (2011) which is ‘figure out what can be measured’. This perception of environmental sustainability however has complications since the traditional view of projects and project management is that a project is unique (Maylor 2010, p.7). Using measurement of energy, emissions, recycling, disposal, traveling, local procurement and etc. within a project may not be applicable on the next project within the organization since the uniqueness may cause variations in size of project, duration and complexity.

Due to the uniqueness of projects (Maylor 2010, p.7) a more dynamic approach would be preferable to sustainability within the process part of true project lifecycle. As described by Melendez (2009) lean is a relentless pursuit of adding value, waste elimination and continuous improvement. The presented wastes by McBride (2003) and supplemented by Vinodh et al. (2011, p.469) are:

- Defects

- Over processing
- Transport
- Motion
- Waiting
- Inventory
- Overproduction
- Underutilization of creativity
- Environmental waste

The first view on aspect of the dynamic approach towards sustainability in projects is Lavy (StevenBLavy, 2010) view on lean in projects, activities within the project (process part of the true project lifecycle) must change the work and be visible to the client, if it is not the question must be asked why are we doing it, in other words value must be added. (Activities within a project is everything done within the boundaries of a project, this means transports, meetings, printing papers, buying new equipment, teambuilding etc.)

The wastes within the activities can be mapped by using the nine identified wastes (this research however primary aims towards environmental wastes). The environmental aspect of wastes of a particular activity can be divided into the components from a modified model of the practical application of sustainability for project manager by Silvius and Schipper (2010). Figure 4.5 below illustrates the connection between activities and waste.

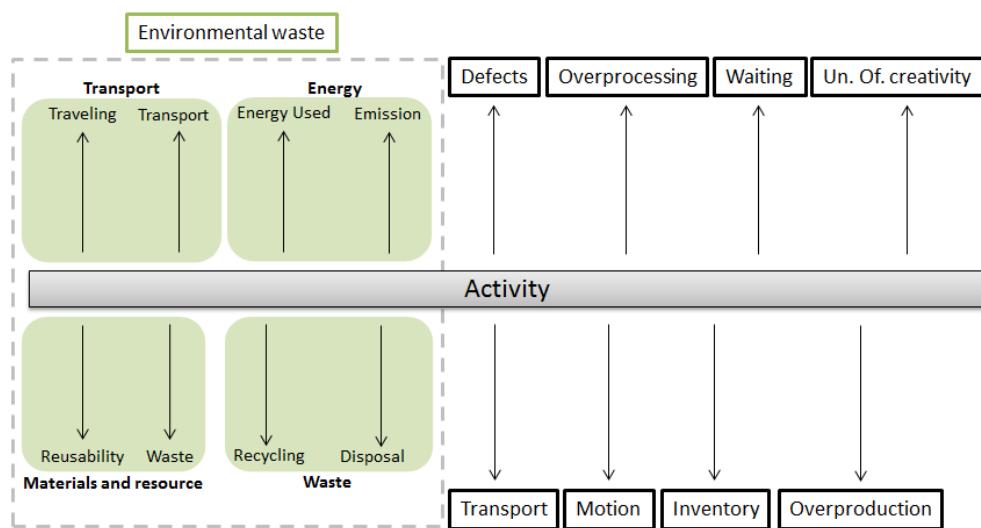


FIGURE 4.5 - CONNECTION BETWEEN ACTIVITIES WITHIN A PROJECT AND WASTE

Figure 4.6 below illustrates waste activity mapping of a project related business travel.

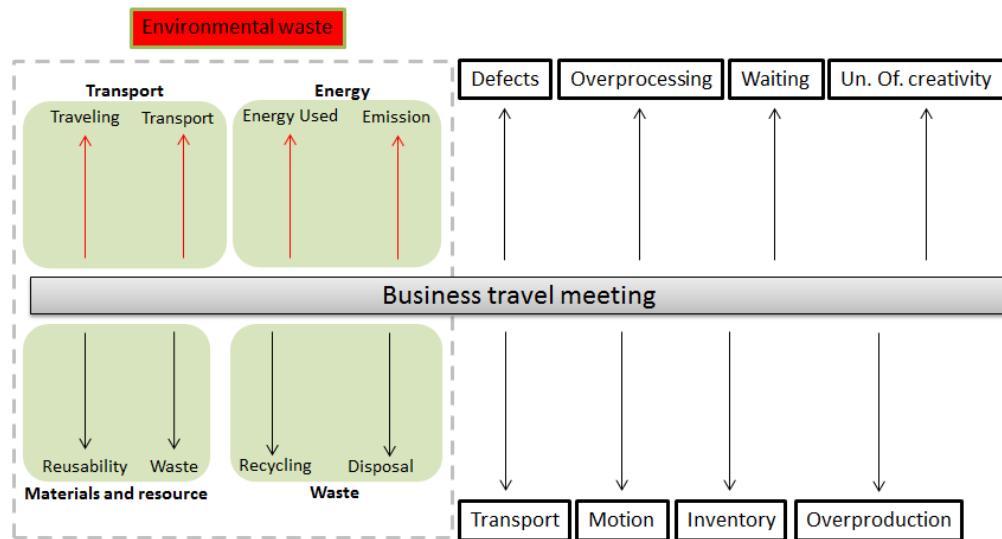


FIGURE 4.6 - WASTE ACTIVITY MAPPING OF A BUSINESS TRAVEL MEETING

The Figure 4.6 illustrates the assumed environmental waste of the particular activity (arguably it may be over processing, waiting, motion, transport waste as well). The concept of 'green lean' is to determine wherever this activity first of all is adding value to the particular project. The second aspect is to determine if there is an activity that will produce the same value but with a decrease of waste, especially environmental waste. In this particular example a virtual meeting may produce the same amount of value without the having the same amount of environmental waste performing the activity.

Other examples of application is the example provided by Dave Shirley (Softwareprojects, 2010) about exploring the possibility of sending electronic reports instead of using paper by supplying the team with for example an kindle which is an electronic reader ('Kindle', 2012), this of course require the kindle to be used to an extend where the costs and environmental impact of printing papers is higher than the cost of the kindle and the environmental impact of the product lifecycle of the kindle. According to Dave Shirley (Softwareprojects, 2010) using the kindle would probably also be faster and easier to update documents then printing new.

Putting this into context of the 'green lean' methodology by using kindle the same value to the project may be delivered without the elements of the environmental waste.

The core aspect of the concept is to see wherever activities can be done differently in favor for the environment, other areas of application within the process part of the project is the decision making process for example, Mochal and Krasnoff (2008, p.3) suggest that environmental aspects should be considered during decision making. In context to the waste mapping principle it would be to map the environmental impact

of a particular decision or the outcome of the decision. Examples of that may be what LaBrosse (2010, p.89) calls ‘green purchasing’ which means to select the most environmental friendly products or services but that gives the project the same value.

4.5.1.1 Further aspects on the process part

- Is a dynamic approach to sustainability in projects a more suitable approach than static measuring of environmental impact?
- Can all activities be mapped by the suggested waste activity mapping and is it practical?

4.5.2 The product part of the project

The product part of the true project lifecycle is the outcome of the project, when the project is handed over. This is also where the project according to Maltzman and Shirley (2011, p.49) have the most environmental impact. Figure 3.7 illustrates the product part of the project.

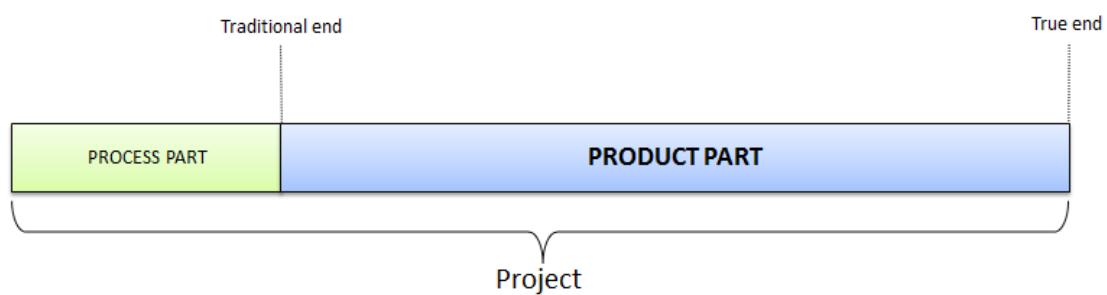


FIGURE 4.7 - PRODUCT PART OF THE TRUE PROJECT LIFECYCLE

As described earlier by Maltzman and Shirley (2011) every project (the product of the project) can be divided into four categories (Se chapter two section five for further explanation).

- Green by definition
- Green by project impact
- Green by product impact
- Green in general

In the description on the core fundamentals of 'green lean' made earlier in this research 'green lean' was described as:

Green Lean is the concept of delivering **value** in a **sustainable development** manner so that **project success** is fulfilled.

Initially the project should deliver value to the client in a sustainable development manner, but still satisfy internal and external stakeholders in order to be successful.

However value is rather subjective (Kerzner and Saladi 2009, p.36), Being on time, budget and within performance does not guarantee that value have been delivered (Kerzner and Saladi 2009, p.36). Salvatierra-Garrido and Pasquie (2011) suggests that the traditional understanding of value which is about technology and economic should move from the customer focus and more to a global context where social values are captured as well (illustrated in figure 4.8 below).

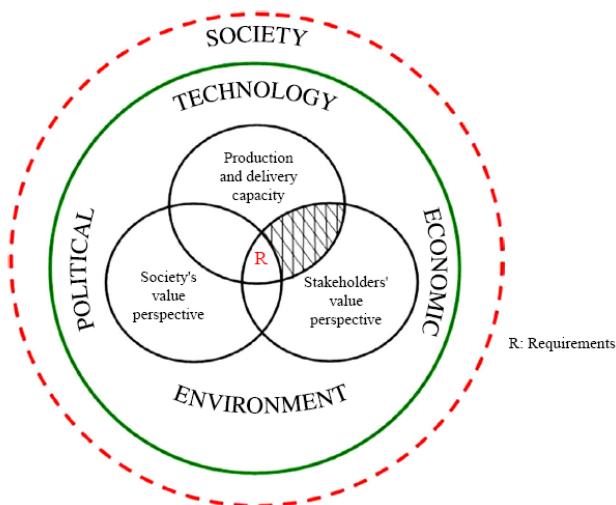


FIGURE 4.8 - TRADITIONAL UNDERSTANDING OF VALUE

In order of being able to deliver value at an global context the stakeholders needs to be redefined, Maltzman and Shirley (2011, p.51) argues that looking at stakeholders throughout the environmental lens gives 'future generations' as stakeholders to all projects, this can change could affect the stakeholder management within the project (Maltzman and Shirley 2011, p.51). Mochal (2009a) comments that identifying stakeholders the green way should involve if necessary the environmental policy committee or local environmental government agencies. Further aspects on the green thinking are to gather green requirements from the different stakeholders (Mochal 2009b).

First aspect of the outcome (product) part of the project is according to Maltzman and Shirley (2011, p.74) a project should be initiated with a perception of that a green project is the right thing to do. From chapter two section six the examples from

project ‘Hammarby Sjöstad’ and the Ford’s river Rouge plant is examples of projects with green intents from the beginning. Translating these projects into the concept of ‘green lean’ value has been delivered in a sustainable development manner.

Using the examples above from chapter two and Maltzman and Shirley’s (2011) view that a green project is the right thing to do set the first criteria’s for a project which is:

- Are we doing the right thing? (Environmentally speaking).
- Can the same value be generated with more environmental friendly solution?

It should however be pointed out as Mochal and Krasnoff (2008, p.3) concludes that it is not about making every decision as green as you can but take the environment into account, this means that every project or every value a particular project try to achieve may not be suitable to do the ‘green’ way.

The second aspect on the product part of the project is what Maltzman and Shirley (2011, p.43) argues that green must be designed in and not inspected in. Some of the ways of greening the product of the project is the concept of cradle-to-cradle and reducing nonproductive output (described further in chapter two section five). In context to the ‘green lean’ concept cradle-to-cradle approach in the product part of the project should be applied if it delivers the equivalent value, reducing nonproductive output is about delivering same value, but with less resources (both environmental resources and human resources).

The factors that needs to be considered during the product part of the project is the suggestion that Kurland and Zell (2011, p.50) gives to think in product (physical products) lifecycles and to determine the environmental impact the products have (in this case the outcome of the project) it have from birth.

The factors needed to be considered to assess the environmental impact a product have is presented below in figure 4.9 from Eco Index (Index tools, 2012).

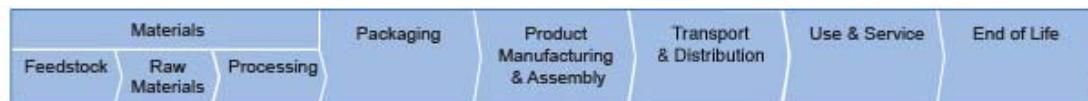


FIGURE 4.9 - ENVIRONMENTAL FACTORS THAT NEED TO BE CONSIDERED AT PRODUCT LEVEL OF THE PROJECT

Not all project outcomes is a physical product, but every project have some aspects of the product lifecycle presented below. For example Kurland and Zell (2011, p.54) suggest that choosing green suppliers is way to become greener. Translating the action to the product lifecycle presented above it covers material, packaging, product manufacturing & assembly part of the product lifecycle in Figure 4.9.

Looking at the examples from chapter two section six Apple Inc have considered all elements of presented Figure 3.9, Timberland have taken initiatives in looking at suppliers and the end of life in their particular products by cradle-to-cradle thinking.

The product part of the project in relation to the concept of ‘green lean’ is to deliver value with considerations on the environment without jeopardizing project success. This means that waste activity mapping can be done on components in the Figure 3.9. The factors needed to consider is to identify at each process of the lifecycle what type of value is delivered, the second step is to map the waste elements on each part. (This is aiming for generic projects and not all projects can be done green, and not all projects do contain each element of Figure 4.9). Figure 4.10 illustrates the ‘green lean’ approach to the outcome (product part) of the project.

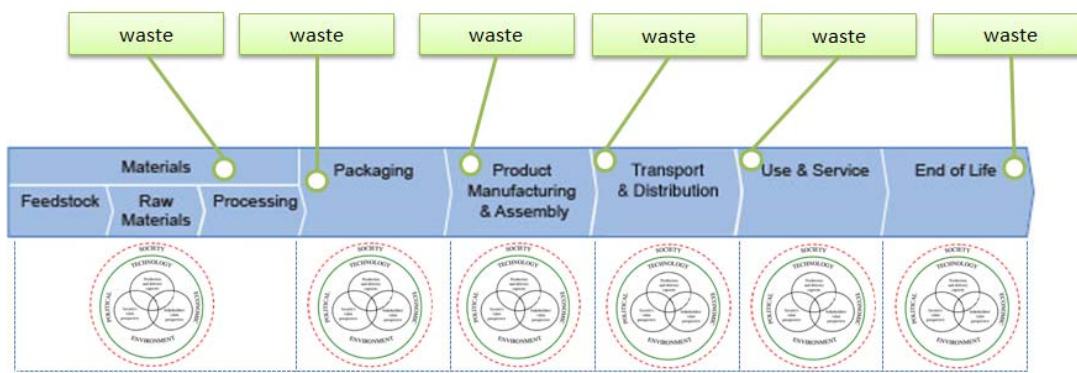


FIGURE 4.10 - THE ‘GREEN LEAN’ APPROACH OF THE PRODUCT PART OF THE PROJECT

4.5.2.1 Further aspects on the product part

- Are project managers capturing global value, and if not why?
- Are environmental requirements gathered by project team?

4.6 Summary of conceptual model

This chapter summarizes the conceptual model of ‘green lean’. Figure 4.11 below illustrates the framework for projects and ‘green lean’.

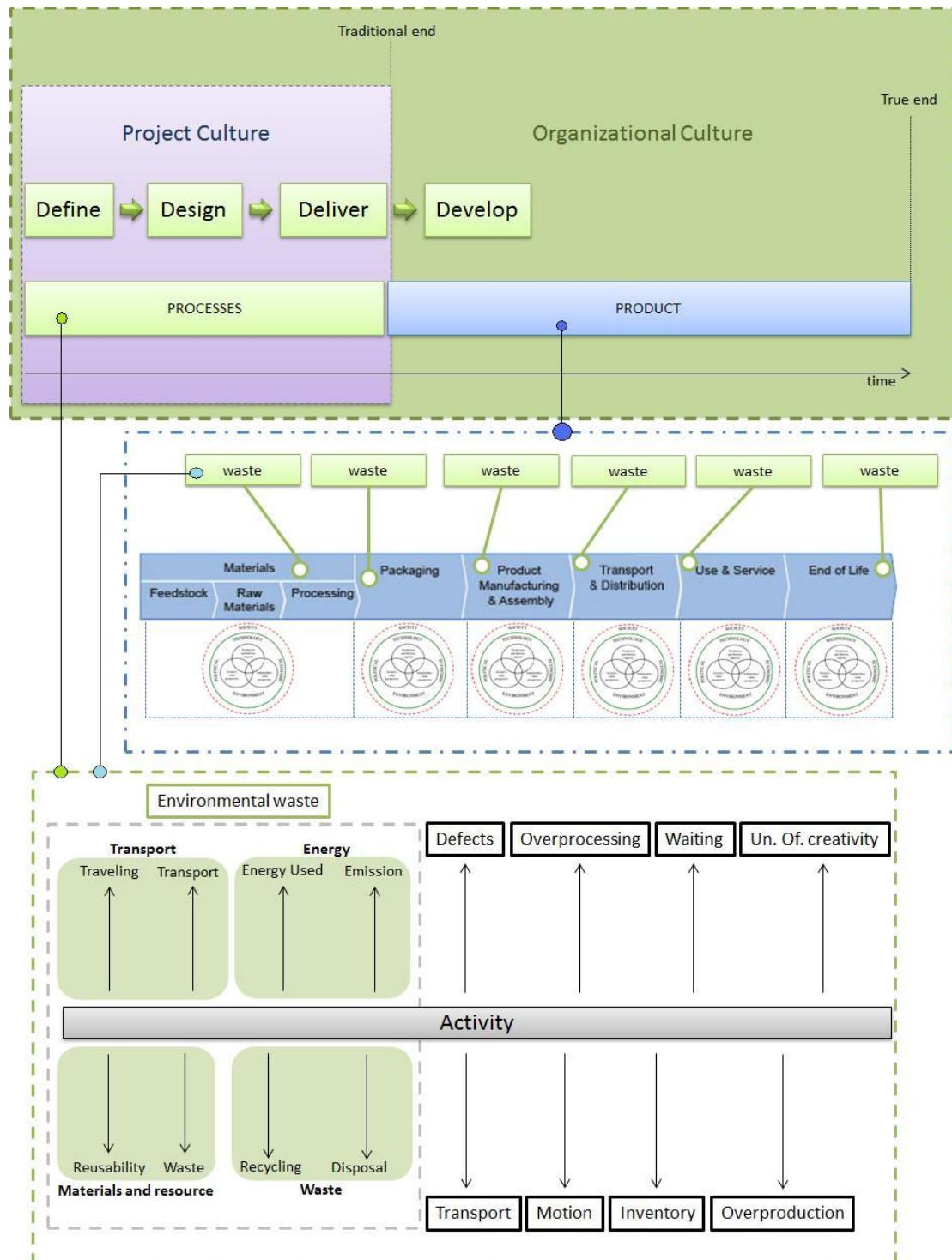


FIGURE 4.11 - SUMMARY OF ‘GREEN LEAN’

- First aspect of the conceptual theory is that organizational culture influences the outcome of the project (product part). Greener organizational culture may favor greener outcomes.
- Project culture is highly affected by overall organizational culture.
- The environmental impact of activities within the process part can be mapped by using the ‘environmental activity mapping’.
- The targeted value delivery and waste elements of outcome of projects (products) can be mapped by determine what type of value is delivered at every stage of the project product and the elements of waste.

5 Data Presentation

This section presents the gathered data during the conducted interviews.

From the conceptual model the overarching questions which needed to be answered regarding the research topic were:

- o The role of organizational culture in implementing environmental aspects at project level.
- o The role of activities within the project.
- o Project managers, organizations and the view on global value (social value)

5.1 Interviews

There were four interviews conducted, the participants were:

- Person A, president of a project management consultant and training company (company 1), located in Georgia (USA).
- Person B, architect at a municipality (company 2). Located in central Sweden.
- Person C, experience in project management, working at a company (company 3) located on the west coast of Sweden.
- Person D, experience in project management and manager at company (company 3) located on the west coast of Sweden.

Each of the participants was chosen to complement different parts of the conceptual model. Each participant had different industrial background which generates a more generic picture. Figure 5.1 below illustrates each section on which the interviewed was targeted.

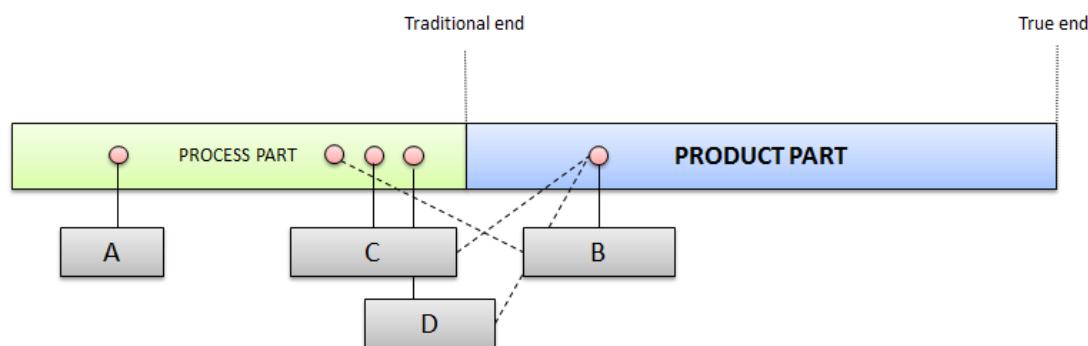


FIGURE 5.1 - TARGETED AREAS OF INTERVIEWEES

- **A -** Pioneered the concept of ‘Green Project Management’

Questions: What is ‘green’ project management

The future for ‘green’ project management

The impact of ‘green’ project management

Organizational culture and implementation of ‘green’ pm

- **B –** Heavily involved with the outcome of projects (product part)

Questions: The organizational view on sustainability

Capturing environmental requirements

What stakeholders are taken into account

Power of impact on the product

Organizational impact on the product part

Environmental concerns on process level

- **C and D –** Experience in PM and experience on organizational level.

Questions: Organizational view on sustainability

Value delivery in projects

Differences between project success/project management success

Organizational impact on product of project

Activities on process level

The project managers level on influence on project outcome

Environmental requirements and risks

*Full questionnaires and answers are found in appendix

5.1.1 Interview with A (summary)

A has over 30 years of experience, he is located in Georgia (USA) and currently president at company 3. At one point he was director at Coca-Cola. During the interview A pointed out that the concept of ‘green’ project management is about integrating the ‘green’ into the core methodology of project management, he however said that interest for green pm (project management) is low. A pointed that ‘green’ pm is not so easy to understand, in order to understand what he defines as ‘green’ pm one would need to understand the methodology and core of project management in general which even some project managers do not do. The future for ‘green’ pm is also unclear, A said that there would need to be a strong player involved (large organization, PMI or APM etc.) to really get the movement going. A defined ‘green’ pm as something separate from ‘green’ projects, ‘green’ pm is according to A imbedded in the methodology of project management such as risk management, scope management, quality management etc.

According to A green ‘pm’ has most impact on the day-to-day decisions, his and their thinking at company 3 is that every time there is scope change, issues, risks etc. green implications should be taken into account.

The benefits of implementing ‘green’ pm according to A is small, at least looking at project level. He comments that 95% of the time there will be no green implications, but he also said that if you ask yourself are there any green implication sometime it will be and then you can take that into account. A says that the concept of ‘green’ pm is not to favor any decision because they are green instead you should still make decisions based on what is best for the project and company, but some decision may be taken differently using the concept of ‘green’ project management which means that you are not taking the decision because it’s ‘green’ but because it is the best for the project and organization. As mentioned earlier for specific projects the benefits may be small, but A comments that looking at a broader level there could be larger benefits for the company, and even more benefits looking at society level because all decisions that would be taken differently adds up.

Organizational culture plays a big role, A thinks that the organizations that are going to adapt this type of concept will be people who have more of a green culture. A also says that implementing this type of concept will need to be implemented as a culture change initiative. A also points out that this concept is not so obvious for everybody, and that fair amount of training would be required.

5.1.2 Interview with B (summary)

B works at the town building department which is responsible for municipals physical planning, building permission, measuring and mapping operations etc. As a planner she is considered to be a project manager as well since the work of detail planning is driven in project form. The physical planning is a universal operation where use of ground, water and the built environment is processed upon ecological, social,

esthetical and society economic aspects. The mission is to provide a layout plan which reflects the commune's vision in the long term planning.

B organization is pushing on the aspect of sustainable development, they considered future generations as very important stakeholders and they worked with sustainability at both process level and product level. At process level they had for example environmental managements systems in place, staff were environmentally trained both on a theoretical level and practical level. At product level several aspects of sustainability was considered by policies but also the product use itself (how it affects ground, water and air for example.) The environmental requirements before project start are captured by looking at regulatory requirements. Although B acknowledges that there is several aspects that needs to be considered she comments that she still thinks that she have big impact on the outcome of the project but with some reservation because stakeholders and other aspects needs to be considered.

B commented that future generations are included as stakeholders, this is regulatory done by promoting society development with equal and good living conditions, long term sustainable environment for present people and for future generations. B also commented that from the aspect of delivering value both the client and other stakeholders stay in focus and that delivering value in their case is delivering value from a society development perspective.

5.1.3 Interview with C and D (summary)

C has worked as a project manager and have experience from automotive and steel industry, D have also experience in the field of project management. Their company (company 3) which is a consultant company located in the west coast of Sweden is in terms of environment ISO 14001 certified, and all new staff gets educated in their environmental handbook. C and D comments that their company doesn't really have that much environmental impact but they have done their part by for example changing the coffee machine, decrease the lightning, print double pages etc.

In terms of value deliver C commented that their organization has their own dimensions of what a quality project is, it is a component of ten dimensions (found in full interview, se appendix). But he also comments that time, cost and performance are the driving forces and what we primary focus on in projects. However he said that if focus would be on the other seven the three would go along the way and we may even need less resources, however to consider the other seven it is an organizational question and often resources are not given to do this. C and D commented that in their particular industry value is primary delivered in the economic field and technical field. They further comment that social value is not really considered but environmental goals are captured.

C and D commented that there are differences in project management success and project success, there are different aspects of why projects are not successful, they further comment that no matter how skilled you are as project manager, not being

given the resources may only make you able to decrease the damage and not really do a successful project.

On the question regarding organizational culture and project teams D commented that there are differences depending on type of organization/project team. For example in a project team the team spirit is one factor that differs from for example matrix organization where the information sharing is more central. Regarding procedures of work D answered that from his experience the project team work procedures and etc. is the same as for the whole organization. Looking at organizational influence on the project outcome (the product) C answered that the organization have the most impact on the outcome of projects and that a project manager have minor influence on what is actually delivered. D gave an example of how globalization of an organization did affect projects in way where projects after the globalization had lower success rate than before. D comments further on that as a project manager you can have influence on factors such as time, cost and quality within the project. D commented later on that in terms of the outcome project managers may sometime have the opportunity to choose between for example two different designs of a product and in that sense affect the outcome of the project.

Further on activities were discussed and whether activities are questioned if they actually affect the project in such way that it is visible to the client. Both C and D said that activities are of course questioned but this often has to be done in communicating with the client. As for environmental impact D commented that environmental impact are looked on in technical part, but what goes for meetings and etc. he commented that they haven't come this far yet, C gave an example from his working experience where flights from Sweden to Germany were done all the time without actually no need. The financial aspect was questioned and C commented that there are human factors involved such as morale and conscious level. D also commented that environmental conscious is often the last that comes into play. C and D did agree upon that in order to choose more environmental friendly solutions financial benefits would need to be presented.

In their organization environmental requirements and risks are captured. D commented that environmental requirements are captured on product level, but as for project level such as flights and etc. they are not. C commented that it is often regulations that forces to capture environmental requirements and that you only do what is necessary and no more.

Further on both C and D commented that environmental issues and sustainable development is something that is buried in the values of people, and in order to promote sustainability and environment benefits have to be in place. The only connection between environment, sustainability and project were according to D if environment was on the top of the agenda.

6 Analyse of the data

From the conceptual model and the conducted interview's sustainability in projects is still a rather abstract topic. The overarching questions from the conceptual framework that needed to be addressed by the interviews were:

- o The role of organizational culture in implementing environmental aspects at project level.
- o The role of activities within the project.
- o Project managers, organizations and the view on global value

6.1 The role of organizational culture

The role of organizational culture from the conceptual model is illustrated in Figure 6.1 below.

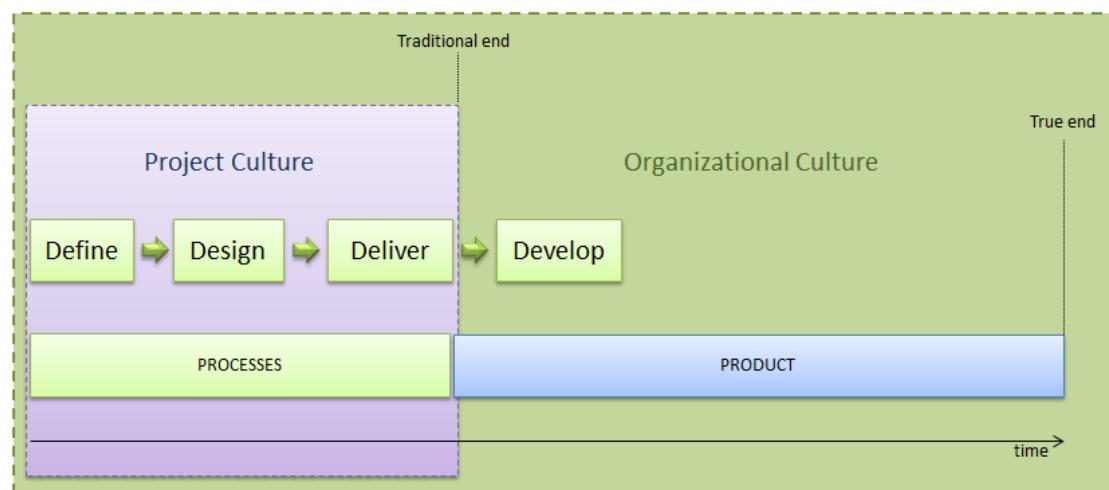


FIGURE 6.1 - OVERARCHING CULTURAL PERSPECTIVES ON THE TRUE PROJECT LIFECYCLE

The conceptual models standpoint where that organizational culture determines what type of products is done (outcome of project). The project culture were seen as a separate part with a own culture, however D commented that although project culture may vary from organizational culture the work procedures and so on would be the same. D said that 'team spirit' was the factor that separated project teams from the rest of the organization. In terms of organizational culture on product level C commented that often organizational culture determines what is done (outcome of the project). D further on commented that project managers sometimes have the ability to affect cost, time and performance within the project but as for the product level he commented that project managers had little impact but sometimes project managers may be given the opportunity to choose between two designs for example. In alignment with C and D industry which is automotive (and others) value is considered

to be delivered in the technical and economical field to client. D comments that in terms of social (global) value, environmental goals at product (physical) level are delivered which are regulatory drivers. They further on comment that regulatory requirements are captured but often only the necessary is done and no more.

In B's organization which is a municipal the vision of the organization is the long term planning. The organization was pushing for sustainable development and future generations were very important stakeholders. In this particular organization value for them is to deliver value from a society perspective. Looking at the particular outcome of projects the work was regulated by policies in favor for sustainable development, which means when doing a particular project the project was heavily regulated, for example they are promoting society development with equal and good living conditions, long term sustainable environment for present people and for future generations. In other words the organizational culture forced the project outcome to be all about sustainable development and take the environment into account. C commented that although she had big impact on the outcome of the project stakeholders and other aspects needed to be considered and taken into account.

A who pioneered the concept of 'green project management' also comments that organizational culture plays a big role, that those who are going to adapt his type of concept will be people who have a more green culture.

6.2 Activities within the project

Looking at the process part and the activities within the project both B, C and D's organization are ISO 14001 certified which means they have defined how to work with environmental issues on process level, they have therefore special procedures for example C comments that they have changed their coffee machine, decrease lightning, double printing on pages etc. B comments the same thing that they have been educated in eco-driving etc. and the same goes for C organization where every staff member gets educated in their environmental handbook.

From D experience activities are questioned whether they are adding value or not, he further comments though that this have to be done with approval from the client in projects. Further on D comments that although they are questioned their particular environmental impact is not taken into concern, he also said that environmental impact are looked upon in the technical parts but as for meetings and etc. within the project they haven't really come that far. C further on gave an example from earlier work experience where flights between Sweden and Germany were done on regular basis without actually any need and pointed out human morale and conscious as one big factor regarding the flights.

D and C commented further on that environmental issues and sustainable development is something that is buried in the values of people which aligns with A's comment that the concept of 'green project management' should be implemented as a culture change initiative.

6.3 The view on global value

The view on global value (society value) differed depending on type of industry, whilst B's organization was all about promoting sustainable development C and D industry were more clients focused and were looking at delivering value on a technical and economical level. Figure 6.2 below illustrates the aspects of the product part of the project and its value components.

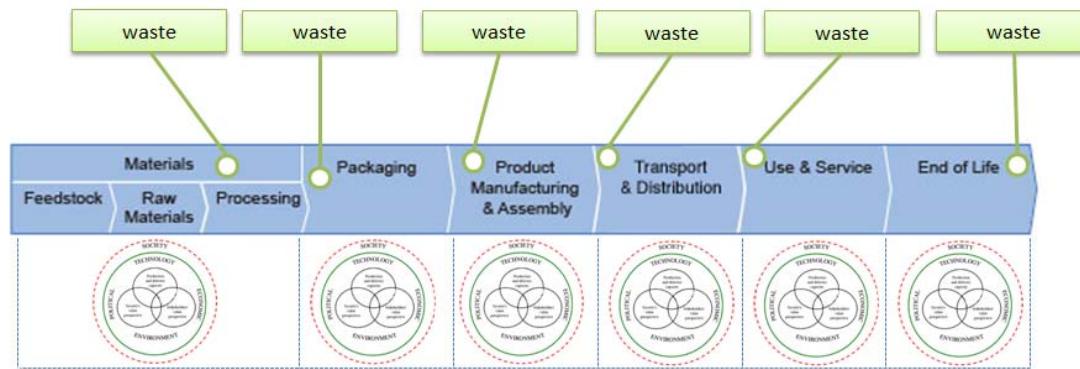


FIGURE 6.2 - VALUE AND WASTE ASPECTS

Although B's organization delivered overall value (see figure 6.3 below) which reflects their mission the elements of waste was not identified, also delivering social value was only considered in the (use & services) of the projects whilst materials, packaging (or equivalent), manufacturing, end of life was not wider considered.

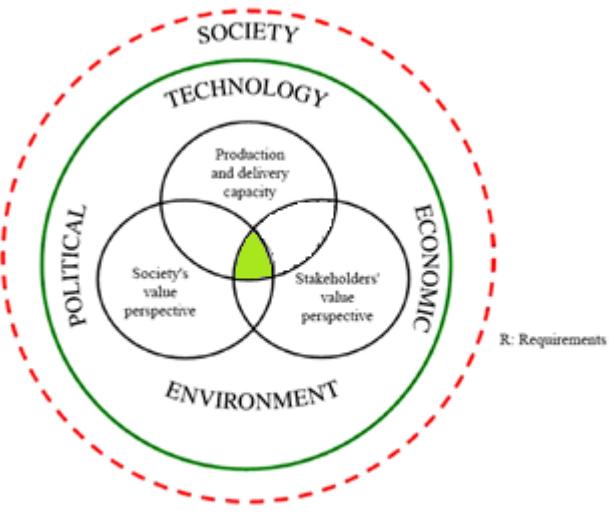


FIGURE 6.3 - VALUE DELIVERY OF USE & SERVICE OF B'S ORGANIZATION

From the conducted interviews for this particular research the aspects on the project product lifecycle was primary focused on 'Use & Service' in the organizations.

6.4 The components of green in projects

Three major fields have been identified regarding sustainability and ‘green’ in projects.

Figure 6.4 below illustrates the components of ‘green’ and sustainability at project level.

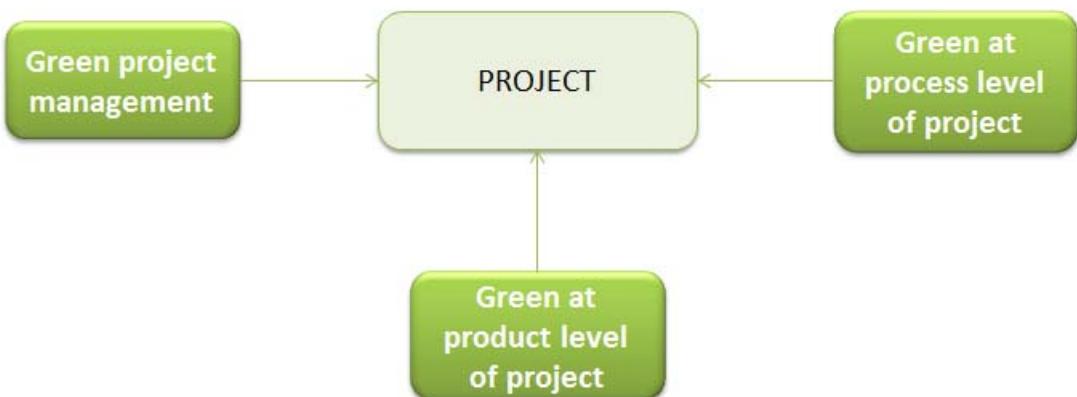


FIGURE 6.4 - COMPONENTS OF 'GREEN' AND SUSTAINABILITY AT PROJECT LEVEL

Figure 6.5 below illustrates the different elements of the components, A and company 1 have defined the alignment of green project management with the PMBOK (Krasnoff, 2008). The environmental aspects on the process level of project are defined by Silvius and Schipper (2010). The environmental aspect of the product part (outcome) of the project is defined by Eco Index (Index tools, 2012).



FIGURE 6.5 - ELEMENTS OF THE DIFFERENT COMPONENTS OF SUSTAINABILITY IN PROJECTS

A and company 1 pioneered the concept of green project management, this is a concept which is embedded in the methodology of project management (se figure 6.2 above). According to A ‘green project management’ is a concept which has the most

impact on the day-to-day decisions. A further comments that this concept is not to make every decision in favor for the environment but by looking at green implications some decisions may be taken differently, not because they are necessarily green but because it is the best decision for the project and company.

The process level of projects is according to B, C and D determined by policies and regulations, their respective organization are however ISO 14001 certified but as described before D comments that the environmental impact of activities are not taken into account.

The product level of the project is according to B, D and C heavily influenced by the organization which according to B limits her impact on the product. In C and D case they commented that they had little or non-existent impact on the product part in their industry expect in some rare cases.

6.5 Benefits

Looking at benefits A comments that benefits of ‘green project management’ are small when looking at project level, but can be big for company level and even bigger looking at a global level because every decisions taken differently adds up. From D and C side they commented to really implement environmental consciousness and question activities environmental impact clear financial benefits needs to be presented.

6.6 Summary of data analysis

Figure 6.6 below illustrates the summarized factors and content of each component. The organization plays a major role on both process level and product level of projects.



FIGURE 6.6 - THE COMPONENTS OF GREEN IN PROJECTS

Whilst ‘green project management’ is a component of its own pioneered by company 1 which is imbedded in the methodology of project management, processes within the

project are organizational driven by policies, procedures and regulations. On product level organizational vision and strategy determine what is done whilst for environmental issues regulations is major driver for take environmental aspects into account.

7 Discussion and result

This section consists of discussion and result.

7.1 Discussion

7.1.1 Drivers for sustainability

As described in chapter 6 the components of green and sustainability in project management consists of three identified components, the project management methodology are, the process level area of projects and the product level area of projects. As for the three areas on product level according to D and B environmental aspects are taken into account but are regulatory driven for their specific industry, whilst B's organization promotes sustainability and are considering global value, the outcome of their projects are reflecting their organization vision and culture. On D and C's side their organization considers value on a more technical and economical level the outcome of their projects did take environmental aspects into account on the technical level, this mainly due to regulations.

Figure 7.1 illustrates the different drivers for corporate social responsibility and sustainability.



FIGURE 7.1 - DRIVERS FOR CORPORATE RESPONSIBILITY AND SUSTAINABILITY (CORPORATE RESPONSIBILITY DRIVERS, 2012).

From the industries interviews were conducted it was mainly regulations that was the drivers for sustainability. Although in B's case public pressure was yet another factor. According to the study made by McKeown (2010, p24) brand, trust and reputation was the main driver amongst CEOs for sustainability this was not mentioned during the interviews. However B, C and D's organization is ISO 14001 certified, in a research done by Fingal and Benipoor (2003, p.48) drivers for implementing ISO

14001 is at external level customers, governmental regulations and on internal level staff, management and owners.

7.1.2 Connection between sustainability and projects

The connection of sustainability (green) and projects are presented earlier. It consists of:

- o The project management methodology
- o The process level of projects
- o The product level of projects

Figure 7.2 below from Maltzman and Shirley (2011, p.66) illustrates the project managers role depending on type of project.

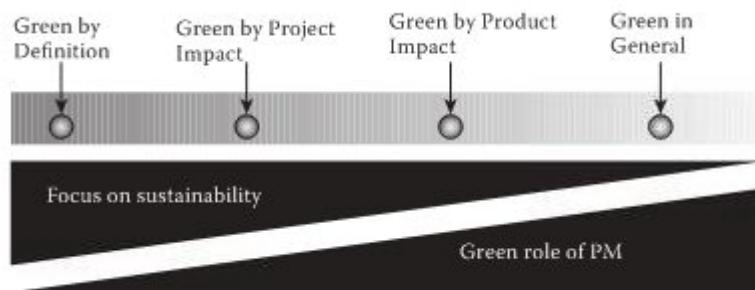


FIGURE 7.2 - PROJECT MANAGER'S ROLE

However this is only looking at the product part of the project (the outcome). This research indicates that there are two more components included which are the process part and the methodology part of green in projects. Doing a 'green by definition' project does not necessary mean that project processes or the methodology within that projects is green.

7.1.3 'Green Lean' integration into projects

The earlier definition of the concept 'green lean' was:

Green Lean is the concept of delivering **value** in a **sustainable development** manner so that **project success** is fulfilled.

From the conducted interviews value was depending on industry, while one organization primary aimed for global value the other organization looked at to deliver value at a technical and economic level to their internal and external clients. The concept of 'green lean' reflects A's concept of green project management, not make every decision in favor for green but because it is the best decision. D and C separated project success from project management success and commented that the

organization plays a big part on the project success, given the wrong resources the best project manager may in best case decrease the damage to the project. In translation to the definition of ‘green lean’ not having the resources to question activities (lack of policy, regulation, lack of trained staff etc.) or not being able to change outcome of projects towards greener is a big obstacle.

7.1.4 Benefits of implementing green in projects

In this research a distinction is made between benefits of implementing green at organizational level and at project level. A commented that the benefits of his concept of green project management would be small, further on in order to even implement the concept of ‘green lean’ C and D thought that financial benefits would be the main reason for implementation. It is still of further investigation whether the concept would generate financial benefits or other type of benefits.

7.1.5 Framework for ‘Green Lean’

The framework for ‘green lean’ is green implementation in the methodology of projects, the processes of projects and the outcome of the project. The framework for green project management is already pioneered by company 1 and A whilst processes and products of projects are heavily influenced by the organization. The ‘waste activity mapping’ can be used as a tool of mapping activities at process level and product level, it is however of further investigation how this could and should be regulated. The second aspect of ‘green lean’ is to look at the project lifecycle and what type of value is delivered, the primary focus of value delivery lies within the ‘Use & Services’ of projects from the organizations interviews have been conducted, the question of further investigation is in what way a consideration of all elements (materials, manufacturing etc.) would affect a project outcome.

7.2 Result

7.2.1 Research question 1: What are the drivers for sustainability?

On project level the drivers for sustainability (environmental friendly) in projects are as illustrated in Figure 6.3 (chapter 6) policies, procedures and regulations (mainly from the ISO Certification) is influencing the process part whilst on the outcome of projects vision, strategy and regulations are the main drivers.

At organizational level governmental regulations, employees, management, owners etc. are big drivers for implementing sustainability.

7.2.2 Research question 2: What are the connection between sustainability and projects?

The connection between sustainability (green) and projects are presented by three components.

- o Project Management methodology
- o Process level of projects
- o Product level of projects

Green project management is according to A imbedded in the methodology of project management, the concept of ‘green project management’ can be imbedded in every project non-dependent whether the project is ‘green’ or not.

On process level of projects policies, procedures and regulations have high impact on activities done. However according to D environmental impact of activities within the project is not questioned. C even gave an example from his experience of unnecessary flights. From the conceptual model/theory the tool ‘waste activity mapping’ was presented (See Figure 7.3 below) which can be used to map activities environmental impact and other type of waste. This is the strongest correlation found in this research between lean, sustainability (environmental friendly) and projects.

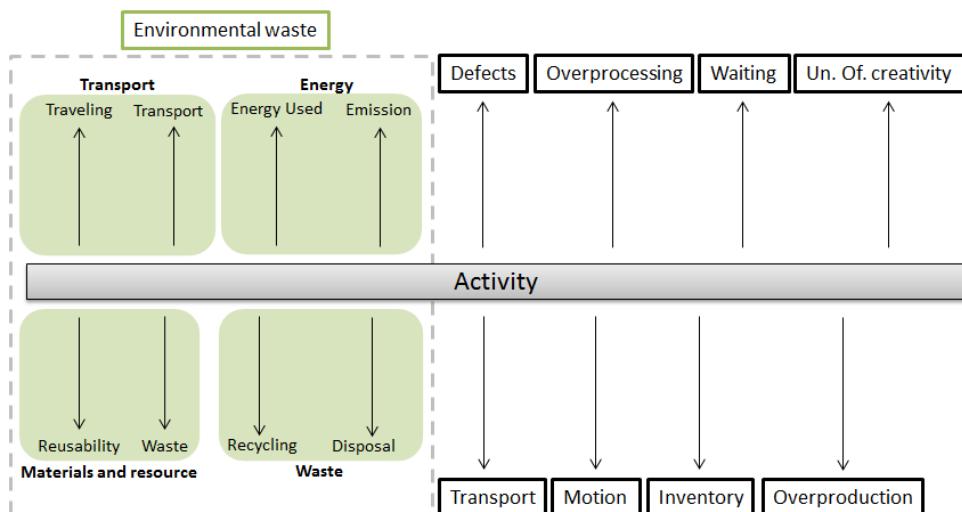


FIGURE 7.3 - ACTIVITY WASTE MAPPING

The product level of project was highly influenced by the organizational culture, vision and strategy. Regulations were a contributing factor to take environmental aspects into account at product level. According to the interviewed they had some minor impact on the product part whilst the organization had more impact. One of the interviewed commented that in a particular company “the economics designed the car” which explains the complexity of affecting the outcome of the project. Whilst one interview showed an organization that is all about delivering global value sets regulations, policies and etc. to promote project outcomes to be environmental friendly, green and sustainable. The other organization implements ‘green’ on technical level mainly due to regulatory aspects.

7.2.3 Research question 3: How can ‘Green Lean’ be integrated into projects?

The ‘Green Lean’ concepts consist of the three components described above. According to A implementing green project management would require a culture change initiative and a lot of training. Whilst on process part and product part according to D and C clear financial benefits would need to be presented and that after while employee morale and environmental conscious would change.

D commented that although environmental requirements are set on the technical aspects of projects requirements regarding allowed travelling and etc. would be one solution, but that companies haven’t come that far yet.

Because organizational culture plays a big role and the interviewed all agree that sustainability should be taken on organizational level it is a question of culture change and that implementation of environmental requirements at process and product level are either set by the organization in form of policies, requirements etc. or other regulatory organizations.

7.2.4 Research question 4: What are the benefits of implementing green into projects?

According to A benefits of implementing the concept of green project management are small looking at project level, but increases when looking from company perspective and global perspective. The key point of green project management is that some decisions may be taken differently, and according to A this could be another parameter for project success if it is appropriate and applicable.

In order to implement ‘green lean’ as a concept and measure activity impact D and C comments that financial benefit is the key factor that needs to be in place first. It is of further investigation if this type of concept would bring financial benefits, from C’s experience with unnecessary flights it certainly would be of financial benefits in stopping or decreasing them. D further on commented that activities environmental impact is not taken into account, this leads to potential field of application for the concept.

7.2.5 Research question 5: Is it possible to generate a framework for the identified concepts of ‘Green Lean’?

The framework have been provided which is a constitution of three components, green project management, green at process levels and green at product levels. Waste mapping of activities have been provided by the concept of lean (waste and value), it is however according to the interviews on organizational level where requirements, policies and regulations are impacting process level and product level of the project. Green project management is according to A implemented as a culture change initiative. At product level value have only been considered at ‘Use & Services’ level

of projects, therefore the lifecycle model can be used as an framework when considering other elements of the project.

A considerable draft of the framework is presented in the conceptual model, it is however still unclear whether it is applicable in practice or not. As for green project management A comments that interest for his particular concept is not high however he thinks that somewhere in the future the concept of green project management may come into play but that it would take a large organization to get the momentum needed. A further believes that a company who is going to adapt his concept will be a company with green culture which indicates that a company who is going to start questioning activities environmental impact will also have a green culture.

7.3 Conclusion

- The concept of green in projects consists of green at project management methodology level, green at project process level and green at project product level.
- The connection between lean and green in projects emerge in value and waste theory at process level.
- Organizational culture and regulations have the major impact on environmental aspects in projects.

7.4 Further research

- This research have been limited to experience from four types of industries, it would be of further interest to include perspectives from other industries.
- The conceptual model has been provided in this research, it is however of further investigation the practical application of the concept.
- The return of investment (ROI) by implementing the concept.
- Further research on global value at product level of the project (the outcome).

8 Appendix

8.1 QUESTIONNAIRE FOR A AT COMPANY 1

INTRODUCING QUESTIONS

1. A, tell me a little about yourself and your experience in project management.
2. How would you define ‘green’ project management?
3. What drove you to explore the field of ‘green’ project management?
4. Do you see an increase of interest in ‘green’ project management?
5. Do you think that ‘green’ is the next big thing?

QUESTIONS REGARDING GREEN IN PROJECTS

1. Where in the project do you feel ‘green’ have the most impact? (E.g. day to day decisions, greening supply chain, etc.)
2. Could ‘green’ be considered as yet another parameter on which project (management) success is based on?
3. Aside from identifying risks and etc. what benefits do you think implementing ‘green’ in the project could have?
4. Moving away from projects in general and looking at the outcome of the project, is it practically possible to consider future generations as stakeholders in a project?
5. Do you think that type of organizational culture is important when trying to implement ‘green’ thinking into projects?
6. What are your tips to a project manager/or organization that wishes to implement green into projects, where should they start?

8.2 QUESTIONNAIRE FOR B AT COMPANY 2

INTRODUCING QUESTIONS

1. B, can you tell me a little about what it is you are doing and how you are related to projects?
2. What standpoint does your organization have on environmental issues and sustainable development?
3. What practical application does your department/organization have regarding environmental issues and sustainable development?

QUESTIONS REGARDING PROJECTS.

1. How do you identify requirements prior to tasks (project start)?
2. Is environmental requirements identified before start of task/project?
3. To what extent do you feel that your team* can affect the outcome of the project/task?
4. What is your (organization, department, and team) standpoint on the concept of delivering value to client is the customer the primary stakeholders towards the project/task or is other stakeholders considered?
5. Is it practically possible to consider future generations as project/task stakeholders?
6. How do you handle environmental issues on a day-to-day basis, i.e. what type of environmental policy's or unofficial policies are used to make your day-to-day work more environmental friendly?
7. How is sustainable development considered at product level? (Product of the project), e.g. reusable material, energy efficiency etc.
8. If sustainable development is considered, does the organization set the requirements? And in what way? (E.g. specifications etc.)

8.3 QUESTIONNAIRE FOR C AND D AT COMPANY 3

INTRODUCING QUESTIONS

1. C and D, tell me a little about yourself.
2. What is your experience in project management?
3. What type of industries do you have experience from?
4. What is your organization's relation towards sustainable development?
5. How does your organization work with environmental concerns (staff education etc.)?

QUESTIONS REGARDING PROJECTS

1. From a project management perspective, what is your opinion on delivering value in projects? Is it to be on time, within budget and according to quality or are there other dimensions?
2. From your experience, is the primary goal to deliver value at an economical and technical level?
3. From your experience, have global values been captured, i.e. what type of stakeholders have been taken into account when doing a project?
4. Are there differences in project management success and project success?

QUESTIONS REGARDING ORGANIZATIONAL CULTURE AND PROJECT CULTURE

1. From your experience are there differences in organizational culture and project culture?
2. Do you think that the organizational culture has the most impact on deciding what the outcome of the project should be?
3. From your experience how much space do project managers have to affect the outcome of the project?
4. Do you think that sustainable development should be taken on organizational level?

QUESTIONS REGARDING VALUE AND SUSTAINABILITY

1. From the definition of lean in projects activities should affect the project in such way that it is visible for the client, are activities questioned if they are making impact on the project or not?

2. Are activities environmental impact questioned?
3. From your experience how much room are there for changing activities?
4. What is deciding how activities are performed within the project? (Policies, intern decisions etc.)
5. From your experience in what areas do you feel the project manager can have impact? (Choosing suppliers, choosing people in project team etc.).
6. When determine requirements at project initiation, is environmental requirements captured and how?

OTHER QUESTIONS

1. From your experience, are environmental risks included in the risk management processes?
2. Do you see any relation between sustainable development and project management?

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