Kapacitet: Highlighting Sustainability Initiatives for a Research & Development Engineering Consultancy

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ABSTRACT

Currently, there is a global lack of standardized sustainability processes within the R&D Engineering field. Our team conducted interviews and workshops to develop a language of sustainability and designed a showcase for Kapacitet, an R&D engineering consultancy in Copenhagen, Denmark, to highlight the centrality of sustainability to its company-wide mission. We accomplished this goal by evaluating the sustainability strategies of various R&D engineering consultancies, analyzing Kapacitet's current approach for sustainable practices by facilitating two workshops and conducting interviews with its employees. Key findings of these tasks include the concepts of Minimum Viable Products/Solutions (MVPs and MVS) and the client-based decisions made for projects. Finally, we designed the framework for the wall of sustainability, a physical wall in the firm's office, to exemplify the power of Kapacitet's mission within the field. We conclude the report by explaining how Kapacitet has created sustainable products. We also provide recommendations for displaying the wall of sustainability digitally and offer a visual representation of a variety of sustainable materials to better advise clients to prioritize sustainability during product development.

EXECUTIVE SUMMARY

Research and Development (R&D) engineering firms are expected to hold responsibility socially, economically, and environmentally when creating products. **Kapacitet, our project partner, had a sustainable mindset toward product development that was not being advertised to the public. Our goal was to highlight the company's mission in order to inspire its employees, current clients, and potential customers.**

Because there is a lack of a standard for sustainability in the R&D engineering industry, we began our process by evaluating world-leading companies' current sustainable practices. We gathered information specifically regarding Kapacitet by **conducting workshops and interviews with its employees**. As our team assessed Kapacitet's sustainability measures, we discovered that the firm particularly focuses on using the **Minimum Viable Product (MVP) method**. The MVP approach to product development encourages companies to reduce material and energy use in order to create, design, and construct products that are as simplified as possible. This, in turn, promotes a sustainable solution. **Kapacitet's employees also shared specific products that fell under three sections of sustainability**: developmental, environmental, and human health. Through our analysis, we discovered two main obstacles that contributed to Kapacitet's current underdeveloped approach to sustainability: a lack of regulations requiring sustainability and the client-driven approach to most product development processes. Lastly, we developed **the wall of sustainability** using language from comparable companies, sustainable Kapacitet products, and impactful quotes from its employees, described below (Figure 1).

Figure 1: Final Version of the Wall of Sustainability

To achieve our project goals, we developed the following five objectives:

1. *Benchmark sustainability strategies of R&D engineering consultancies*
2. *Develop a common language regarding sustainability at Kapacitet by facilitating a workshop with its employees*
3. *Analyze Kapacitet's current approach to sustainable development by conducting employee interviews*
4. *Hold a second company-wide workshop to solidify our findings and gain a further understanding of Kapacitet's sustainable products and decisions*
5. *Propose a sustainability showcase at Kapacitet to inspire employees and clients*

To **benchmark sustainability strategies** of R&D engineering consultancies, our team identified and compiled a list of world-leading engineering firms that prioritize and advertise their approaches to sustainable development. We researched the United Nations' (UN) 17 Sustainable Development Goals (SDGs) and ultimately focused on SDG #12, which ensures responsible

consumption and production and aligns best with Kapacitet's focus on reducing, reusing, and recycling. We narrowed down our initial list of 18 companies that prioritize this goal to five companies that stand out for excelling in this area: Dansk Teknologi, Designit, Viegand Maagøe, Thinkstep, and Technolution. Comparing Kapacitet's practices to those of the previously listed five companies provided further insight into our next objective: develop a common sustainability language within the company.

To accomplish that goal, we **facilitated a workshop in the first week** of our program to gain insight on how employees view sustainability within the consultancy. Lasting approximately 30 minutes, our workshop opened with an introduction of our team, an overview of our goals for our time at Kapacitet, and the need for a wall of sustainability to highlight the company's sustainability. The first activity primarily focused on having employees answer the question: "How does Kapacitet innovate while remaining sustainable?" The second activity prompted employees to react to three statements and respond whether they "strongly agreed," "agreed," "disagreed," or "strongly disagreed." These responses determined employees' and clients' personal connections with sustainability and how they are reflected in the company-wide mission. To conclude the workshop, we discussed as an entire group why individuals reacted the way they did and identified common thoughts on Kapacitet's current sustainability outlook.

To **analyze Kapacitet's current approach to sustainable development**, we conducted interviews with seven employees in a variety of positions and levels of experience. Our team interviewed employees to connect on a more individual level and gain more perspectives on the consultancy's sustainability processes. Interviewing employees from a variety of backgrounds helped us gain a well-rounded view of the entire company.

In our **sixth week at Kapacitet, we held a second company-wide workshop** to solidify our findings and gain a further understanding of the firm's sustainable products and decisions. Our team asked three questions to solidify our findings from the interviews and inspire conversation and dialogue between those attending. Before asking the third question, we presented information on **two of Kapacitet's case studies, Unmute and Careturner**, to share examples and promote similar thinking. We gave the participants time to discuss amongst themselves, then share their thoughts with the entire staff. The questions are listed below:

1. How are MVPs incorporated into your individual and company-wide work?
2. How can we work to influence our clients to make sustainable decisions, especially when the client is eco-conscious?
3. When was a decision made during the development process that improved its sustainability? Can you think of any specific example projects?

To develop the framework for the final sustainability **showcase, we consolidated all of the data collected from benchmarking, workshops, and interviews**. The wall features a storyline of the original vision for the company and Kapacitet's journey, the MVP and Minimum Viable Solutions concepts implemented at the firm, a handful of the consultancy's sustainable products.

After analyzing the methods listed above, we drew **two main conclusions:**

1. **Kapacitet uses their innovative mindset to develop sustainable solutions by using the Minimum Viable Product (MVP) approach**.
2. Although the company is client-driven, it should **incorporate more sustainable alternatives into initial discussions with customers**. Kapacitet should be as prepared as possible for the placement of future sustainability regulations.

Our interviews and workshops created an engaging environment where everyone working at Kapacitet could think critically about times they observed sustainable practices in their work. Employees began having breakthroughs and considered possibilities that had not been brought up previously, such as marketing the minimum viable product (MVP) approach. MVP is a sustainable development method that Kapacitet uses to make the core design of a product as simple as possible.

Rebranding the company's current engineering practices and advertising their positive impacts on the environment ensured that sustainability is in Kapacitet's DNA through everyday practice. Additionally, we learned that upcoming regulations and legislation may further establish standards for industrial sustainability. By developing sustainable practices now, Kapacitet will be a pioneer of sustainable thinking in the future; this is an attractive selling point for clients who will be looking for experienced consultancies. Our work left a positive impact on Kapacitet and inspired employees to continue their journey toward integrating sustainable practices into their product development processes.

We achieved our final deliverable by producing a design for the wall of sustainability. This layout opens with Kapacitet's mission: "**Reduce, Reuse, Recycle - Rethink Sustainability**" and includes a QR code that links to a video of an interview we conducted with the co-founder and chairman of Kapacitet, Jens Peter Bredholt. This section of the wall also outlines the firm's perspective and internal definition of the MVP approach and the concept of Minimum Viable Solutions. The outside ring of the design features five sustainable products that Kapacitet has created, which are categorized into groups that positively impact developmental, human health, and environmental sustainability.

For future work, we recommend that Kapacitet advertise simulations for prototyping and product design, involve sustainability in initial discussions with clients, and visualize

material choices for clients. Simulations digitally prototype designs, which results in zero physical scrap. It is a sustainable alternative to conducting physical tests and can save engineers time, costs, and energy.

It is also important that **Kapacitet places an emphasis on sustainability during initial client meetings**. In these meetings, consultants and customers come to agreements on design goals, such as the product's look and performance. As a consultancy, Kapacitet has the obligation to empower and guide clients to think sustainably. Several customers fail to consider the long-term effects that decisions have on products, so Kapacitet can educate them on the benefits of thinking sustainably.

Lastly, **we recommend creating a material database and a physical sample of materials commonly used at Kapacitet during the design process**. This includes aluminum, steel, polymers, and biodegradable materials that clients can select for their projects. While sustainable materials are available for commercial use, many firms fail to display them as an option for their products. Physical samples can influence the clients in the early stages of development to choose a sustainable alternative to their original design. Customers can be more receptive to change if they interact with the material to analyze texture, stiffness, and other mechanical properties that they might consider for their products' needs.

These suggestions, if implemented, could potentially **improve Kapacitet's communication with clients and better display the consultancy's prioritization of creating sustainable products**. In addition, we believe our analysis will reach beyond Kapacitet and promote external companies to incorporate sustainable practices in their agenda and drive the movement to maintain our world.

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Advisors: Professors Peter Hansen and James Hanlan

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CONTRIBUTIONS

Emily Sollecito

Emily was one of the primary authors and a secondary editor of the final report. She was responsible for guiding the direction of the project by leading conversations, organizing materials, delegating tasks, and taking notes throughout the process. In terms of performing methods, Emily assisted in benchmarking, took notes for the workshop and some interviews, and solely led the final discussion with Kapacitet employees. Lastly, Emily organized the information to be highlighted on the wall of sustainability and graphically designed the multiple drafts using Photoshop and other design applications.

Cameron Shelley

Cameron Shelley was one of the secondary authors and supplementary editors of the report. He provided contextual research for the background materials that went into the report. In terms of performing methods, he was primarily responsible for benchmarking comparable R&D companies, scheduling, facilitating, and notetaking for interviews with Kapacitet employees. Cameron took notes and pictures and floated around the workshop and discussion that our team conducted with Kapacitet.

Liliana Loughlin

Liliana Loughlin was one of the primary authors and the primary editor of the report. She was also responsible for guiding the direction of the project by leading discussions with Kapacitet employees, delegating tasks, and keeping a line of communication open with the team. In terms of performing methods, Liliana assisted in benchmarking, aided in the design of the workshop, and solely facilitated said workshop. She also ran employee interviews and took interview notes. Lastly, she researched and consolidated the information to be highlighted on the wall of sustainability.

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Abigail was one of the secondary authors and supplementary editors of the final report. She was responsible for writing the first drafts of various sections of this report that Liliana and Emily edited and finalized. In terms of achieving methods, Abigail assisted in benchmarking, facilitated and took notes during a majority of the interviews with employees, as well as took notes and floated around the room to listen and take pictures during the company-wide initial workshop and final discussion. She was also responsible for primarily monitoring the Kapacitet email our team was given and sending our weekly schedules to the consultancy's CEO.

1. INTRODUCTION

Research and Development (R&D) engineering firms have a responsibility, socially and economically, to be sustainable while continuing to develop products. Naturally, R&D firms integrate new ideas for sustainable measures into their current practices to react to the present-day social and physical climate. Many current, but outdated, methods of production involve compromises in sustainability. Consultancies have even more responsibility to promote sustainability as they are the leading experts in their field. Maintaining sustainability throughout the entire product development process remains a challenge. A major issue across several industries, including R&D engineering consultancies, is the lack of a specific standardized framework. Ultimately, there may be no "one size fits all" method for sustainability, but industries must start considering various methods and processes in a sustainability framework to support their sustainability goals.

Kapacitet is an R&D engineering consultancy that aims to present their current sustainable methods to clients, employees, and competitors. While Kapacitet's product development processes are sustainable in many ways, they are not showcased or highlighted on their website or in their office. Kapacitet fosters a company-wide culture of sustainability and invited our team to facilitate discussions to develop sustainability that gave prominence to its commitment to sustainable product development as a world-leading R&D engineering consultancy.

This project aimed to benchmark and showcase sustainability processes at Kapacitet. After identifying an applicable, empowering language and a company-wide culture of sustainability, we developed a visual display of our findings for employees and clients to view. The **mission of our project was to highlight Kapacitet's sustainable practices by proposing a physical wall of sustainability** to inspire employees, current clients, and potential customers. We **accomplished these goals through the following five objectives**:

1. Benchmark sustainability strategies and their presentation at comparable R&D engineering consultancies
2. Develop a common language regarding sustainability at Kapacitet by facilitating a workshop with its employees
3. Analyze Kapacitet's current approach to sustainable development by conducting employee interviews
4. Hold a second company-wide workshop to solidify our findings and gain a further understanding of Kapacitet's sustainable products and decisions
5. Propose a sustainability showcase at Kapacitet to inspire employees and clients

This paper details the background, methods, results, conclusions, and recommendations of our

project conducted and proposed to complete these objectives.

2. BACKGROUND

This chapter provides an overview of sustainability in broad and narrow contexts in accordance with our project mission, sustainability of product development within engineering research and development (R&D). The connection of sustainable development goals to Kapacitet gives us a defined area of study. Kapacitet's goal is to highlight its sustainable measures to inspire employees, current clients, and potential customers. Kapacitet will benefit from these measures economically and socially. We benchmarked sustainability among similar firms and researched sustainable tools and methods including Life Cycle Assessments (LCA) and LCA lite, Minimum Viable Products (MVP), and lastly the impact of fostering a sustainable environment.

2.1 Sustainability in Denmark

Legislation in the European Union (EU) has been implemented to increase environmental and sustainability awareness. The EU has some of the world's highest environmental standards, which have been developed over decades. Some of the goals of this legislation include reducing greenhouse gas emissions (GGE), adapting to climate change, waste management, and environmental responsibility for businesses to hold themselves to. Denmark Is an EU member state and created additional legislation to reduce negative environmental impacts. Their country-specific goals focus on economic effects, energy usage, and transportation. The Climate Act is the most recent legislative act, passed in 2020 and amended in 2021. This act will reduce Denmark's GGEs by seventy percent in 2030 and will allow the country to reach carbon neutrality by 2050 (Grantham Research Institute, 2020).

To expect every individual to take steps for sustainability is aspirational, as sustainable goals are implemented after leading scientists worldwide work to find solutions. As a result, governments implement sustainability protocols and standards to help guide their populations in the correct direction. As companies start complying with these regulations, negative environmental impact should decrease.

2.2 Sustainable Development Goals

Sustainability is an umbrella term, summarizing the concepts of improving and conserving the lifespan of resources and systems. Because of this broad definition, sustainability applies to a variety of topics (McGill University, 2015). Traditionally, sustainability ties to an environmental context, but the United Nations General Assembly (UNGA) defines 17 sustainable development goals (SDGs) (UN DESA, 2022). Prior to the UN SDGs, the millennium development goals (MDGs) outlined goals addressing world issues such as "hunger, disease, gender inequality, lack of education and access to basic infrastructure, and environmental degradation" (United Nations, 2007). The MDGs were too general, and progress was slow, so the United Nations developed these seventeen SDGs in 2015 to provide a more detailed framework. SDGs encompass the broad definition of sustainability by including facets that traditionally

received less attention. Denmark has made much progress in social and economic sustainability in terms of equality, equal access, and equity. Of the 17 goals in Figure 2, not every SDG is essential to Kapacitet's definition of sustainability.

Figure 2: 17 Sustainable Development Goals (UN General Assembly/United Nations, 2023)

2.3 SDGs and Kapacitet

Analyzing the sustainable development goals relating to Denmark and Kapacitet generates a specific direction for our sustainability benchmarking. **As a mechanical engineering-based R&D consultancy, Kapacitet has various social responsibilities and impacts in the context of sustainability.** Initially, we identified two SDGs with concrete connections to Denmark and Kapacitet.

Sustainable Development Goal #12 ensures sustainable consumption and production patterns (UN DESA, 2022). Within the EU, the scope of monitoring SDG #12 includes making progress in areas such as the reduction of environmental impacts and waste generation from economic growth, the integration of a green economy, and environmentally friendly waste management practices.

The production industry includes companies that involve any area of the product life cycle: design, prototyping and testing, production, retail, and end-of-life. Kapacitet works through the first three sectors of the product life cycle. Naturally, engaging in these areas leads to excess material and energy waste. When looking at trends, the reliance on natural resources for production has grown 65% globally from 2000 to 2019. This trend must be slowed or managed by 2030 to achieve worldwide sustainability goals of combating climate change and pollution rates (UN DESA, 2022). Because of this, decisions are made to improve processes regarding waste management, materials, and energy sources (Aldieri, L., Makkonen, T., & Vinci, C. P., 2022).

Section 12.5 of SDG #12 specifically focuses on reducing waste generation through prevention, reduction, recycling, and reuse (UN DESA, 2023). The steps from SDG #12 apply to Kapacitet's development process by using sustainable materials and implementing effective recycling processes. Section 12.6 of SDG #12 highlights the importance of companies integrating sustainability into their practices and reporting said practices annually (UN DESA, 2023). Participation in this process allows companies to understand their impact on overall consumption and production. This also ensures that corporations are maintaining and improving their sustainable initiatives over time. Kapacitet engages with SDG #12 and will highlight its eco-conscious outlook by displaying a physical wall of sustainability to empower employees and clients alike.

Sustainable Development Goal #17 is to strengthen the means of implementation and revitalization of the Global Partnership for Sustainable Development (UN DESA, 2022). According to Operation Eyesight, "strategic and inclusive partnerships at the community, national and international level play a critical role in achieving sustainable, meaningful development" ("Partnerships for the Goals", 2023). Denmark is committed to this goal through the widespread use of public-private partnerships. This allows the Danish government to collaborate with organizations and confirm that sustainability initiatives are being properly enacted ("What Makes Denmark", 2023). Kapacitet also reaches SDG #17 by partnering with several eco-conscious companies in order to make a sustainable product. One of its clients, Ørsted, focuses specifically on renewable energy solutions in the United States. Working through Kapacitet's maritime sector, the two companies "designed, built and delivered a hydraulic subsea drilling tool for remotely operated vehicle (ROV) operations", as shown in Figure 3 below (Kapacitet, 2023).

Figure 3: Hydraulic Subsea Drilling Tool Developed by Kapacitet and Ørsted (Kapacitet, 2023)

Kapacitet doesn't only work with maritime organizations. Another one of its partners, X-Solar Systems, enlists its engineering background to design and manufacture "high-quality prepaid solar energy systems for low-income households and businesses in the developing world" (Kapacitet, 2023). Kapacitet has a strong understanding of the importance of partnerships in terms of advancing sustainable development, but Kapacitet's progressive mindset is currently not broadcasted to its employees or its clients.

2.4 Sustainability Analysis in Practice

Although Kapacitet develops eco-friendly products for clients in various sectors, including Industrial, Healthcare, Consumer, and Maritime, it does not currently highlight its sustainability measures (Kapacitet, 2023). As stated above, it partners with many organizations that value sustainable development and practices; highlighting its partners' eco-friendly initiatives will improve its market position. Kapacitet also has an overarching sustainable outlook worth highlighting to the public due to its positive impact on the environment.

Kapacitet's goal is to stay up to date with sustainable development and to find adequate ways to present that information to its current and future clients. Our first step towards reaching this goal involves assessing comparable R&D engineering consultancies as well as Kapacitet's sustainable partners to understand how they are maintaining their green initiatives. Sustainability assessments are generally defined as operations that "direct the planning and decision-making process toward achieving sustainable development" (Hacking and Guthrie, 2008). To initiate the process of assessing sustainability in Kapacitet, our team focuses our attention on various methods and ideologies that similar companies follow. These include Life Cycle Assessments (LCA), Minimum Viable Products (MVP), the simplifications of these methods, and the comparison of different types of economic cycles. Lastly, the most effective ways to develop a culture around sustainability in a business are evaluated. This foundation highlights the essential tools in evaluating Kapacitet's products and practices.

2.4.1 Life Cycle Assessments

Life Cycle Assessments (LCA) measure "the impacts on the environment associated with the life cycle of a product, process, or service" (Golsteijn, 2020) and track the carbon footprint of a product from beginning to end of its lifespan. The diagram below (Figure 4) maps out an example of an LCA analyzing different stages of resource usage. Firms like Kapacitet must keep in mind the recyclability of raw materials they acquire to ensure said materials' lives will not end in the "Waste Management" segment of the model below. The energy used in the "Manufacturing" and "Operation/Use/Maintenance" sections should also be renewable to avoid creating unnecessary

emissions. In turn, waste outputs are minimized and end products are maximized. SDG #12's goal is to ensure that responsible consumption and production align with the overall values of LCAs.

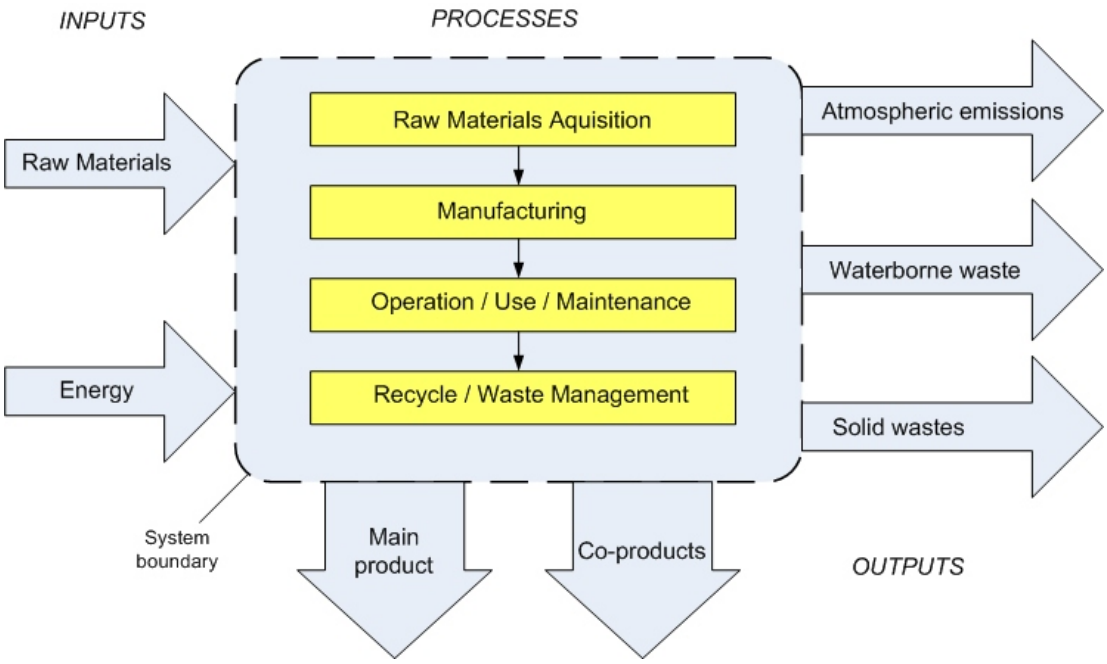


Figure 4:Graphic of a Mapped-out LCA for a Traditional Manufacturing Process (Fedkin, 2020)

While the LCA is a useful tool for analyzing environmental impact over a lifecycle, it requires complex data collection that makes it difficult for designers to integrate the tool into their work (Persson, 2000). The LCA Lite tool is a simplified version of the LCA process that uses observations rather than data collection; this makes it more user-friendly and applicable to the average engineer. Because Kapacitet is a smaller sized firm, collecting data on projects is unappealing; its engineers prioritize building and designing products quickly and efficiently. Usage of the LCA Lite tool "minimizes data requirements and is useful for identifying the most effective parameters that promise to make the most difference" (Tabrizi & Brambilla, 2019). Focusing on the framework of a product rather than individual data points allows Kapacitet engineers to quickly identify the most efficient method to develop said product. LCA Lite also minimizes impact from the early design stage by "identifying components or materials that have the largest impact" (Life Cycle Assessment, 2004). This cuts development time and allows Kapacitet's employees to simplify the initial process as much as possible. Overall, LCA Lite will be a more useful and effective tool to implement at a small R&D engineering firm.

2.4.2 Simplimize Using the Minimum Viable Product Approach

Simplimize is a progressive method that "simplifies and optimizes [a] company's product range" (Simplimize, 2022). Its goal is to reduce costs at every stage of product development while

remaining competitive. This is a relatively new process, with over 40 companies taking advantage of its tools. Kapacitet strongly believes in Simplimize's mission; employees prioritize the simplicity of the original portfolio so the constraints around it don't grow in complexity as the project advances. This is exemplified through Kapacitet's consistent use of the Minimum Viable Product approach.

The Minimum Viable Product (MVP) approach is a method that develops a product in stages, which decreases the overall use of material and energy in the design process (Hanschke, 2011). The early phases are important to consider from a sustainability perspective because "over 80% of all product-related environmental impacts can be influenced during the design phase" (European Commission 2014). Compared to other approaches to product development, the MVP method incorporates the need for market research into these features. The product must first be researched to service the consumer and identify the most essential features.

Not only does MVP promote fast development and build a customer base, but it also minimizes cost and material usage through the stages of product design (Dansk Lean Forum, 2023). The MVP method creates a mock product that includes the features researched to show the true and simple application of the product (Metafuro, 2020). This version is deliberately not fully developed to allow for feedback. The final product will not be produced until multiple iterations of MVP have been performed.

2.4.3 Circular Economy

Corporations are also assessed on the longevity of their product. In a circular economy, products are recycled and processed into raw materials so they can be used in future development. Because of this, it has the potential to reduce the reliance on finite natural resources. According to the Ellen MacArthur Foundation, implementing a circular model in industrial sectors could also "cut C02 emissions by 3.7 billion tons by 2050" (Khalamayzer, 2022). Lastly, the circular economy benefits businesses long term, as they can effectively improve the quality and longevity of their products. This, in turn, gives them a competitive and sustainable advantage against companies using a linear model (Macdonald, 2022). As shown in Figure 5, a linear economy encourages the immediate disposal of products after they have been used to their supposed lifespan. Businesses that follow this model must account for extra costs involving repair and replacement of products.

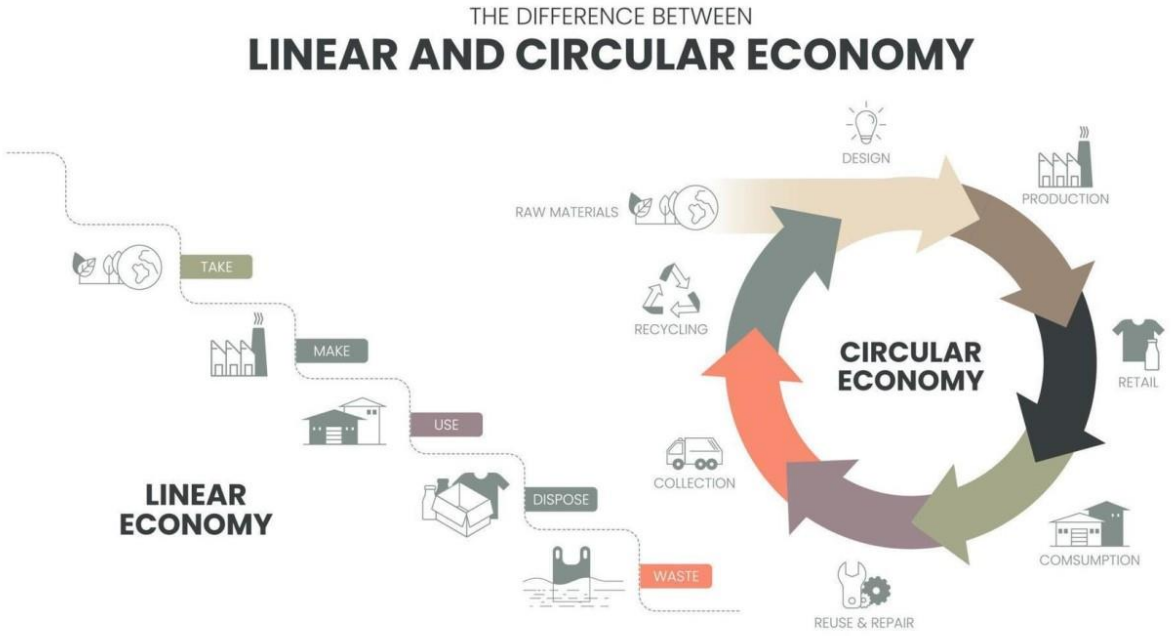


Figure 5: Linear Economy vs. Circular Economy (Macdonald, 2022)

In order to create an effective circular economy, it is important to design products that are easy to recycle. Design for sustainability can make it easier to recycle products because it considers material selection and product design; a modular design allows for a product to be easily disassembled and refined into raw materials, which are later processed into new products (Minnette, 2022). Kapacitet applies this framework to its R&D process by choosing standardized parts, modular designs, and sustainable materials that can easily be recycled. Design for sustainability aims to create products that align with the environmental, social, and governance goals outlined by the United Nations General Assembly, which directly aligns with Kapacitet's mission.

2.4.4 Fostering Sustainable Innovation

Fostering a sustainable mindset within a company is the final key to success in the development of sustainable practices. As previously mentioned, sustainability's intricate definition can cause confusion and misalignment between individuals. For a company to have a unified environment, conversation on the topic of sustainability is essential. Developing a common language, or a unified voice through a company, builds a strong foundation for communication, reduces misalignment of ideas, and promotes a unified culture within a company (National Business Research Institute, 2023). Second, giving employees the opportunity to openly discuss the topics of sustainability solidifies their understanding within the company. Workshopping is a great way for employees to collaborate to find tangible ways to improve their skills and abilities

while developing practical methods (Natsir, 2022). Overall, a well-integrated common mindset throughout a company is essential for its progress towards more sustainable practices.

2.5 Conclusion

The evaluation of definitions of sustainability provides a starting point for analysis of Kapacitet's sustainable practices. Within the field of R&D engineering consultancies, a company's ethical drive is what compels them to approach sustainable development. The use of a shared language can further foster this mindset within Kapacitet.

3. GENERAL METHODOLOGY

The mission of our project is to highlight Kapacitet's sustainable practices by designing a physical wall of sustainability to inspire employees, current clients, and potential customers. We accomplished these goals through the following five objectives:

1. Benchmark sustainability strategies of R&D engineering consultancies
2. Develop a common language regarding sustainability at Kapacitet by facilitating a workshop with its employees
3. Analyze Kapacitet's current approach to sustainable development by conducting employee interviews
4. Hold a second company-wide workshop to solidify our findings and gain a further understanding of Kapacitet's sustainable products and decisions
5. Propose a sustainability showcase at Kapacitet to inspire employees and clients

Later chapters discuss our efforts to achieve these objectives by benchmarking the field, and researching comparable firms, developing a language for Kapacitet's culture, and creating a visual display of our findings to inspire current and future employees and clients.

4. BENCHMARKING SUSTAINABILITY

In order to benchmark sustainability strategies of R&D engineering consultancies, our team identified and compiled a list of world-leading firms that advertise their eco-conscious approaches to development. Comparing Kapacitet's practices to the defined benchmark provided further insight into our later objective: develop a common sustainability language within the company.

4.1 Benchmarking Sustainability Method

Due to the lack of a clear standard for sustainability in the engineering field, our team researched the 17 Sustainable Development Goals, as shown in Figure 1, to gain a deeper understanding of the methods used by sustainable companies on a global scale. **Kapacitet asked us to focus directly on SDG #12, which "envisions sustainable production and consumption based on advanced technological capacity, resource efficiency and reduced global waste"** (Eurostat Statistics Explained, 2022). We originally developed an inventory of eighteen companies (see Appendix A for a complete listing and criteria for each choice) that emphasized this goal and specifically referenced their sustainable practices on their websites.

Through extensive online research, as well as through partnered organizations, we narrowed down our initial list to five companies (see Appendix B) that **met the following criteria**:

- Based in the EU
- Clearly stated a sustainability mission
- Integrated powerful sustainability language throughout the website
- Used a hands-on approach to problem solve
- Related closely to Kapacitet's practices and values

Dansk Teknologi is a Danish product development firm that has created over 950 products for numerous companies internationally, many of which focus on sustainable solutions such as Nitrogen Oxide reduction devices, offshore drilling technology, hospital products, and digital dosing pumps (Dansk Teknologi, 2023). The firm's goal is to "always find simple solutions to complicated problems," which follows the minimum viable product (MVP) approach used by Kapacitet engineers. Similarly to Kapacitet, Dansk Teknologi is an engineering consultancy with decades of hands-on experience. We selected technical consultancies like this one to ensure that our findings resonated with Kapacitet employees and clients.

Designit is a Danish design consultancy that helps companies develop products more efficiently and sustainably through the usage of strategic design. It empowers change within the engineering industry by helping clients understand the decision process that goes into sustainable development (Enabling sustainable transformations for businesses, 2023).

Viegand Maagøe is a Danish consultancy that specializes in creating “sustainable products through analysis, simulation, calculation, and product development" (Bæredygtige produkter, 2023). It assesses the environmental impacts of its clients’ ideas and develops products with improved and documented sustainability.

Thinkstep is a German software and design consultancy that aids in the development of sustainability strategies within corporations. For the past 15 years, the company has been “delivering consulting projects and implementing software solutions in Australia and New Zealand to build business value from sustainability” (ANZ: Environmental & Corporate Sustainability, 2023).

Technolution is a Danish product development firm that specializes in mobility and technology solutions. Sustainability is emphasized in the initial product discussion to ensure that clients make “informed decisions about sustainable design improvements” (Sustainability Engineering, 2023).

4.2 Benchmarking Sustainability Results and Analysis

The companies’ names, industry type, and language usage of all the companies in this list were recorded in Table 1 below. Finding overlapping terminology and phrases aided in the development of our first deliverable, Kapacitet’s shared language.

Table 1: Final Data for Benchmarking Sustainability on Comparable R&D Companies.

Company Name	**Type of Company**	**Sustainability Terms and Phrases**
Designit	Innovation company / design consultancy	"Activate purpose", "materialize solutions", "empower people", "educate clients"
Dansk Teknologi	Product development company	"Our goal is always to find simple solutions to complicated problems"
Viegand Maagøe	Consultancy	"Concept development of sustainable products and business models", "workshops (innovation and brainstorms on sustainable design)", "Life Cycle Assessment (LCA)", "Use of circular economy", "sensitivity analysis (rapid screening on ideas for greatest environmental impact)", "advice on legal requirements and certifications"
ThinkStep	Software & consulting company	"Walk the talk", "sustainability is in our DNA", "UN global goals", "circular economy", "Life Cycle Assessment (LCA)", "cradle to cradle", "carbon footprint", "materiality assessment", "SDG workshops and implementation"
Technolution	Product development firm	"Life cycle screening (LCA)", "Ecodesign", "Ecodesign + life cycle screenings = improved environmental impact", "design for circular economy", "sustainability improvements we bring to the table have to be applicable in a device development context and be in alignment with our clients sustainability goals", "informed decisions about sustainable design improvements"

5. KAPACITET'S FIRST WORKSHOP

Our team held a workshop in the first week of our program to gain further clarity and insight on how Kapacitet's employees viewed sustainability within the organization. This workshop lasted a total of 30 minutes, opening with an overview of our mission at Kapacitet and the need for the wall of sustainability. The remainder of the workshop was composed of two activities that pushed Kapacitet's workers to share their insights on the company's sustainability initiative.

5.1 First Workshop Method

The first activity centered around the employees answering the question: "How does Kapacitet innovate while remaining sustainable?" We prompted them to work individually, then form groups and consolidate their notes. We proceeded to give them space to share their work with everyone on a flip chart in the front of the workspace. They combined notes as more groups shared their thoughts and common themes developed, eventually creating a mind map.

The second activity allowed employees to state their personal opinions about their company and the work it accomplishes. We announced three statements, and depending on how employees felt, they would move to one of four sections: "Strongly Agree", "Agree", "Disagree", and "Strongly Disagree". The statements are listed as followed:

1. Personally, my work positively impacts sustainability and the environment.
2. My clients care about sustainable development.
3. Sustainability is in Kapacitet's DNA.

After the initial movement, we gave everyone space to voice why they moved to their respective areas. We identified common thoughts and ideas regarding Kapacitet's sustainability outlook during this time.

5.2 First Workshop Results and Analysis

During the first activity, we found that **Kapacitet employees frequently mentioned MVPs, LCAs, and the emphasis on client needs**. As shown in Figure 6 below, there were numerous sticky notes stating that Kapacitet uses strategies to achieve tasks with minimal waste, such as topology optimization and MVPs. Additionally, a few employees mentioned using LCAs as a way to compare the sustainability of different products and educate their clients accordingly. Since Kapacitet is a customer-driven consultancy, we gathered that it was important to present sustainable alternatives to clients and discuss the long-term benefits of choosing said alternatives.

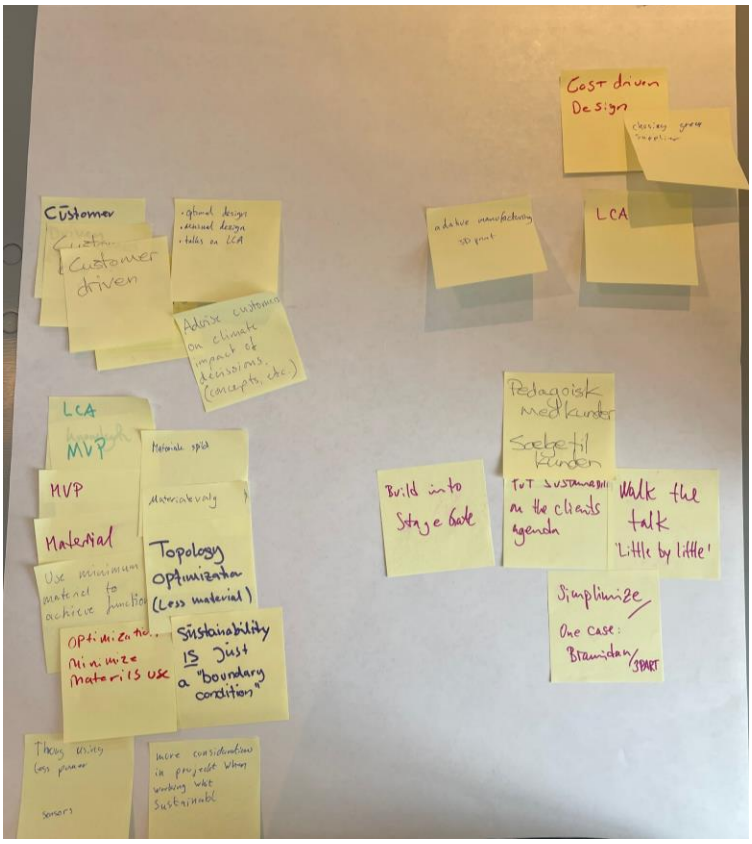


Figure 6: Completed Mind Map Exercise Compiled During our First Workshop

In response to the first statement of the second activity, everyone participating in the workshop split between the "Disagree" and "Agree" sections, as shown in Figure 7 below. While one employee claimed, "every time you create something new, you will negatively impact sustainability", another mentioned that Kapacitet engineers have the ability to use computer simulations, which can run tests without the need for a prototype. According to the discussion, projects are driven in a sustainable direction only when clients request it. **The general consensus was that Kapacitet is "on a journey" in terms of sustainability and improvements are being made little by little.**

Figure 7: Kapacitet Employees Participating in the Second Activity of our First Workshop

After reading the second statement out loud, the group remained split between the "Disagree" and "Agree" sections. **Two main findings** emerged from the following discussion. First, **clients often do not share their opinions on sustainability, as their projects are mainly driven by fixed budgets and deadlines**. Second, **several clients do care about sustainability but are limited by fear**. There is a common misconception that sustainable alternatives are not marketable, so it is important to educate clients on the potential benefits of sustainability and help them make informed decisions regarding the impact of their products.

In **response to the third statement**, two participants moved from the "Disagree" section to the "Agree" section, creating a more even division. **While several employees agree that sustainability is a part of Kapacitet's DNA, it is important to "communicate sustainability more to make it a core value."** Kapacitet's co-founder, Jens Peter Bredholt, is a visionary who created the company with sustainability at its core; some employees who have been with Kapacitet for several years believe his mindset still resonates, while others believe his vision is not incorporated enough into current practices. **According to the discussion, it is important to communicate sustainability more to make it a core value in order to move in the right direction**. Table 2 below displays our final data collection from the workshop, including themes, findings, and quotes.

Table 2: Data Collection for the First Workshop with Kapacitet Employees.

Theme	Findings	Quotes
Minimizing Materials	- Aims to minimize material usage while keeping the product's same function - MVPs (minimal viable products) - Material choice is important	"Most of us try to drive the projects in a sustainable direction. It might be the small things such as the materials; we are trying"
Customer Driven Work	- Put sustainability on the agenda for clients	"Communicate sustainability more to make it a core value"
Sustainability Mindset	- Customers have to "buy in" to sustainability - Improvements are made little by little	"Kapacitet is on a journey"
Active Choices	- Additive manufacturing > Subtractive Manufacturing	"Walk the talk"

6. EMPLOYEE INTERVIEWS

By conducting interviews, our primary goal was to connect with Kapacitet employees on an individual level and gain a further understanding of their current sustainability procedures. Opinions in every sector of the company were essential to understand how Kapacitet's mission and language can be integrated into our last method, the wall of sustainability.

6.1 Primary Interviews Method

Throughout the interview process, we gathered data from seven employees at Kapacitet. In order to collect as much relevant information as possible, our team created a series of questions to introduce depending on the type of employee being interviewed. The table displaying these questions can be found in Appendix E. The meetings with engineers were based on product development processes, while the meetings with the marketing employees were based on client engagement.

We met with Kapacitet employees from a variety of backgrounds to ensure that we gained perspectives from the entire company. We decided who we interviewed based on personal interest and recommendations from the CEO, Helle Olund Villumsen. The workers we interviewed gave us unique insight into the development of a project from conceptualization to the end product.

These employees provided us with a more technical background and discussed the sustainable practices at Kapacitet:

- Bo Peterson, CTO (Chief Technology Officer)
- Marie Bay Borg, R&D Engineer
- Lasse Holst, R&D Engineer

The following individual gave us a unique perspective on Kapacitet's sustainable initiative since he was new to the company and witnessed Kapacitet's most up-to-date ideology on sustainability:

- Alexander Søgaard Petersen, R&D Intern

These employees gave us information regarding how they interacted with Kapacitet's clients, how they introduced sustainable alternatives to said clients, and how they could develop their suggestions even further:

- Nadim El Mir, CSO (Chief Sales Officer)
- Anders Michelsen, Client Engagement Director

Jens Peter Bredholt, Co-Founder and Chairman, expressed his initial mindset when he first established Kapacitet, which was incredibly helpful in terms of fostering ideas regarding the wall of sustainability. He also discussed several subjects with us, from process development tools to

client relationships. We met with him a second time to solidify our discussion points and pull more impactful quotes to use on our final deliverable.

After the interviews were completed, we uploaded their data, including audio files and written notes. Each member of our team listened to the files, added personal notes, and pulled impactful phrases from the interviews; as the amount of data grew, we grouped together content based on relative themes. We consolidated our information in Table 3, shown below in section 6.2, with four columns: the employee's name, position, thematic notes, and significant quotes. It is noted that the quotes column was combined to respect workplace privacy. The final phrases used in our results section, as well as our final deliverable of the wall, were not attached to specific employees at Kapacitet.

6.1.1 Supplementary Interviews Method

After our initial seven interviews were completed, we met with Anders and Bo to gain insight on two Kapacitet products, Unmute and Careturner. Unmute is a picture frame that can store audio files, while Careturner is a mechanical addition to medical beds that gently turns patients to prevent seizures and ulcers. During a discussion with Helle, she recommended that we learn more about their development, as she believed they were both prime examples of sustainable products. We later met with Bo and Anders specifically, as they have worked on the development of both deliverables.

6.2 Results and Analysis of Kapacitet Interviews

Key findings from most of the interviews included employees mentioning using LCAs and LCA Lite, but that the latter concept is pretty inconsistent as it does not yet have a specific defined procedure. However, **Kapacitet does use MVPs often, which is a common theme among engineers across the R&D industry**. A phrase spoken by Jens Peter Bredholt in his interview with us was, **"MVP is at its core a sustainable way of thinking as it explains that you should only do what you need to do."** Our team believes this quote provides **a good summary of Kapacitet's mindset** for approaching product development using the MVP method. MVPs focus on the core issue and identify how to solve problems with minimal features in the simplest way possible. Overall, Kapacitet employees conveyed that MVPs are very important for **simplifying development processes and products** and reducing costs, time, and materials. Some employees also mentioned rephrasing the **generic term MVPs to "Minimum Viable Solutions"**, which better represents Kapacitet's mindset for its work towards creating solutions for problems.

A common theme observed across most of the interviews surrounds the lack of very developed regulation within Denmark for sustainability policies within companies. Our team gathered that regardless of the need for new legislation to drive the creation of detailed sustainability strategies across firms, Kapacitet can start establishing their own policies. These created policies will put Kapacitet ahead of their competitors in the market when legislation goes

into effect. Kapacitet will be one of the companies looked up to by others for already having experience and established sustainability strategies for years.

Another major theme gathered from interviews with Kapacitet employees consisted of decisions made for projects being client-driven, which creates the need for suggesting to clients in initial meetings to focus on producing a sustainable product. **Informing clients that many sustainable solutions are also inherently economically sustainable** would be a good point to advise customers on. Mentioning that creating a sustainable product ultimately reduces costs, time, materials, parts, and scrap is a huge selling point for clients. Table 3, shown below, includes the data we gathered from each employee interview.

Table 3: Data Collection for Employee Interviews.

Employee	Position	Notes	Quotes
Jens Peter	Chairman & Owner	- Policy in Denmark can drive sustainability if new legislation is created - Best sustainability definition is meaning to last a long time - MVP and LCA and their ideas are at their core sustainable - MVPs are sustainable at their core - Transparent education on the area within the company to then deliver to outside the company (clients) is what is needed - Sustainable action, especially with other benefits, becomes easier as time goes on and will actually save money	- The market is "Not a pull, a push" - "People need to realize they have a choice" [regarding sustainability]. - "We will give the enlightened choice" - "MVP is, at its core, a sustainable way of thinking as it explains that you should only do what you need to do" - "We're good at physical/ mechanical development, and we're remaining at the forefront"
Marie	R&D Engineer	- MVP is important, especially for smaller start-ups. MVP can help simplify and cut costs - Some firms don't know that they've over-engineered their product - The sustainable material will be provided if the client is interested, how much we push that right now - I don't know - Good recycling methods: Paper Cardboard and Metal and Food in the kitchen	- "A lot of sustainable solutions are also economically sustainable" - "We are really good at getting good ideas and executing to build things that work" - "Teaching the customers what they really want is the hard part; doing the mechanical engineering is the easy part."
Alex	R&D Intern	- No real sustainability methods have been taught to him - He focuses more on the process of development than on sustainability; Customers aren't asked about sustainability often - They'll do an LCA comparison to show one model is better than the other and that is the only consideration	- "If a client wants a green product, Kapacitet will make that happen"

		they do.	
Bo	CTO	- MVPs focus on the core issue, cut the product to the bone, and it is important to get the customer on the same page - LCA and LCA lite is not accurate to the companies methods - Collection of scrap properly is already a common practice in Denmark, nothing special there - Showing the clients materials as a way of educating them to make a good decision - Money, time, functionality are the order of priority in this company, legislation drives us.	- "MVPs find what it takes to solve the real problem with minimal features" - "Regulation is needed to create change" - "If it solves the problem that should be a market" - "There is no such thing as sustainability…just less impact".
Nadim	CSO (Chief Sales Officer)	- Sustainability information must be highlighted more. This starts with better internal communication. - Presenting sustainability information in the form of case-studies/product examples will be most powerful - Proposed highlighting sustainability in weekly Linkedin posts to "advertise" strategies to clients and employees - Minimal Viable Product → Minimal Viable Solution - The information could be then presented in story-line format to explain Kapacitet's thought processes	- "Minimum Viable SOLUTION" - "Clients choose Kapacitet for its ability to deliver high paced quality products"
Anders	Client Engage-ment Director	- Customers that prioritize sustainability get these options such as alternative material choices - The conversation with clients on sustainable decisions should always happen. It is only happening sometimes. - We must stay ahead of legislation and regulations - Ways to persuade: you can save money in the long run - Possible packages to incentivize sustainable decisions	- "I think sustainability will become a competitive advantage if you can document that a product is sustainable" - "We can't sell anything they don't want to buy" - "We have suggestions for other concepts that have less impact that we're going to sell to customers"
Lasse	R&D Engineer	- Cost has been a limiting factor - Their decisions include ones which will lower the amount of materials or parts needed - Use the MVP way of thinking to rebrand ourselves - We ask critical questions when talking to the clients - Small improvements will be safer than changing the entire process - Wants education of different materials, possibly in the form of a type of database	- "Simulation is a great way to do things the sustainable way…to make a structure lighter so you're polluting less" - "We are on a journey" - "MVPs let you combine multiple parts into one which is inherently sustainable" - "When building prototypes, we're good at sorting the [scrap] materials" - "It's hard to change the direction of a ship that has already sailed,

			but we have a great captain (Helle)”

We used the information gathered in **our table to identify the overarching methods and mindsets that Kapacitet employees demonstrate in terms of sustainability**. We chose to write sections of the wall based on these topics: **Jens Peter Bredholt’s initial vision and storyline**, **Kapacitet products representing three sectors of sustainability**: environmental, developmental, and human health. The concept of **Minimum Viable Solutions** was included as a preface to the developmental sector. Lastly, we added a section about **Kapacitet’s journey** and their goals moving forward.

6.2.1 Results and Analysis of Supplementary Interviews

The meetings with Bo and Anders gave us context regarding the sustainability of two **Kapacitet case studies, Unmute and Careturner**. Both employees expressed the fact that the original **Unmute design** was made out of unsustainable material and had three separate parts, so **Kapacitet’s development team proposed a new prototype. The updated design** was consolidated into one component and recycled fishermen nets were used for the frame’s mold. Simplifying the product and advocating for a material change were sustainable decisions that should be highlighted at Kapacitet.

Although saving costs was the main objective while creating **Careturner, Kapacitet engineers made several sustainable decisions throughout the development process**. The product was designed as a “one size fits all” model, which inherently saved material and minimized scrap. The team also decided to use aluminum to develop Careturner as opposed to painted steel; aluminum is considered an eco-friendly material due to its high rate of recycling. In the end, this product became sustainable in order to cut costs, which further proves that the green alternative is not necessarily the more expensive option.

7. KAPACITET'S SECOND WORKSHOP

We conducted a final company-wide event to have dialogue during Week 16 (the sixth week of our program) to ensure that our findings from the interviews resonated with the employees as a collective while staying true to Kapacitet's practices.

7.1 Second Workshop Method

We opened our presentation by acknowledging the fact that working sustainably in the R&D engineering field comes with its challenges due to profit incentive taking priority. We introduced the concept of working in a "gray area" – The answers to a sustainable future are never black or white.

Our team asked three questions to solidify our findings from the interviews and inspire conversation and dialogue between those attending. We gave them time to discuss amongst themselves, then share their thoughts with the entire staff. The questions are listed below:

4. How are MVPs incorporated into your individual and company-wide work?
5. How can we work to influence our clients to make sustainable decisions, especially when the client is eco-conscious?
6. When was a decision made during the development process that improved its sustainability? Can you think of any specific example projects?

We gave more context to our third question by introducing two case studies that represented prime examples of times when products were developed in sustainable ways unintentionally. The two case studies came from information gathered in section 6.2.1, supplementary interviews with Kapacitet R&D engineers. The information gathered on Unmute and Careturner were then presented to the discussion group. With this context, the third question was asked and the employees were able to provide more examples of times they simplified designs.

7.2 Results and Analysis of the Second Workshop

After we completed the workshop, we organized the data into Table 4, as shown below. The left-hand column displays the main questions asked in the discussion with the right-hand column displaying summaries of the groups' responses. This data was used for our final objective of creating the information for the wall of sustainability.

Table 4: Data Collection for the Second Workshop with Kapacitet Employees.

Question	**Responses**
How are MVPs incorporated into your individual and company-wide work?	- MVPs driven by customer's need to have a cheap solution, where more complications mean more cost - Would rather come up with something too simple than come up with something too complicated - If the product is a little more complicated, it quickly becomes much more complicated during running production - Failing fast → saves steps and redoes less - Having a robust design, decoupling features → healthy product
How can we work to influence our clients to make sustainable decisions, especially when the client is eco-conscious?	- Having some type of sustainable material database - Try to go deeper into the LCA - Asking in the discussion if they have any sustainability goals/requirements to plant a seed early in the process - Kapacitet has to stand behind all of their products

When was a decision made during the development process that improved its sustainability? Can you think of any specific example projects?	- Hydro Hull Cleaning - Sea Badger
	- Little Sun's Solar lamp
	- Solar Sack
	- Golden Light
	- Flat Belt
	- Overall Theme:
	  - Reduce time
	  - Reduce material
	  - Reduce parts
	  - Reduce waste

After analyzing the discussion points compiled into Table 5, some major themes can be observed. **The first major theme is that MVP or Minimum Viable Solution (MVS) drives all of Kapacitet's work**. As stated in the table, "failing fast" leads to a quicker solution. Using the MVS approach, these prototypes can be produced quickly and save material and effort while doing so. **The second major theme is to find ways for Kapacitet to present sustainable options to clients during the early conversations**. The employees brainstormed ways to present information early, evaluate the carbon life cycle of the products, and provide material data. The brainstorming process is shown in Figure 8 below. The material database referenced in Table 4 would relate to the life cycle assessment and provide insight on how a material change could alter the results.

Lastly, the employees provided us with a list of products to observe in their office space and to exemplify on the wall of sustainability.

Figure 8: Kapacitet Employees Discussing their Responses During the Second Workshop

8. SUSTAINABILITY SHOWCASE FOR INSPIRATION AT KAPACITET

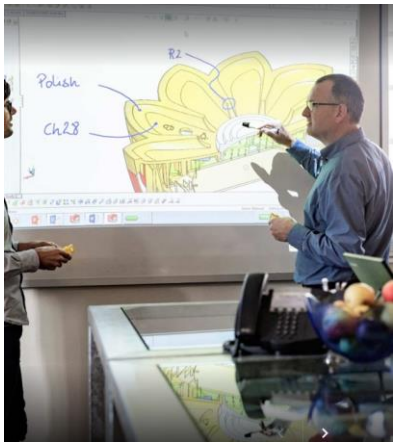
The data from the previous methods was consolidated to perform **our project's final objective, proposing a sustainability showcase at Kapacitet to inspire employees and clients**. Once we had compiled the language of sustainability at Kapacitet, we narrowed down which quotes, stories, and pieces of information we would like to see on the wall of sustainability. Using this information, we pulled together a potential design for the wall and developed a one-page summary of information that might be represented on Kapacitet's website in the future.

8.1 Sustainability Showcase for Inspiration at Kapacitet Methodology

A visual showcase of the Kapacitet team's sustainability mission may take the form of a physical wall in their office space. This showcase highlights the team's practices and features through the voices of employees which will empower them to take further action. The wall features the company's language of sustainability that we identified above to ensure alignment with other companies and the fundamental sustainability mindsets at Kapacitet. In other words, simply using the exact language from other companies and their websites is not sufficient. Kapacitet has a strong culture of innovation, quick-moving processes, and more, which differ from the traditional representations of sustainability in the field.

The center of the wall was designed to encapsulate the thematic message of Kapacitet's sustainable development. The overall theme of Kapacitet's mission involves the related sustainable development goal, main ideas from interviews, and a minimum viable solution description. The owner and the CEO both expressed the importance of SDG #12 through conversation in the office. This SDG summarizes the ideas of "reduce, reuse, recycle" which applies to the development process in terms of materials, their scrap rates, and their recyclability. From interviews, the most impactful quotes came from Jens Peter which were further supported by following interviews with other employees. Using quotes from the owner of Kapacitet encapsulates the overall vision most effectively. Lastly, the minimum viable solutions section was supported by quotes from Jens Peter as well as all conversations had in the final discussion. Table 5 was created to summarize each of these subsections. The supplementary material includes any photos and videos, in the form of QR codes, which apply to the subsection. The cohesive story represented on the wall of Kapacitet's progressive product development and innovation will further exemplify its mission to create a sustainable future.

Table 5: Organization of Themes for the Wall of Sustainability.

Theme	Quotes/Text	Supplementary Material
SDG #12	"Reduce, Reuse, Recycle, Rethink Sustainability."	
Jens Peter's Story	N/A	
Minimum Viable Solution	"Simplify every step of the process" "Minimum Viable Solutions ● Decrease material usage ● Reduce carbon footprint ● Support clients goals" "MVP is, at its core, a sustainable way of thinking. It explains that you should only do what you need to do." - Jens Peter"	

After the inner portion of the wall was finalized, there were a handful of specific products which supported Kapacitet's mission. Table 4, from the final discussion, summarizes these supportive products in the "Can you think of any specific example projects?" section. After analyzing these products, they were sorted into **three sustainable categories**: products made sustainable through the development process, products which specifically benefit environmental sustainability, and products which benefit human health. **Table 6 categorizes these products with their respective captions and supplementary photos**. Additional research was done on each product to write succinct captions which encapsulate their impact.

Table 6: Organization of Products for the Wall of Sustainability.

Subsection	Environmental	Human Health	Developmental
Product 1	Hydro Hull Cleaning	SolarSack	Unmute
Caption 1	-Fully electric hull cleaning ROV and surface set up -Replaces live divers	-Removes bacteria in water using solar energy -Gives communities better access to safe drinking water	-Created out of recycled fishing nets -Initially designed as 3 separate pieces → final product is one component
Photos	 (Hydro Hull Cleaning, 2023)	 (SolarSack, 2018)	 (Unmute Greetings, 2023)
Product 2	Hydro Hull Cleaning (continued)	Little Sun's Solar Lamp	Careturner
Caption 2	-Preserves ecosystems by limiting cross-contamination -Reduces fuel consumption by increasing hydrodynamics of hull	-Uses solar energy -Replaces hazardous kerosene lamps	-Universal design -Used recyclable aluminum rather than painted steel
Photos	A supplementary video from Kapacitet's website	 (LittleSun, 2020)	 (Careturner A/S, 2023)

The final version of the wall was made using various graphic design software including Adobe Photoshop, Procreate, and Vimeo. The colors and design were chosen to align with Kapacitet's current logo. The overall shape of the design was designed to be circular, resembling the reuse circle, shown in the figure below.

Figure 9: Recycle and Reuse Symbol Used as a Reference for the Wall of Sustainability (Woodhouse Photos, 2020)

8.2 Sustainability Showcase for Inspiration at Kapacitet Results

This version included all the information from table 5 and table 6. The center of the wall included the information from table 5 which summarizes Kapacitet's story and main sustainable themes. The outside of the wall included information from table 6, all products which support their mission. **Multiple iterations of the wall were drafted, and this final version was approved by the CEO and all other staff. The wall of sustainability is shown in the figure below**.

Figure 1: Final Wall of Sustainability

9. CONCLUSIONS

After completing our methods, **these conclusions focus on the process of developing and highlighting Kapacitet's sustainable mission**. We have provided further recommendations for the company to expand these efforts in the future.

The most important conclusion is to **continue to encourage the innovative, problem-solving minds of Kapacitet employees to solve the complex issues of working sustainably in the research and development field**. Various challenges were presented during our first workshop and following interviews. These **challenges** included the prominence of client-driven decisions received in a consultancy, the cost of sustainable options being high, and the idea that unsustainable consumption and production are inevitably visible in development processes. These **obstacles can appear insurmountable but offer opportunities for problem-solving using the methods that Kapacitet employees identified in our workshops, interviews, and discussions**. The process of identifying a common language was critical for Kapacitet employees to feel more confident in their ability to analyze these issues. Various terms, such as Minimum Viable Solution and Simplimize, helped the engineers recognize the positive effects they had on the company from a sustainability standpoint.

After the mindset of the employees had been broadened, they were able to acknowledge their potential and possibility for positive sustainable impacts much more easily. Many decisions are made through the development process that cut costs, limit the number of parts to a product, and limit the amount of material used. The main motive for these decisions may originate in a desire to save costs but also have the consequence of saving resources and lowering the products carbon footprint. After reframing these factors, saving energy, materials, and time are powerful components to a sustainable approach.

Finally, the implementation of a language and mission of sustainability into Kapacitet's DNA will give the company a competitive advantage in the field. As legislation requiring sustainable action continues to be implemented, and as companies are required to make substantial changes to their practices to comply, Kapacitet will have the experience and knowledge to adjust accordingly. In many ways, if Kapacitet continues to improve its sustainability mission now, the consultancy's practices should naturally comply with any legislation to come. When clients are looking for consultancies, Kapacitet will have years of experience dealing with sustainable methods of R&D engineering. **With the use of its curated language of sustainability, Kapacitet employees will be able to advocate for the importance of sustainability as well as the repertoire of sustainable methods, materials, and processes to the work of a wide range of clients**.

10. RECOMMENDATIONS

This section highlights all of the future actions we recommended for Kapacitet. Our **recommendations include the continued use of a company-wide language of sustainability, increased internal and external communication, and increased internal education on sustainable matters**. Communication to clients can happen in a variety of ways, including conversations at the beginning of the development process and visual aids to address material choice.

10.1 Language Development

To highlight Kapacitet's sustainability, the development of a language was the first essential step to improving the communication methods in place. Through our first method of benchmarking comparable companies, we were able to gain insight on language used throughout the field. Kapacitet agreed that it would not be useful to claim another company's language as their own, as its missions and the employee's work style were objectively different from other R&D engineering firms. Therefore, the language gathered from benchmarking was used as a guideline. Use of language that resonated with their work, emphasized their positive sustainability mission, and felt natural to integrate into Kapacitet's agenda was crucial.

We recommend this language to be constantly developed and revised as Kapacitet's sustainability mission strengthens. Kapacitet's use of powerful, intentional language will reinforce its arguments for eco-friendly materials, simplification of designs, and any other recommendations they suggest to their clients. For every employee to be able to properly dictate these ideas, communication must be occurring within the walls of Kapacitet first. Ideas for the development of this language were raised during interviews. Some suggestions are included in the subsections below.

10.1.1 Internal Communication

Sustainability should be a topic of discussion in Kapacitet's weekly staff meetings. Each week, Kapacitet meets as an entire staff to discuss projects, marketing, finances, and other essential company communications. As sustainability rises on their weekly agenda, consistent communication is essential and can be started within these meetings.

10.1.2 Internal Education

Company-wide education on sustainability will be equally important and supplementary to the development of Kapacitet's language. Through practice, research, and consideration of the client's needs, the definition of sustainability within Kapacitet's walls will continue to develop. All employees at Kapacitet must have an up-to-date idea of the company's sustainability mission. Through education on the issues and importance of sustainability, their

mission will be consistent and well-established. Education on sustainability can also happen at weekly staff meetings as well as during employees' prioritized time. Individual efforts for education will be just as important as the collective effort.

10.1.3 External Communication

External communication was elaborated on in section 5.3, but can be summarized as **the ability of Kapacitet to convey the benefits of sustainable options to their clients**. Kapacitet has conversations early and often with their clients during the development process and through a lot of decision-making steps. If the developing teams found ways to present these options in a positive light, clients will more likely be influenced to make these decisions. More products that are produced by Kapacitet with sustainable highlights will support their mission, strengthen their argument, and increase their marketability in the field.

10.2 Developing Methods

Having established methods for the development teams to use during their process will provide consistency not only for the team to improve their practice but will simplify the conversations around sustainability with clients. As new employees enter the company, having these defined methods will also improve their ability to educate.

The first established method, widely used at Kapacitet, is the **Minimum Viable Product (MVP) method**. This method encapsulates the idea of simplifying a design in the early stages to avoid excessive changes in design or failed designs. It is expected for there to be variations in a product design during development, but removing excess features will decrease the number of variations needed. The MVP method saves employees time, energy, and materials, and supports clients' goals. The resources saved by the employees are what truly defines the MVP as a sustainable method. All these resources impact a product's carbon footprint and life cycle, which are great indicators of the sustainability of a product. Kapacitet employees actively work to make designs easier for them to create. They do so by incorporating features needed into the minimum number of moving parts, printing or cutting parts from the same sheets or films of material and finding the finalized designs of products quickly by "failing fast" in the initial stages of their development (Anders, Discussion on 4/18).

The second, less developed, method Kapacitet can incorporate into their processes is using the **Life Cycle Assessment (LCA) or LCA lite**. Using this form of assessment will allow for the product to be analyzed through every stage of its life, including end of life. The end of life of a product is most important to consider as this affects the final carbon footprint. If the material is recyclable or reusable, the carbon footprint of the product will decrease. Overall, thinking about the impact of a product in the future before it has even been developed will lessen the final negative impact it may have. Kapacitet does not currently use this method often, but employees have

expressed interest in learning to use it. One of the R&D engineers, Marie, referred to the process as “an investment” for Kapacitet.

Finalizing Kapacitet’s sustainable methods will make their communication to clients clear and concise. Kapacitet prides itself on moving in the right direction and making small improvements daily. The development of MVP and the addition of LCA to their methods will aid in this progress.

10.3 Client Communication

After interviews were conducted with Kapacitet employees, several expressed interest in physically showing materials with reduced carbon footprint to clients during negotiations. We believe that the addition of a material showcase would accomplish this.

A material wall should consist of a physical sample of the materials most frequently utilized in engineering design at Kapacitet. As seen in Figure 11 below, an exhibit at Princeton University displays samples of materials commonly used in architecture, engineering, and design with a short description (Princeton University Library, 2023). While this particular wall is too broad for Kapacitet, a simplified version that applies to its **commonly used materials could be helpful for educating, inspiring, and promoting sustainable options**. Our team’s first prototype for Kapacitet’s material showcase can be seen in Figure 12.

Figure 10: Princeton University Library’s Material Collection (Princeton University Library, 2023)

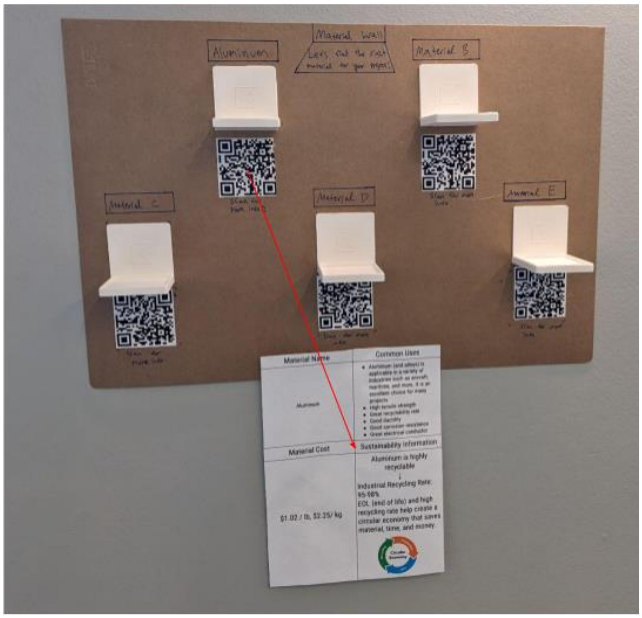


Figure 11: Material Showcase Prototype Developed by our Team

As mentioned in the last section, **Kapacitet should push sustainable alternatives to clients in the early stages of projects**. While this is not a common practice in engineering firms, making this a routine procedure has the potential to create a stronger reputation for the company. As a consultancy, Kapacitet has the obligation to find ways to reduce the time, material, and costs during development. By putting sustainability on the table and "planting a seed", clients have the opportunity to consider the long-term benefits of sustainable thinking for their project.

T**hese suggestions, if implemented, could potentially improve Kapacitet's communication with clients and better display the consultancy's prioritization of creating sustainable products**. In addition, we believe our analysis will reach beyond Kapacitet and promote external companies to incorporate sustainable practices in their agenda and drive the movement to maintain our world.

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APPENDIX A - Benchmarking Selection Process for Comparable Companies

Selected: Companies 1-5 Not Selected: Companies 6-18		Criteria				
		1	2	3	4	5
Company Number	Company Name	Based In the EU?	Clearly Stated a Sustainability Mission?	Integrated Powerful Sustainability Language Throughout the Website?	Used a Hands-on Approach To Problem Solve?	Related Closely to Kapacitet's Practices and Values?
1	**Designit**	✓	✓	✓	✓	✓
2	**Dansk Teknologi**	✓	✓	✓	✓	✓
3	**Viegand Maagøe**	✓	✓	✓	✓	✓
4	**ThinkStep**	✓	✓	✓	✓	✓
5	**Technolution**	✓	✓	✓	✓	✓
6	ProInvent	✓	×	✓	✓	×
7	Norion	✓	✓	✓	×	×
8	Nordic Sustainability	✓	✓	✓	×	✓
9	SustainX	✓	✓	✓	×	×
10	Valcon	✓	✓	✓	×	×
11	Implement	✓	✓	✓	×	×
12	Rambøll	✓	✓	✓	×	×
13	Cowi	✓	✓	✓	×	✓
14	CREADIS	✓	✓	×	✓	✓
15	Frog Design	✓	✓	✓	✓	✓

16	TPU	✓	×	×	✓	✓
17	Niras	✓	✓	✓	✓	✓
18	Lendager	✓	✓	✓	×	×

APPENDIX B - Final Data for Benchmarking Sustainability on Comparable R&D Companies

(as shown in Table 1)

Company Name	**Type of Company**	**Sustainability Terms and Phrases**
Designit	Innovation company/design consultancy	“Activate purpose”, “materialize solutions”, “empower people”, “educate clients”
Dansk Teknologi	Product development company	“Our goal is always to find simple solutions to complicated problems”
Viegand Maagøe	Consultancy	“Concept development of sustainable products and business models”, “workshops (innovation and brainstorms on sustainable design)”, “Life Cycle Assessment (LCA)”, “Use of circular economy”, “sensitivity analysis (rapid screening on ideas for greatest environmental impact)”, “advice on legal requirements and certifications”
ThinkStep	Software & consulting company	“Walk the talk”, “sustainability is in our DNA”, “UN global goals”, “circular economy”, “Life Cycle Assessment (LCA)”, “cradle to cradle”, “carbon footprint”, “materiality assessment”, “SDG workshops and implementation”
Technolution	Product development firm	“Life cycle screening (LCA)”, “Ecodesign”, “Ecodesign + life cycle screenings = improved environmental impact”, “design for circular economy”, “sustainability improvements we bring to the table have to be applicable in a device development context and be in alignment with our client's sustainability goals”, “informed decisions about sustainable design improvements”

APPENDIX C - Data Collection for the First Workshop with Kapacitet Employees

(as shown in Table 2)

Theme	Findings	Quotes
Minimizing Materials	- Aims to minimize material usage while keeping the product's same function - MVPs (minimal viable products) - Material choice is important	“Most of us try to drive the projects in a sustainable direction. It might be the small things such as the materials; we are trying”
Customer Driven Work	- Put sustainability on the agenda for clients	“Communicate sustainability more to make it a core value”
Sustainability Mindset	- Customers have to “buy in” to sustainability - Improvements are made little by little	“Kapacitet is on a journey”
Active Choices	- Additive manufacturing > Subtractive Manufacturing	“Walk the talk”

APPENDIX D - Images from the First Workshop with Kapacitet Employees

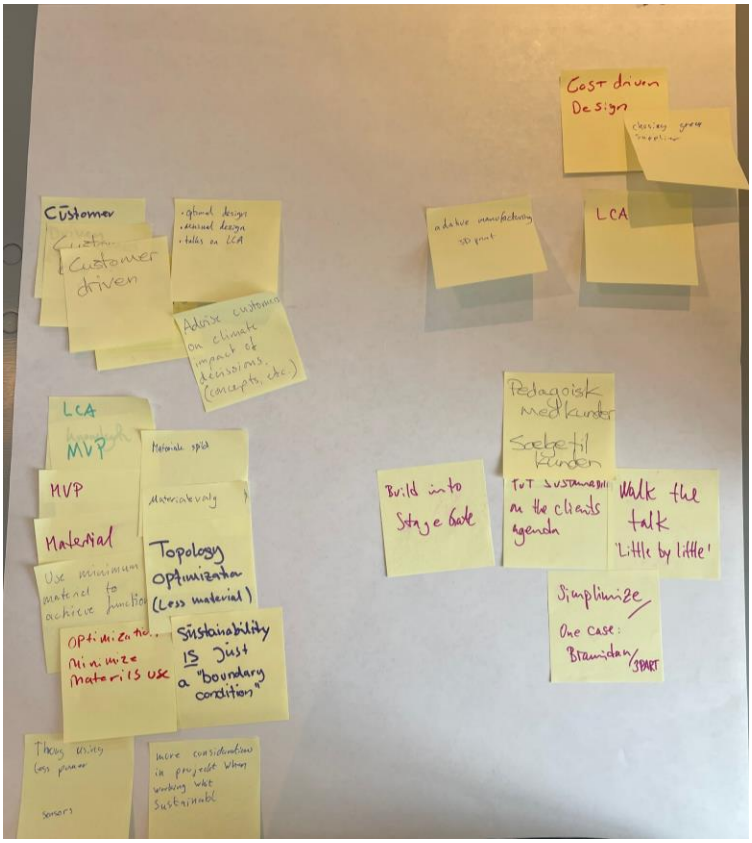


Figure 6: Completed Mind Map Exercise Compiled During our First Workshop

Figure 7: Kapacitet Employees Participating in the Second Activity of our First Workshop

APPENDIX E - Interview Questions for Kapacitet Employees

Question Type	Question
Questions for All Employees	● Please tell us about yourself. What is your role at Kapacitet? ○ Level of experience? ● In what ways is Kapacitet committed to sustainability? ● What do you think Kapacitet's clients prioritize when choosing a consultancy? ● How does Kapacitet communicate/display its sustainable practices to employees and clients? ● What type of improvements would you like to see to allow Kapacitet's mission to grow and develop?
Marketing-Specific	● How does Kapacitet currently market its sustainability to clients and potential customers? ○ How is this an effective strategy? ○ What do you believe specifically appeals to clients/customers in this process?
Finance-Specific	● What is Kapacitet's financial approach for advertising its sustainability to clients and potential customers encompass?
Engineering-Specific	● How is sustainability prioritized during the product development process? ● How are materials chosen for your projects?

APPENDIX F - Data Collection for Employee Interviews

(as shown in Table 3)

Employee	**Position**	**Notes**	**Quotes**
Jens	Chairman & Owner	- Policy in Denmark can drive sustainability if new legislation is created - Sustainabilities best definition is meaning to last a long time - MVP and LCA and their ideas are at their core sustainable - MVPs are sustainable at their core - Transparent education on the area within the company to then deliver to outside the company (clients) is what is needed - Sustainable action, especially with other benefits, becomes easier as time goes on and will actually save money	- The market is "Not a pull, a push" - "People need to realize they have a choice" [regarding sustainability]. - "We will give the enlightened choice" - "MVP is at its core a sustainable way of thinking as it explains that you should only do what you need to do" - "We're good at physical/ mechanical development, and we're remaining at the forefront"
Marie	R&D Engineer	- MVP is important, especially for smaller start-ups. MVP can help simplify and cut costs - Some firms don't know that they've over-engineered their product - The sustainable material will be provided if the client is interested, how much we push that right now - I don't know - Good recycling methods: Paper Cardboard and Metal and Food in the kitchen	- "A lot of sustainable solutions are also economically sustainable" - "We are really good at getting good ideas and executing to build things that work" - "Teaching the customers what they really want is the hard part; doing the mechanical engineering is the easy part."
Alex	R&D Intern	- No real sustainability methods have been taught to him - He focuses more on the process of development than on sustainability; Customers aren't asked about sustainability often - They'll do an LCA comparison to show one model is better than the other and that is the only consideration they do.	"If a client wants a green product, Kapacitet will make that happen"
Bo	CTO	- MVPs focus on the core issue, cut the product to the bone, and it is important to get the customer on the same page - LCA and LCA lite is not accurate to the companies methods - Collection of scrap properly is already a common practice in Denmark, nothing special there - Showing the clients materials as a way of educating them to make a good decision	- "MVPs find what it takes to solve the real problem with minimal features" - "Regulation is needed to create change" - "If it solves the problem that should be a market" - "There is no such thing as sustainability…just less impact".

		- Money, time, and functionality are the order of priority in this company, legislation drives us.	
Nadim	CSO (Chief Sales Officer)	- Sustainability information must be highlighted more. This starts with better internal communication. - Presenting sustainability information in the form of case-studies/product examples will be most powerful - Proposed highlighting sustainability in weekly Linkedin posts to "advertise" strategies to clients and employees - Minimal Viable Product → Minimal Viable Solution - The information could be then presented in story-line format to explain Kapacitet's thought processes	- "Minimum Viable SOLUTION" - "Clients choose Kapacitet for its ability to deliver high-paced quality products"
Anders	Client Engage-ment Director	- Customers that prioritize sustainability get these options such as alternative material choices - The conversation with clients on sustainable decisions should always happen. It is only happening sometimes. - We must stay ahead of legislation and regulations - Ways to persuade: you can save money in the long run - Possible packages to incentivize sustainable decisions	- "I think sustainability will become a competitive advantage if you can document that a product is sustainable" - "We can't sell anything they don't want to buy" - "We have suggestions for other concepts that have less impact that we're gonna sell to customers"
Lasse	R&D Engineer	- Cost has been a limiting factor - Their decisions include ones that will lower the amount of materials or parts needed - Use the MVP way of thinking to rebrand ourselves - We ask critical questions when talking to the clients - Small improvements will be safer than changing the entire process - Wants education of different materials, possibly in the form of a type of database	- "Simulation is a great way to do things the sustainable way…to make a structure lighter so you're polluting less" - "We are on a journey" - "MVPs let you combine multiple parts into one which is inherently sustainable" - "When building prototypes, we're good at sorting the [scrap] materials" - "It's hard to change the direction of a ship that has already sailed, but we have a great captain (Helle)"

APPENDIX G - Data Collection for the Second Workshop with Kapacitet Employees

(as shown in Table 4)

Question	**Responses**
How are MVPs incorporated into your individual and company-wide work?	- MVPs driven by customer's need to have a cheap solution, where more complications mean more cost - Would rather come up with something too simple than come up with something too complicated - If the product is a little more complicated, it quickly becomes much more complicated during running production - Failing fast → saves steps and redoes less - Having a robust design, decoupling features → healthy product
How can we work to influence our clients to make sustainable decisions, especially when the client is eco-conscious?	- Having some type of sustainable material database - Try to go deeper into the LCA - Asking in the discussion if they have any sustainability goals/requirements to plant a seed early in the process - Kapacitet has to stand behind all of their products

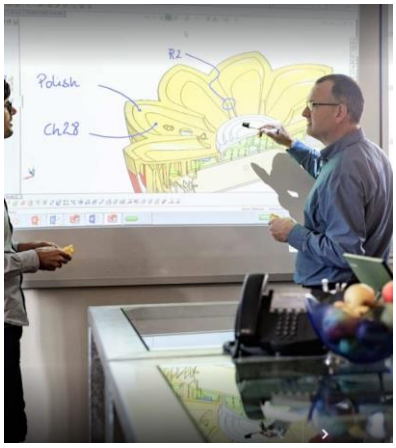
When was a decision made during the development process that improved its sustainability? Can you think of any specific example projects?	- Hydro Hull Cleaning - Sea Badger
	- Little Sun's Solar lamp
	- Solar Sack
	- Golden Light
	- Flat Belt
	- Overall Theme:
	  - Reduce time
	  - Reduce material
	  - Reduce parts
	  - Reduce waste

APPENDIX H - Image from the Second Workshop with Kapacitet Employees

Figure 8: Kapacitet Employees Discussing their Responses During the Second Workshop

APPENDIX I - Organization of Themes for the Wall of Sustainability

(as shown in Table 5)

Theme	Quotes/Text	Supplementary Material
SDG #12	"Reduce, Reuse, Recycle, Rethink Sustainability."	Kapacitet
Jens Peter's Story	N/A	Kapacitet
Minimum Viable Solution	"Simplify every step of the process" "Minimum Viable Solutions ● Decrease material usage ● Reduce carbon footprint ● Support clients goals" "MVP is, at its core, a sustainable way of thinking. It explains that you should only do what you need to do." - Jens Peter"	

APPENDIX J - Organization of Products for the Wall of Sustainability

(as shown in Table 6)

Subsection	Environmental	Human Health	Developmental
Product 1	Hydro Hull Cleaning	SolarSack	Unmute
Caption 1	-Fully electric hull cleaning ROV and surface set up -Replaces live divers	-Removes bacteria in water using solar energy -Gives communities better access to safe drinking water	-Created out of recycled fishing nets -Initially designed as 3 separate pieces → final product is one component
Photos			
Product 2	Hydro Hull Cleaning (continued)	Little Sun's Solar Lamp	Careturner
Caption 2	-Preserves ecosystems by limiting cross-contamination -Reduces fuel consumption by increasing hydrodynamics of hull	-Uses solar energy -Replaces hazardous kerosene lamps	-Universal design -Used recyclable aluminum rather than painted steel
Photos	A supplementary video from Kapacitet's website		

APPENDIX K - The Wall of Sustainability

Figure 1: Final Wall of Sustainability