IMPROVING THE INNOVATIVE MINDSET OF ENGINEERS

AN APPROACH TO HELP CORPORATES BUILD NEW INNOVATIONS

Master Thesis | Cas Sunderman

April 2021

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Master Thesis Strategic Product Design
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ACKNOWLEDGEMENTS

It was March 2020 when I first started to think about my graduation project. We all know what happened during this period last year. I could not have imagined that my graduation project would be so different from what I had in mind beforehand. I wanted to focus on innovation and entrepreneurship within a large organization. However, with the economy in free fall, I figured that innovation would not be top of mind for companies if they have to cut back costs due to the recession. A significant setback right from the start.

In the summer of 2020, things looked better, and I decided to focus on companies in the 'vital' sectors. Companies that were still in full swing even with corona. That is how I ended up in the construction sector. I started to discuss my ideas for my project with Croonwolter&dros (CWD) and Giulia, and quickly we were able to find common ground. After Sander joined the team, I was ready to start my project.

Unfortunately, the corona situation was deteriorating. I always looked up to doing such a large project on my own, but until then, it seemed I could work at CWD, which would make it feel less lonely. Unfortunately, the day before my kick-off meeting, the government issued a renewed advice to work from home. Another setback before I even began my project.

The corona situation significantly impacted my project, but it was not all bad. I pushed through with larger and smaller steps. Corona challenged me to find other routes to reach my goal, moving me out of my comfort zone and thinking outside the paved ways. This project has been a great ride, and it was both enjoyable and challenging. I learned new skills, met new people, and proved that I can do such a large project independently. Well, not entirely on my own. There were some fantastic people along the way that helped me get to the finish line. Therefore, I would like to thank:

Giulia, for sharing your ideas and experiences on the topic and for her support from an early stage all the way to the end.

Sander, for your endless time and willingness to coach, your unlimited library of literature, and the casual conversations and discussions we had on other topics.

Douwe, for making it possible for me to graduate at CWD, introducing me to all kinds of interesting people, and bringing me along to different presentations and meetings.

Mariska, for listening when things were not going my way, your endless support if my motivation was low, and for celebrating the highs with me.

My parents, for cooking and caring when I visited their place to finish my deadlines and for all you did to support me throughout my times at the TU Delft.

My roommates, for letting me blow off steam if I needed to and providing a spot on the couch after a long day of work.

My friends, for drinking coffee together, for showing interest in my work, and for providing other topics to talk about besides my project.

Everyone who contributed to my project, for participating in the interviews, brainstorms, and validation sessions, your overall interest, curiosity, and your enthusiasm towards my final result.

Thank you all for cheering me on during this challenging year.

May my thesis inspire you,

Cas Sunderman

EXECUTIVE SUMMARY

To innovate requires people. People that know how to innovate. For engineers, it is not always easy to do that. They know a lot about technology (feasibility) but could lack knowledge about the business (viability) and the market (desirability). This report aims to help engineers create a more innovative mindset and thereby boost the innovation output of their organization.

A case study into Croonwolter&dros (CWD) explores the problems they encounter with innovation. CWD is a system integrator specializing in engineering and installing technical systems. They have over 140 years of experience in this field and aim to launch three new product-market combinations (PMC's) a year. Currently, they are working hard to achieve this but have not managed to do so.

From several interviews with stakeholders, I learned that knowledge sharing between divisions and colleagues is one of CWD's issues. CWD is divided into three divisions: Infrastructure, Utility, and Industry. All these divisions have to develop their own business. This causes them to form silos where there is little to no cross-departmental collaboration. Therefore this case study focuses on addressing the lack of knowledge sharing to boost the innovation output of CWD.

To understand what knowledge is needed in the organization, I analyzed innovations that are under development at CWD. This analysis showed that CWD employees mainly focus on the feasibility of their innovations and do not pay as much attention to the viability and desirability of their innovations. Because of that, they fail to fully convince essential stakeholders of their innovations' potential.

To tackle this problem, I organized three ideation sessions with innovators to brainstorm ideas that could create a more complete story around their innovations. Three different concepts resulted from these brainstorms. All with the potential to boost the innovation output of CWD. I needed a clear reference frame to compare and decide between the three concepts. The initial plan was to see which concept fitted best to the innovation strategy of CWD, but the innovation strategy was, at that point, too vague and ambiguous to decide between the concepts. Therefore I chose to set a clear starting point for innovation at CWD. This resulted in the six principles for innovation at CWD. Based on these principles, I decided to combine two concepts. These concepts are the foundations of IVI.

IVI (Iedereen Voor Innovatie) is an approach to boost the innovation output of CWD by improving the innovative mindset of CWD's innovators. IVI consist of a business development team that helps the innovators. Everyone at CWD with an idea can go to the development team and ask for help. Together they will make a smoke test. This smoke shows the idea to a broad audience via a web page. Everyone can leave comments, questions, or suggestions on this web page. The innovator can use this data to improve his or her innovation. The development team also collects this data for further analysis. From the data, the best performing innovations are invited to the innovation fair. All fair visitors can invest a number of hours into innovations they see potential in. The innovators can use these hours to progress their innovations. If the innovators fail to get enough engagement on their smoke test or to convince enough investors, they know they have to improve their innovation's viability, desirability, and feasibility. The development team can help them with that.

IVI was received positively in an early validation session, both by several stakeholders as well as by the CWD board. Further testing is needed to validate additional assumptions around IVI, but there are no major game stoppers at this time. IVI could be implemented by first putting together the development team. They can become the product owners of IVI and continue implementing IVI. The team should start by actively approaching CWD employees that have an idea to get the ball rolling and create the first smoke tests. From there, they can move on the organizing the first innovation fair. After a significant period, they can organize training and coaching sessions to further boost the innovative mindset of CWD's innovators and engineers. This completes the implementation of IVI and should, in theory, help CWD to reach its goal of launching three new product-market combinations a year. IVI partly democratizes innovation, and future research might even find applications for this concept in a broader context.

READING GUIDE

STRUCTURE

This report focuses on improving the innovative mindset of engineers within established organizations. The first chapter introduces this subject. Chapters two to nine cover a case study that revolves around improving the innovative mindset of engineers at Croonwolter&dros. In the final chapter, the case study's findings are discussed to see if they apply to other situations. Chapters two to nine use the Double Diamond model (UK Design Council, 2004) to structure the process. The first diamond is used during the green chapters, as shown in figure 0.1. The second diamond is covered by the chapters in red in figure 0.1. The grey chapters are the introduction and the discussion of the case study. Figure 0.1 also shows which chapters to focus on if you are more interested in either the analyses or the creation of the final concept. If you are interested in strategic design in general, I would recommend reading all chapters.

DEFINITION

To avoid confusion, I want to set the definition for "Innovator" to anyone who has a (good) idea and is willing to come forward with his or her idea and work on it. Innovators are not only the people currently working on innovation or who worked on innovation in the past.

ABBREVIATIONS

CWD - Croonwolter&dros
TBI - Techniek Bouw & Infra
PMC - Product Market Combination
BM - Business Model
BMPM - Business Model Portfolio Map
IVI - Iedereen Voor Innovatie (the name of the final concept)

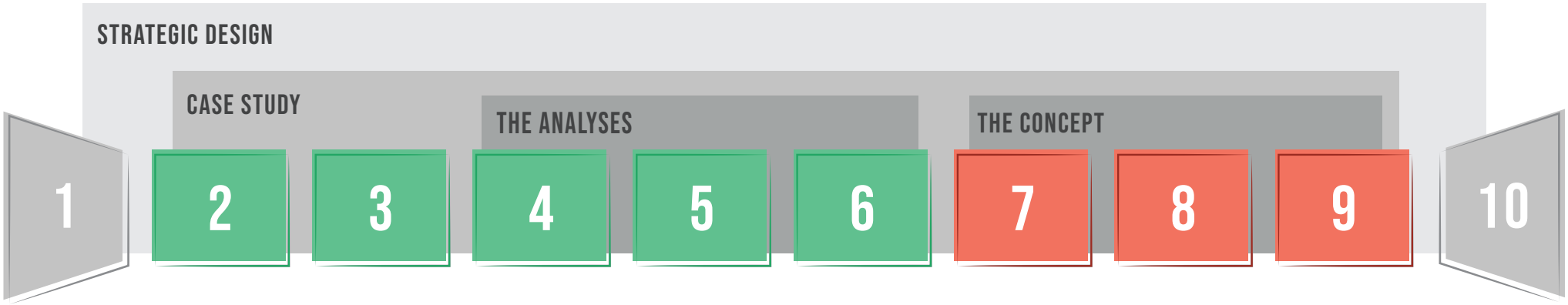

Figure 0.1 Reading Guide

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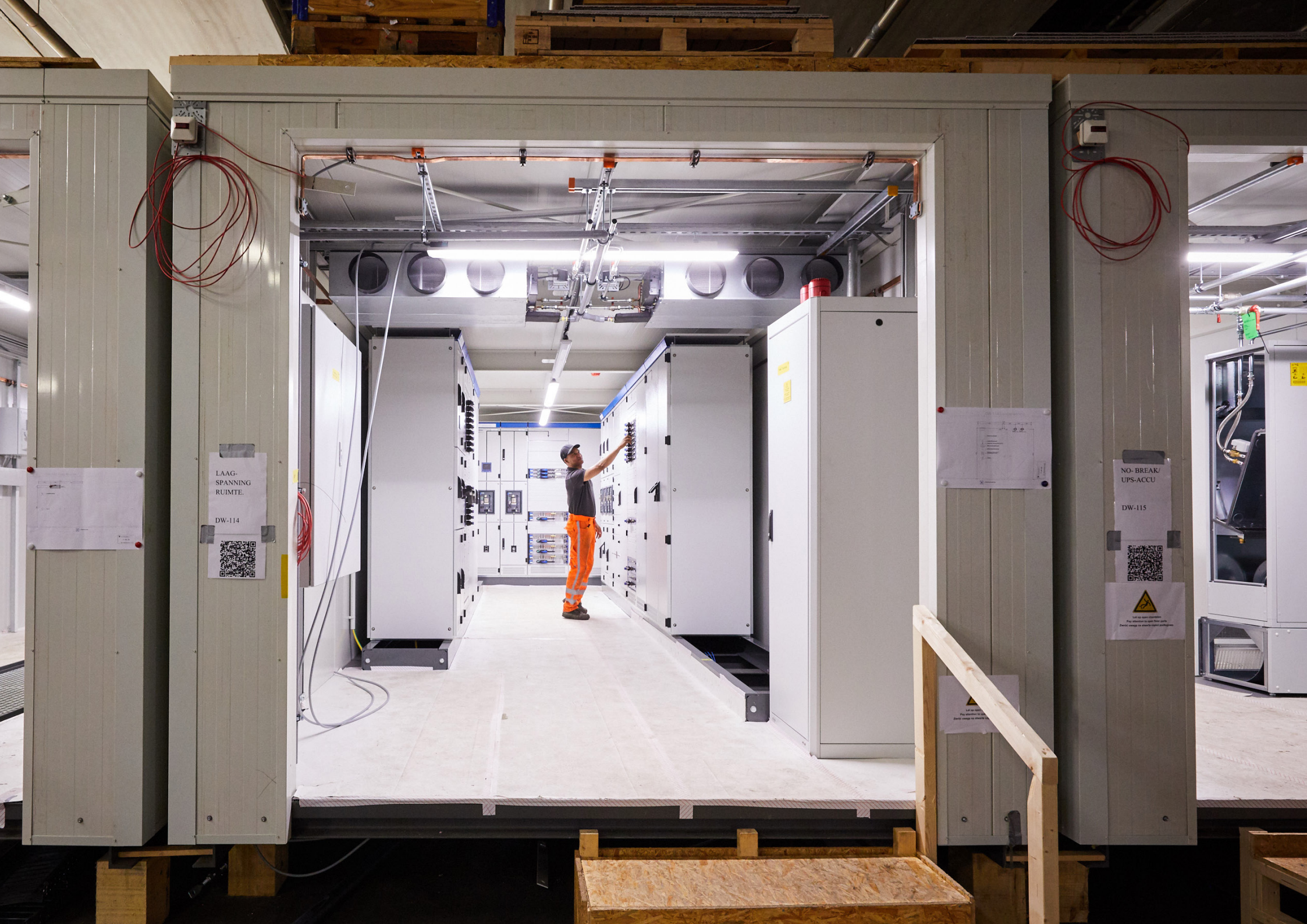
LAAG-
SPANNING
RUIMTE.
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RIJNLANDROUTE

In October 2020, Comol5 (a contractors cooperation, of which Croonwolter&dros is a part) finished a successful test of the systems for the Corbulotunnel. The systems were tested at a special testing facility.

CHAPTER 1
INTRODUCTION

PARAGRAPH 1.1

INTRODUCTION

Ramadani and Gerguri (2011) stated that:

> *"In order for companies to innovate as much as possible, it is necessary to be familiar with the process of innovation and the principles in which innovation is founded." (pp. 101)*

In other words, the company and its employees first need to know how to innovate before they can start doing it. This also means that managers can not just expect their employees to start innovating if they are never taught how to do so. This is interesting because it sparks the question: How do you teach, help, and/or coach employees to be more innovative or to have a more innovative mindset? This report aims to find an answer to that question. To do that, it is essential first to understand what innovation and an innovative mindset are.

A DEFINITION FOR INNOVATION

The literature provides many definitions for innovation, from complex to simpler ones and older to newer definitions. But since this report focuses on helping others with innovation, I want to use a definition for innovation that includes people's needs. Therefore I prefer the definition for innovation of Lionnet (2003). He defines it as:

> *"A process in which a novel idea is brought to the stage where it eventually produces money. It is a dynamic technical, economic and social process involving the interaction of people with different perspectives and motivations. It represents a process namely an activity of creating a new product or service, new technology, new organization, or enhancement of existing product or service using existing technological processes and organizations." (pp. 6)*

In Lionnet's definition, people play an essential role in innovation. It is the people who need to interact and work together to make innovation happen.

AN INNOVATIVE MINDSET

Thinking about new ideas or finding solutions to problems you encounter during your work is one thing, but turning these ideas and solutions into successful new products, business models and ultimately new revenue streams for your business requires more than just skills. It requires an entrepreneurial look at the idea or, as I would like to call it: An innovative mindset.

An innovative mindset is the ability to think and work on the three different aspects of innovation. These aspects are the technology, the business, and the market aspect, or as Lionnet (2003) called them: The technical, economic, and social process. I borrowed these aspects from the field of strategic design. A strategic designer can make innovation decisions based on desirability (the market), viability (the business), and feasibility (the technology) as described by Calabretta, Gemser & Karpen (2016).

To make sure that employees can innovate, we have to improve their innovative mindset. To help them think about the market, the business, and the technology. This is a complex problem that will probably require customized solutions for different companies with different business models, infrastructures, and cultures.

THE APPROACH

To scope this research question, I decided to focus on a single case study, where I dive into a single company that wants to improve its innovation output. My goal is to find a way to boost their innovation output by helping the company's employees with creating a more innovative mindset. Afterward, I will discuss if this case study's findings could apply to a broader audience and if the study's result could also be implemented in other companies. In chapters two to nine, I will introduce the company, explain my approach for the case study, analyze the company and show my results. Chapter ten is the concluding chapter where I discuss my methods, results, and whether these results could apply to a broader context and other companies.

INTRODUCING THE CASE STUDY:

croonwolter&dros | TBI

REPLACING POWER STATIONS

Commissioned by Tennet, CWD developed modular high voltage power stations. They are currently working on a proof of concept, with the goal to change all power stations in the Netherlands to make them future proof.

CHAPTER 2

THE COMPANY

PARAGRAPH 2.1

INTRODUCTION TO CROONWOLTER&DROS

Croonwolter&dros (CWD) is, together with approximately 18 other companies, part of the TBI Holdings B.V. (Techniek, Bouw & Infra). Figure 2.1 gives an overview of some companies in TBI Holdings. CWD is a contractor focused on installations and electronics. CWD consists of three divisions: Infrastructure, Industry, and Utilities. Currently, they are working on projects like the Rijnlandroute, connecting the A44 and A4 near Leiden in The Netherlands, and they are involved in the renovation of the Dutch parliament building in The Hague. CWD was formed in a merger of Croon and Wolter&dros in 2017, but has its roots tracing back to 1875 when Hendrik Jan Wolter founded his company.

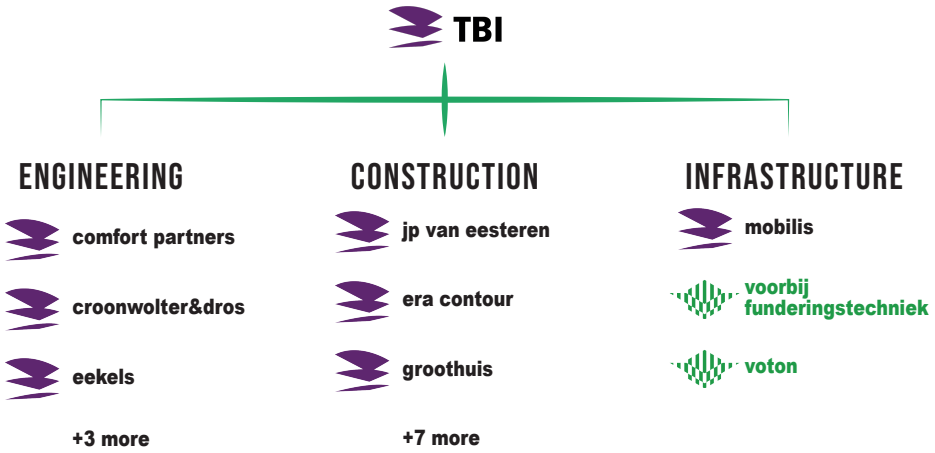


Figure 2.1 Organisational chart TBI

WOLTER & DROS

Hendrik Jan Wolter specialized in heating and ventilation. In 1875, he bought a company called Redeker & Co. This marked the historical basis of Wolter & Dros. Redeker & Co. made drive belts and installed heating equipment. Ten years later, in 1885, Hendrik Jan moved his business to Amersfoort.

Neither the son nor daughter of Hendrik Jan was interested in taking over the business. This is why Hendrik Jan hired ir. Albert Dros in 1906, to make him his successor. That same year Hendrik Jan and Albert became companions, and Wolter & Dros was born. In 1917 Hendrik Jan retired and sold his shares to Albert. The heating industry grew, and so did Wolter & Dros. But still, the crisis years resulted in losses and layoffs. In those years, around 30 to 40 people worked at the company both in construction and in the office. After the second world war, the company's growth accelerated with the reconstruction of the Netherlands. In the fifties, the central heating business went through a significant change as the industry switched from coal to gas as fuel for heating homes. This was caused by the gas reserves that were found near Slochteren. In 1963 the shareholders from Wolter & Dros decided, after some hesitation, to sell their shares to OGEM (Overzeese Gas- en Electriciteits Maatschappij). This ended the family business, and a busy period arrived. More acquisitions followed, either initiated by OGEM or by Wolter & Dros. This resulted in a workforce of around 1200 in the seventies. Wolter & Dros was moved to the TBI Holdings when OGEM was in bad weather. In 2016 Wolter & Dros existed for 141 years and nowadays is specialized in central heating, air treatment, and ventilation. 2016 Marked a new chapter for the company (croonwolterendros.nl, 2020).

CROON ELECTRO

In 1876 Bernardus Hermanus Croon founded Croon & Co Electrische schellenmakers. This is the historical basis of Croon Electrotechniek. Croon specialized in electrical engineering and automation. In 1911 Hendrik Croon started with the import and export of cars and car parts. This was the birth of the R.A.M. (Rotterdamse Automobiel Maatschappij). When the stock exchange crashed in New York, hard times arrived for Croon. The export shrank, and the company was forced to lay people off. In 1931, due to severe losses, the continuation of Croon came into jeopardy. After the second world war, the reconstruction of the Netherlands improved the outlook for Croon. Both the markets for onshore and offshore installations were growing. Croon gained international representation, and things were going smoothly. In 1959 OGEM took over the shares of Croon. This ended Croon's legacy as a family company. Under the wings of OGEM, the growth of Croon continues. This led to national coverage of electrotechnical activities. When OGEM got in lousy weather, its healthy parts were transferred to TBI Holding.

Fortunately, Croon, like Wolter & Dros, was a healthy part and continued as an independent enterprise under the new TBI Holdings. 2016 Marked the 140th anniversary of the company. At this point, Croon specialized in power installations, high voltage systems, and automation (croonwolterendros.nl, 2020).

CROONWOLTER&DROS

Through the years, Croon and Wolter & Dros grew more and more together. TBI Holdings decided to merge Croon and Wolter & Dros to serve the market better. From the 19th of April 2016 onwards, the companies operate together under the new name: Croonwolter&dros (CWD). On the first of January 2017, the merger was legally finalized. With a combined history of 281 years, the merger was a logical step towards further development of the organizations. Together they can provide clients with better integrated technological solutions.

CORPORATE STRATEGY

Croonwolter&dros translates clients' wishes into technical solutions (Annual report Croonwolter&dros, 2019). This is at the core of what Croonwolter&dros does as an organization. Two of CWD's most prominent clients are Rijkswaterstaat and TenneT, as shown in figure 2.2. With intelligent technology, CWD aims to provide practical solutions to its clients. So they can perform better. CWD focuses on electrical engineering, mechanical engineering, automation, and informatization across three divisions: Utility, Industry, and Infrastructure. CWD is a well-established organization that stands out with its proven expertise in designing, realizing, and maintaining technical installations. They put their clients' needs and wishes above all else when developing these installations. They create innovative and sustainable solutions for their clients to improve their living environment.

Rijkswaterstaat

TenneT

Figure 2.2 Large clients of CWD

As part of the TBI-family, entrepreneurship and knowledge development is at the core of CWD. It is CWD's mission to be: More intelligent through technology. With this mission, they want to make the world more healthy, sustainable, and better. Now and in the future. CWD has the ambition to be the leading and most successful technology business in the Netherlands. To achieve this, they focus on four pillars for their strategy: market-focused, customer-focused, operational excellence, and innovation.

Market focussed: CWD serves their customers with relevant propositions due to their thorough knowledge of their field of operations.

Customer focussed: The customer or client is the center of attention. CWD likes to be geographically close to their customers to understand the customers' needs and wishes better

Operational excellence: Everything CWD develops has to be right the first time and must comply with proven standards.

Innovation: CWD adapts quickly to innovations to provide the optimal value for their customers (Annual report Croonwolter&dros, 2019).

PERSONAL INSIGHT

CWD values its clients. They are a significant asset to CWD. A lot of decisions that CWD makes are centred around their clients. They work hard to exceed clients' expectations and deliver more value every day. CWD is also not shy to take on challenges from its clients to provide state of the art solutions for their problems. This is a significant driver for CWD's innovation capabilities.

PARAGRAPH 2.2

PROBLEM INTRODUCTION

Innovation has always played a role in both Croon and Wolter&dros. It had to. Otherwise, both companies would not have managed to survive for over 140 years. During the merger in 2017 of Croon and Wolter&dros, the topic of innovation faded to the background. Synchronizing the operations of both companies became the top priority. Two different cultures had to adapt to each other. A process that is currently still going on. After three years, the dust is starting to settle, and the new company, Croonwolter&dros, begins to appear.

With several difficulties of the merger in the past, it is now time for CWD to pay more attention to innovation and create new propositions. Via a recruiter of CWD, I came into contact with Douwe, and he asked me to help with improving CWD's innovation output. Together we started to discuss which part of the innovation puzzle would suit my project.

CWD is a system integrator. They install electrical systems in various construction projects. They work on a project basis and are paid by the hour. Following the framework of Simon (1989), CWD is a capacity organisation that creates customized work for every client. They also operate as a task organisation, their management and output also serves a higher level organisation. In CWD's case this is TBI Holdings.

Together with the board, Douwe already realized that this model, based on hours, is finite and that CWD should focus more on selling products and creating product-based propositions. Again following Simon's model (1989), they want to move more towards a product organization. Unfortunately, every system and protocol within CWD is based on billable hours. This makes it difficult for CWD to switch from a capacity organization towards a product organization. But it is not impossible. Up and until recently, they still believed in the project-based business model. That made the need for internal product development obsolete. Recently they realized that CWD would cease to exist if clients no longer bring the projects to them. So, if the clients would change, they have to change too, or clients will find another firm to do the job. This results in CWD wanting to change to not be as dependent on clients as they are now. But why are they struggling with this?

CWD is an established organization with over 145 years of experience and more than 2.500 employees. Some of these employees have spent their entire careers in the construction business. This makes CWD a trustworthy organization but also less flexible. With decreasing margins they become risk-averse and thus even less flexible. A single project going wrong could have tremendous impact on the whole company. Since innovating is about flexibility and risk, CWD is not fond of innovating. But there are more causes at play here.

ENTREPRENEURSHIP AT THE BASE

Every organization within TBI holdings is free to pursue its ambitions. Entrepreneurship at the base is a big topic within the holding, which means that every company within the holding has to earn its own money and develop its own business. Companies within the holding, like CWD, take great pride in this. All the holding companies are family, but they have to find their path to success. TBI is like the last name for them.

Generating your own business also translates to the divisions within CWD. Infrastructure, Industry, and Utility also have to develop and grow their business. But there is a drawback to this system. Since every division has to provide its black numbers, they tend to form silos within the company. An engineer working in the Industry division could have no clue about what an engineer is doing in the Utility division. They could be solving the same problem. Since they are too

busy keeping their boat afloat, they forget to work together and communicate. This behavior causes competition within the holding and within CWD. This competition could prevent companies within the holding and within CWD from collaborating and communicating properly to grow the business as a whole.

BILLABILITY

As mentioned before, CWD earns its money by delivering the service of installing all kinds of appliances. They are a project-based company focusing on billability. Every hour an employee spends, needs to be declared to a project. So, in theory, if an employee has a new idea, they can work on it if a project manager agrees to it. But you have to keep in mind that working on new ideas and innovations always involves taking risks. Maybe the idea does not end-up working. In the construction business, risks and safety are big topics. Construction businesses are risk-averse. You can imagine that a project manager would rather spend a hundred hours on an old method that is proven than on a new method that is unproven and still needs to be developed. This is because a project manager is evaluated on the cash results at the end of the project. He or she needs to present black numbers after a project, for CWD to make money. So, with project managers not willing to spend their budget on unproven innovations, innovators at CWD struggle to find time to develop their innovations.

INNOVATIONS WITHIN PROJECTS

With innovators not finding the time to work on their innovations, how does CWD still manage to implement innovations like solar optic fiber lighting in a new tunnel near Leiden in The Netherlands (Rijnlandroute.nl, 2020)? In this example, CWD is innovating within a project. They are using the latest technology to cut back on the electricity needed to power this tunnel. The difference between innovation within a project versus innovation outside of a project is the one paying for the innovation. Construction companies do not like to take risks and invest their own money in innovations. So, if someone else is willing to pay for the innovation, CWD is more than eager to find the right solution for them. You could say CWD is a innovative company, as long as someone else is paying for it. To prove this I added an innovation by CWD to every front page of a chapter. But the problem here is that when the projects come to a halt or clients pick a competitor to do the project, the innovations also come to a halt, and CWD will lose its ability to innovate and learn. This could make them obsolete in the future.

KNOWLEDGE SHARING

There is another problem with capacity organisations like CWD. When a project starts, a team gets together and starts to work. They engineer everything to perfection and even implement innovations if clients ask for it. A lot of knowledge is generated along the way. After a while, the project is finished, and the team is disbanded. Everyone moves on to the next project with different teams. The knowledge that is generated in the previous project is mainly lost. It only exists in the team members' minds and is not shared broadly within the company. A project manager in infrastructure might run into a similar problem as a project manager in utility. They could even similarly solve the problem, and they would never know they did the same thing twice. If they would have shared their ideas they could both have saved time and money to spend on something else.

The previous points explain what is going on inside CWD and what is preventing them from changing and innovating. Fortunately, it is not all bad. All around the company, innovators are stepping up to generate future business for CWD. But these innovators struggle to move their innovations forward. They run into various problems like those mentioned before. This could result in a loss of energy and motivation for the innovators to continue working on their innovations. In the next paragraphs, I discuss the current innovation strategy, what it is currently lacking, and what they are already doing to fix this.

PARAGRAPH 2.3

CWD'S INNOVATION STRATEGY

At the start of this project, CWD has no defined innovation strategy. Nothing is set in stone. This does not imply that innovation is not on CWD's agenda. On the contrary, at CWD, employees are given plenty of space to brainstorm new ideas. But the problem is that most of them, but not all, do not have the proper knowledge, skills, or guidance for validating ideas and bringing new business propositions to the market.

Currently, CWD is working on its innovation strategy to give employees more guidance. This is mainly through the efforts of Douwe. This chapter shows CWD's innovation strategy's current status at the start of my project.

CWD formulated three pillars for themselves on which they want to build their innovation strategy. With the aim to move from a capacity organisation more towards a product organisation (Simon, 1989). These pillars are listed below:

(1) Pro-actively develop new product-market combinations (PMC's)

(2) Invest in PMC's that contribute to the energy transition and are not primarily dependent on billable hours

(3) Develop PMC's with our employees and experience (and collaborate) with external partners

> *A PMC is a proposition that generates a revenue stream. It is a combination between a new product or innovation, and several clients are willing to pay for that product or innovation. A PMC preferably contains a scalable product that can be sold to many different clients.*

With these pillars for innovation at CWD, they set a goal to launch three new PMC's a year. One for each division: Infrastructure, Industry, and Utility. At the same time, they want to improve employee satisfaction with an improved innovation strategy. To map out current problems with innovation within CWD, they used A. T. Kearneys House of innovation (2008) to compare CWD's current innovation management with the framework A. T. Kearney recommends for innovation management (see figure 2.3). For each segment, I will explain its definition (Riel, 2011). After that, I will explain which problems of CWD's current innovation management are already identified.

INNOVATION STRATEGY

In this segment, A.T. Kearney's house of innovation identifies promising areas where the company can achieve superior growth and gain a competitive advantage. This can be achieved by launching new products or services, launching existing products or services in new markets or improving internal processes and business models. Currently, CWD only mentioned they want to contribute to the energy transition and want to create PMC's for the energy transition market, that are not primarily dependent on billable hours. This is too vague and ambiguous.

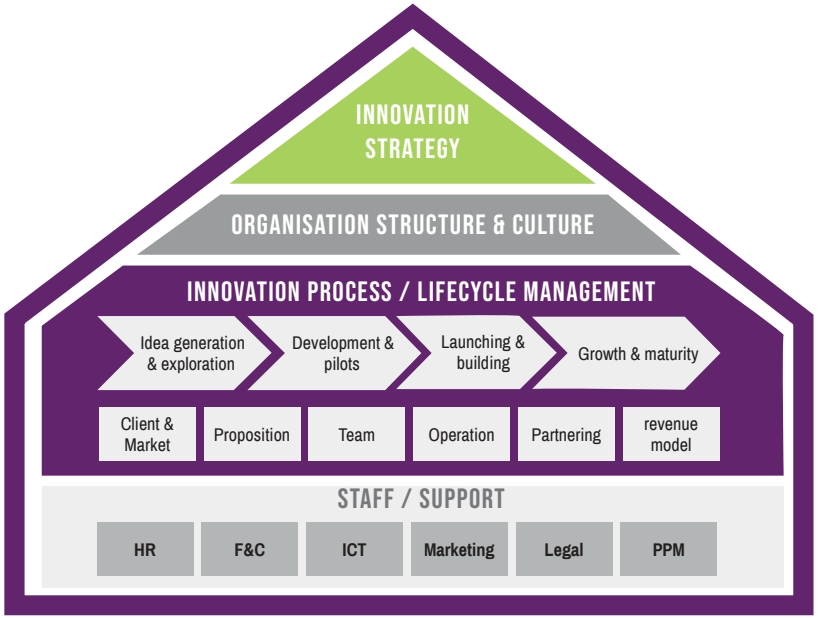


Figure 2.3 A.T. Kearney's house of innovation

Do they want to start building wind turbines? Or maybe they want to start developing e-scooters? Both contribute to the energy transition but could be far away from CWD's core business. This makes it hard for innovators and managers at CWD to judge if their efforts fit with the innovation strategy.

ORGANIZATION STRUCTURE & CULTURE

An organization's structure and culture must support the innovation strategy to reach profit targets. These structures must facilitate a seamless development process. The culture also has to be open to innovation. To provide a warm welcome for every idea, no matter where it came from. The organizational structure translates these ideas into innovations that contribute to the innovation strategy.

The organizational structure of CWD is build around billable hours, They are a capacity organization. This is a different from a product organization (Simon, 1989) where you sell products. Creating a new product-market-combination within a system that is not evaluated on products sold but on billability is hard. Simply because the hours worked on a new PMC are not billable and therefore not wanted within this structure. This structure also creates a culture that is against innovation. Since managers now have to invest hours to develop a new PMC, and the PMC turns out to be a failure, then these hours are lost and can not be used for something else within that project. This makes it too risky for the manager because he or she is not appreciated for trying something new, but only on hours not spend and black numbers at the end of a project.

INNOVATION PROCESS / LIFE CYCLE MANAGEMENT

This process facilitates the innovators (the ones with new ideas within the company). It helps them to build their ideas step-by-step. It shows which parts of innovation are important at which stage. This process avoids inefficiencies and shortens the time to market. Such a process does not exist within CWD. The innovation projects that are being developed at CWD have to find and create their path forward. There are little pre-existing initiatives at CWD that help innovators launch their ideas. But it is not all bad. Before I started this project, some initiatives were already launched to build this process. In paragraph 2.4, I will talk about what CWD is currently doing to start building a proper innovation process. Plus, there is also already a lot of freedom to ideate and come up with your ideas.

STAFF / SUPPORT

These departments of the organization should be aligned with the innovation strategy of CWD. They could help with knowledge management, marketing, and sales to better launch new products. They should be allocated in the right place and leveraged to fully exploit an innovation.

The staff at CWD is not aligned with the innovation strategy because the innovation strategy is not clear. This makes it hard to follow for these different departments. This miss alignment will result in them being all over the place. Since the culture at CWD is not in favor of innovation, this also reflects on other staff. Also, these departments within CWD are not evaluated based on innovations. There is no incentive for them to support innovations within the company actively.

Figure 2.4 illustrates how CWD's current house of innovation looks like.

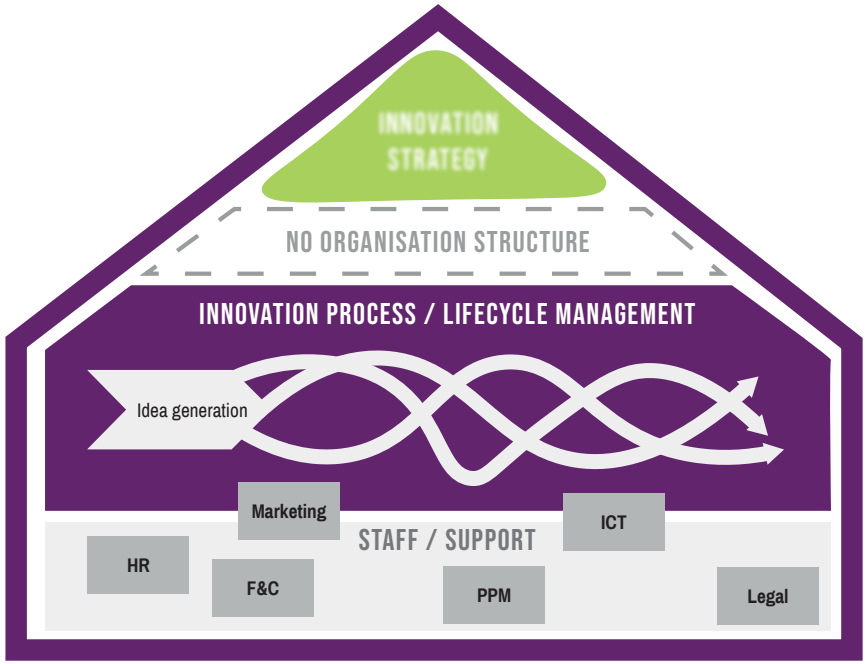


Figure 2.4 CWD's house of innovation

PARAGRAPH 2.4

WHAT IS CWD ALREADY DOING?

As mentioned before, the innovation strategy of CWD is vague and ambiguous. This is a concern for me. To get a better picture of what was going on around innovation at CWD, I interviewed Piet Jan Heijboer, head of the board at CWD. I learned, in my conversation with him, that CWD aims to innovate by creating more value for their clients. CWD plans to generate enough value for their clients that their former clients will recommend CWD to new clients. In my view, this makes the innovation strategy even more vague and ambiguous. Do they want to focus on the energy transition, or do they want to focus on client relations? Or maybe even both?

Since it remained unclear what CWD's strategy will be in the future, I decided to focus on analyzing initiatives that CWD is currently working on to boost its innovation output. I looked into several initiatives that CWD and TBI are working on. I will explain these initiatives in the next sections.

THE INNOVATION S-CURVE

Figure 2.5 shows a model for an innovation process called the innovation S-curve, similar to the standard template for the innovation S-curve as described by Sawaguchi (2011). This curve consists of three phases: Explore, Build and Maintain. Each with its characteristics. CWD aims to use this model as the foundation of its future innovation process. Their goal is to push more innovations through this curve.

Explore
Exploring is the first part of any innovation project. During this period, opportunities are explored and researched. Initial prototypes are built, tested, and iterated in quick succession, in this period, to find a product-market fit.

Build
During this phase, the innovation is launched to the market, beachhead customers are on boarded, and the production is scaled to facilitate future growth. Most financial investments also take place in this period.

Maintain
In the final phase of this curve, a part of the total market share is secured, and products are mainly sold to existing customers. Only incremental changes will be introduced during this period. And also, the innovation starts to pay back for itself.

TBI INNOVATION TOOLBOX

The TBI innovation toolbox is an online environment where help is offered to innovators. Here you can find inspiration for your projects. It is also possible to contact experts and advisors that can help you with all kinds of questions. Here, they frequently organize meet-ups for innovators to chat with each other from all corners of the TBI organization. And finally, they facilitate training sessions and online courses to help innovators with their personal development. You can also subscribe to a newsletter if you want to stay up to date about everything that is going on around innovation at TBI (tbiinnovatietoolbox.nl, 2020).

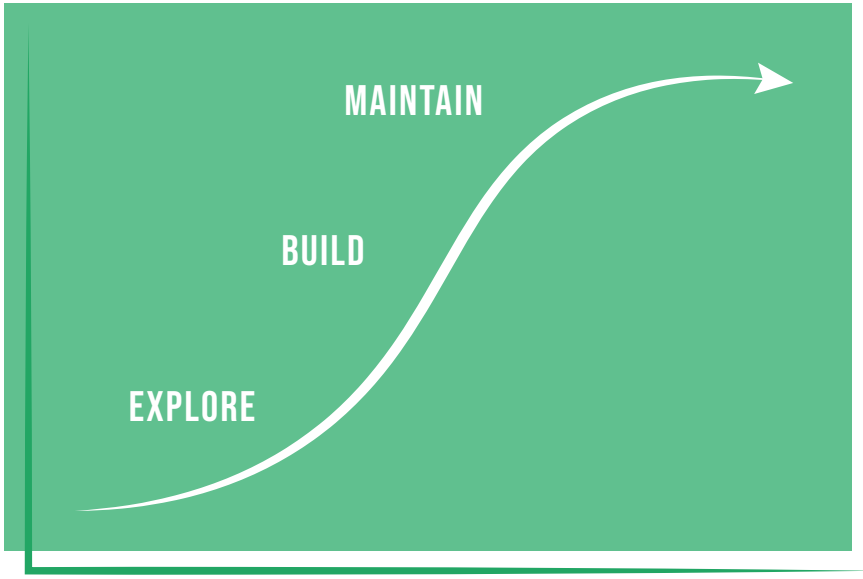


Figure 2.5 Innovation S-curve

TBIX

TBIx is an online platform where ideas and innovations are presented to everyone working for an organization within the TBI holdings. This platform aims to share ideas, ask for help or find colleagues that can help you during your innovation process. This platform is closely related to another platform. This platform shows you where innovation projects are being developed. This is useful because offices of different TBI daughter organizations are spread across the Netherlands (tbix.nl, 2020).

TBI I-FUND

TBI I-Fund stands for innovation fund. It is created to co-finance initiatives from different companies within the TBI holding. Its goal is to grow these initiatives and make them a reality. Everyone working (indirectly) for TBI can apply to this fund given that they have the support and initial funding from their daughter organization. The application form for the TBI I-fund can be found in appendix C. (tbi.nl/innoveren, 2020)

TBI INNOVATION AWARD

The TBI innovation award is an annual competition that looks for the best innovation in two categories. The first category is about the energy transition, climate, and carbon reduction. Here they look for innovative initiatives that contribute to these themes. The second category is about already realized innovations. Here they aim to reward projects that turned out to be successful in the past and give them a boost for future growth. The winners of the awards are rewarded with a trip about climate change, a food truck to share a lunch with their colleagues, and support to further develop their innovation. (tbi.nl/innovatieprijs, 2020)

TBI MAAKLAB

In English, Maaklab would translate to makers lab or makers space. The TBI MAAKlab is a physical space for innovators to meet, ideate, create and work on new ideas. This space houses different appliances for rapid prototyping like 3D printing and laser cutting. It is a creative and inspiring space where innovations can be taken to the next level. It is located in an office in Amersfoort. (tbi.nl/actueel, 2020)

To see where all these initiatives fit on the innovation S-curve, I plotted each initiative on the curve. This is shown in figure 2.6. They focus mainly on the early stages of development and getting an idea started. You can still use both the innovation toolbox and TBIx later on, of course, but they are not focused on growing Ideas. The MAAKlab is mainly about prototyping, which often occurs in the early stages of development, and the I-Fund is used for initial funding. This creates a gap where there is no specific support when you are in the build phase. The innovation award becomes relevant only after your innovation is realized or if you have a strong focus on climate change.

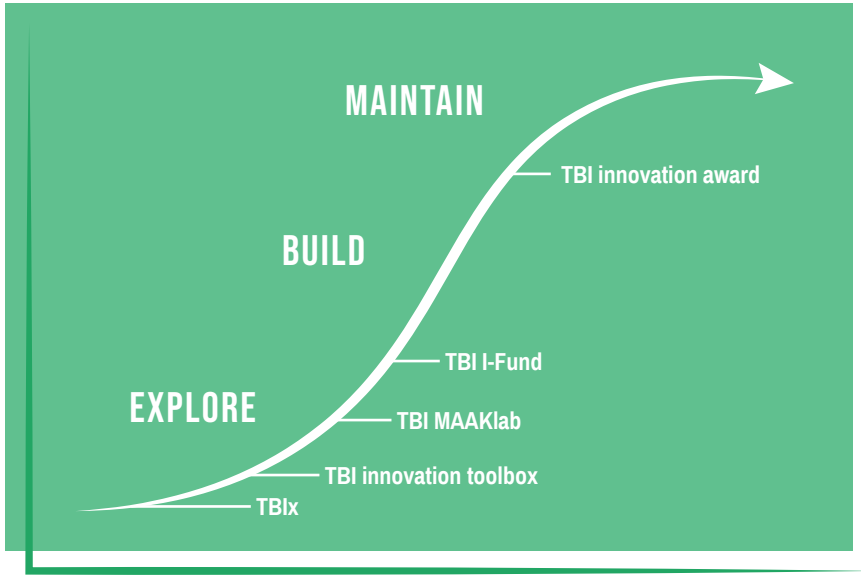


Figure 2.6 Innovation S-curve

PERSONAL INSIGHT

What stands out if you analyze these initiatives is that they are all named after TBI. This makes me think that CWD is not doing much to boost innovation within its organization. This is partly true, but I have to consider is that things they are already doing on the holding level do not need a do-over on the CWD level. But it also shows that there is still a lot of work to be done to create a solid innovation structure at CWD throughout the whole innovation S-curve.

DISCUSSION

The problem introduction and the description of CWD's innovation strategy are based on my observations and conversations I had with different CWD employees. This results in a combined view of the current innovation problem at CWD. Since I could not talk with everyone in the organization, there could be some generalizations within chapter 2 that do not resonate with everyone working for CWD. Besides the things that can improve, I also want to mention that some innovations and innovators currently do thrive in the organization. It is my intend to help even more people succeed with their innovations at CWD.

CONCLUSION

CWD's current innovation strategy is scattered. They are organized as a capacity organization that sells hours, but they want to move towards a product organization that sells products. There are several issues at CWD that prevent them from making this happen and launching three PMC's a year. The things they are currently doing to improve innovation at CWD help but are not sufficient to reach their goals. They also rely heavily on the efforts of TBI. A different approach is needed to boost CWD's innovation output and its engineers' innovative mindset.

RWZI WEERT

It normally takes on average 2 years to build a water purification facility. Using modular building techniques Croonwolter&dros managed to do it in just 11 months.

CHAPTER 3
METHODS

PARAGRAPH 3.1

AN ENTREPRENEURIAL DESIGN APPROACH

To start tackling this problem, I will use the double diamond model by the UK Design Council (2004). As shown in figure 3.1. This model provides structure during the fuzzy front end of this case study. Together with this model, I will use an iterative process that uses input from stakeholders to validate the choices made along the way. This creates support from end-users (innovators) for the final concept. This makes the innovators more open to implementing this concept afterward.

DISCOVER

The first phase of the double diamond model is an exploration phase. This phase is all about figuring out what CWD is really about? What is happing internally in the company? What is going on in the minds of the innovators at CWD? To answer these questions, I want to talk with relevant people inside the organization. People that have different experiences with innovation within the company. These interviews will help me get a good picture of what is going on with innovation within CWD. Desk research around keywords like corporate innovation, creativity, entrepreneurial mindset, and corporate culture will help me to improve my understanding of the topic.

DEFINE

After diverging in the discovery phase, it is time to converge to a design statement. Which problem needs to be solved in this case? By analyzing the insights, I get from the interviews and the desk research in the Discover phase, I can get closer to exactly what is preventing CWD from achieving three new PMC's a year. Through analysis of a (digital) wall, I will identify different problem areas and choose which direction to take to further define the design statement. Together with my team members and stakeholders, I will formulate a design statement that will act as the starting point for the ideation phase.

DEVELOP

With the design statement as a starting point, it is now time to start the ideation process. Again this part is about exploring, looking for possible solutions that fit the design statement. Through organizing ideation sessions with stakeholders, I want to include their desires and wishes into the concept I will create later on. From there, I move on to the conceptualization phase. I will map out all the solution spaces and by iterating them I want to construct a concept that will be further developed in the Deliver phase.

DELIVER

The final phase of the double diamond method is about providing the stakeholders with a workable solution. Through testing and validating the concept and an iterative process, the concept will evolve to something stakeholders can work with after this project. The final deliverable will also include an implementation plan to help CWD internalize the solution within their organization.

Figure 3.1 shows, besides the double diamond, which chapter concerns which part of the double diamond. The whole project will start wide and fuzzy, but via different design tools and iterations, the project will narrow down towards the final design and end deliverable of this project. The various design tools are explained in paragraph 3.2.

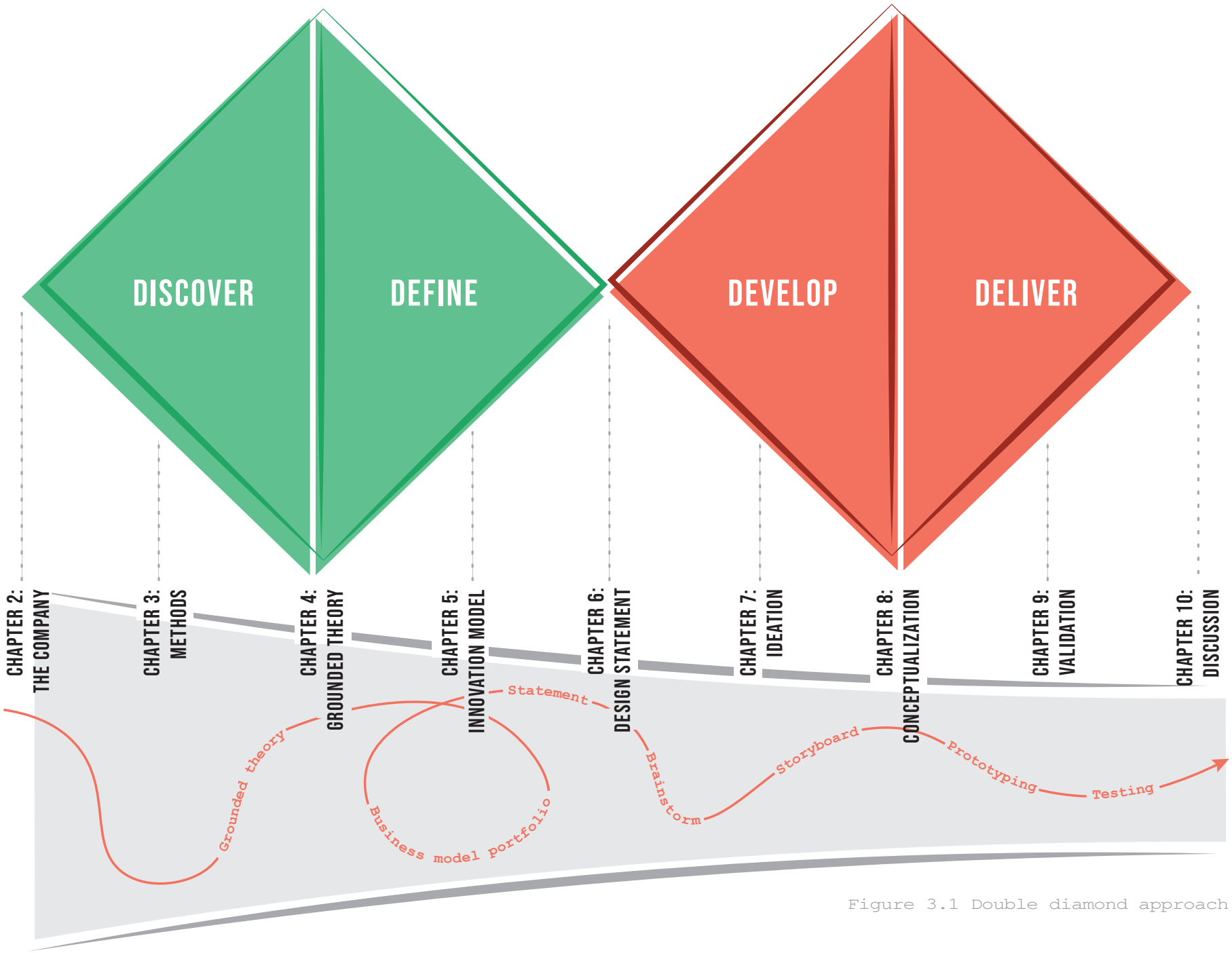


Figure 3.1 Double diamond approach

PARAGRAPH 3.2

DESIGN TOOLS

During the different double diamond model phases, I will use a selection of design tools to dive into the problem, explore different solution spaces, and synthesize a concept to tackle the problem. Most of the design tools I will use have crossed my path earlier in my student career. And I will also use a recently introduced tool called: The Business Design Portfolio Map. Introduced in the book: The invincible company by Osterwalder, Pigneur, Etiemble, and Smith (2020). The tools used in this project are explained below.

GROUNDED THEORY

To understand what is going on inside CWD, I will start with a research method called: grounded theory. This method was first introduced by Glaser and Strauss (1976). Grounded theory is an inductive methodology that lets you systemically gather, synthesize and analyze qualitative data. It suits this project because it helps you to better understand social processes in natural settings (Charmaz, 2001). Or in my case, it helps me understand the process of innovation in the setting of CWD. To gather qualitative data, I will use informal conversational interviews. I will interview the innovators at CWD. These are the people that are currently at the front line of innovation at CWD. Through these interviews' informal setup, I will get to know the interviewees, and I can let the conversation go where the interviewee wants it to go.

The next step is to code the data. By clustering the insights I get from the different interviews, I can understand what is happening inside CWD. The clustering will be done by putting all the insights on a digital wall and finding those that fit together or roughly mention the same overarching theme. The analysis on the digital wall will be explained further in paragraph 4.2. After this process, I want to identify different hypotheses about what is causing the innovation problem at CWD. Since this project is not about building a new theory but more about using theory to understand reality better, I will use a more light version of the grounded theory method. This saves me time because the interviews are not transcribed. The coding is done by hand on a (digital) wall. But still, the amount of interviews is determined by the point of saturation. This is when I do not get any more new information from the interviewees. After this process, I will pick a design direction to focus on further.

HARRIS PROFILE

The Harris profile is a standard tool in the industrial design engineering bachelor and a tool I did not use since my second year in Delft. It is explained in the Delft Design Guide (2013). In this book, the Harris profile is used to decide between different concepts at the end of the ideation phase. The concepts are judges on how well they fit the design requirements and are scored between -2 and +2. The requirements are listed from most important to least important. In my project, I will use it to decide which direction to take after the grounded theory method since this method will probably provide me with different hypotheses. And later on, the Harris profile will return to help me decide between three different concepts in the Develop phase.

DESK RESEARCH

Desk research is a part of every step of this project. Still, it is concentrated at the beginning of the project to orient on innovation management, corporate creativity, and knowledge sharing. Most of this research will probably not be relevant enough to put in this report, but will nonetheless be helpful background information. Desk research will also be conducted after choosing a design direction. After this step, the project's scope will be more narrow and might differ from the original problem. It is helpful to research existing theories to create a lens for me to look at the problem.

THE BUSINESS MODEL PORTFOLIO MAP

The business model portfolio map is a method introduced by Osterwalder et al. (2020). I found it through desk research into developing business models in large corporates and with a little help from fellow graduate students. I will use it to see where the current innovations at CWD stand and what is lacking in developing these innovations. This method is further explained in paragraph 5.1.

DESIGN STATEMENT

A design statement or problem statement is one of the fundamentals of design. It is used often in Design Thinking methods. I first learned about it from the 'yellow bible' written by Roozenburg & Eekels (1995). A design statement is a combination of a few short sentences stating: What the problem is? Who has the problem? In what context the problem exists? And mentions a possible solution space. This method will be the endpoint for the Define phase. After this, the ideation and synthesis of a solution for the problem will start.

BRAINSTORMING

Brainstorming is used to generate a lot of ideas in a short period. It is usually carried out by a small group of people, around 4 to 15. There are some rules to the process, as time restrictions. But the most crucial part is that the project requirements are 'forgotten' during the brainstorm. Everything is possible, and criticism is postponed until after the brainstorm has ended. During this project, I will brainstorm (online) with stakeholders to generate ideas and create support for my final concept.

STORYBOARD

According to the Delft Design Guide (2013), a storyboard is defined as a visual representation of a story or a narrative about your design in its context. A storyboard can help others to understand what your concept is about. The saying "An image can say more than a thousand words" comes to mind here. For this project, I used a storyboard to explain the concept I chose at the end of the Develop phase. Here, the storyboard shows how the concept will work in practice.

PROTOTYPING

A prototype is used to test a concept and show the workings of a concept to others. In this case, it will be used to do a test with stakeholders. A prototype is a simpler version of the product that is envisioned in a concept. There are different methods to create a prototype. For the prototype in this project, I used a wire-framing technique to create a mock-up of a web page.

VALIDATING

Every concept has one or more assumptions. Validating is the act of checking if these assumptions are valid. Checking these assumptions can be done in several different ways. But they all start with writing down the most critical assumptions. After that, you can decide how you can validate these assumptions. For my project, I did a test run of the concept to get feedback and ask if my assumptions were valid or if I need to make changes to the concept to make it work in the real world.

LOCK EEFDE

The Lock in Eefde is a fieldlab, which is part of the Smart Industry Fieldlab CAMINO. Here Croonwolter&dros collaborates with a variety of companies with the aim to monitor the status of infrastructures using sensors and data-analysis.

CHAPTER 4

GROUNDED THEORY

PARAGRAPH 4.1

TALKING WITH EMPLOYEES

With COVID-19 still waving through our society and with most people working from home, getting to know a company becomes harder. The simple 'coffee machine conversations' are not possible anymore, and running by someone's desk to ask a quick question is also not an option. Speaking as a new colleague at CWD, it is hard to meet new people and get a feel for the company culture. To tackle this problem, I asked Douwe to introduce me to some exciting colleagues. Colleagues that have experience with innovation at CWD. I invited them to talk about innovation and their opinions about what CWD needs to do to boost its innovation output.

In chapter 2, I introduced CWD to outsiders, but this is not sufficient to fully understand the problem of innovation at CWD. Through these meetings with colleagues and having an informal interview with them, I want to get a more in-depth overview of CWD's innovation problem. For these interviews, I reached out to colleagues working as:

- Lead Engineer (2x)
- Business Controller
- Innovation Manager (3x)
- Manager Product Development
- Regional Manager
- Manager Smart Buildings

INTERVIEW SETUP

Every interview will start with an introduction since I have never met these colleagues before. They will begin by introducing themselves and their role at CWD. After that, I will introduce myself, my background, and the topic of this case study. Next, the informal conversational interview will start. This gives me the flexibility to explore the topic of innovation together with the interviewee. I used the following questions as a starting point of each interview:

- What are your previous encounters with innovations at CWD?
- Do you have any example of innovation projects going well or bad?
- What do you think CWD needs to boost innovations?

From there, I will think of new questions as the interview progresses, trying to dig deeper into the topic of innovation at CWD and following the grounded theory method. I interviewed different colleagues until I reached saturation in the data.

The informal conversational interview is beneficial for this situation because it is unstructured and allows for flexibility (Turner, 2010). With the flexibility this method provides, I will be able to let the conversation go where the interviewee wants it to go. Exploring the topic of innovations as we go along. To capture all the insights, I will take notes of the important statements during the interview. These statements will later be analyzed. Because of the complexity and fuzziness of the problem of innovation at CWD, informal conversational interviews are best suited for this situation. They provide the flexibility to explore all the facets of innovation at CWD. On the next page, you will find a small collection of the data gathered during the interview. A complete overview can be found in appendix A.

"We can not stand up to management"

"Who is going to take the risk"

"We are Kodak"

"We should not sit and wait until someone shows up with a project"

"We need to show some balls"

"Management has to dare to do it"

"Project managers don't take risks"

"We must innovate with the entire chain"

"Too modest"

"We don't sell concepts"

"Entrepreneurship is missing"

"We innovate within the projects"

"You have to be dedicated"

"Actually there is no budget for innovation"

"There is no space to think about products"

"Everything is focussed on projects"

"Always a short in hours and money"

PARAGRAPH 4.2

ANALYSIS ON THE DIGITAL WALL

COVID-19 is challenging in many ways. It has many downsides, but it also pushes us to find alternatives to methods we were used to in pre-COVID-19 times. Personally, this resulted in using Miro for the first time. Miro is an online interactive whiteboard. You can use it for online brainstorms, for example. Since I wanted to involve others in my analysis, I needed it to be digital to share it during online meetings. I achieved this with Miro.

This analysis is part of the grounded theory method and helps to make sense of the data (Glaser and Strauss, 1976). It aims to find overarching themes in the statements that were made during the interviews. By combining statements into clusters, I want to identify which themes inside the CWD organization prevent successful innovation at the moment. Beforehand it is good to remember that there are many factors at play here that create the situation that CWD is currently in. Similar to what I wrote in the problem introduction paragraph, there will not be one single cause for the problem of innovation at CWD. The full results of the analysis are shown in appendix B. Each cluster has been given a name representing the overarching theme of that specific cluster. I noticed that some clusters are closely related. Because of that, I merged these clusters into one problem area. This resulted in six problem areas, as shown in figure 4.1. Each problem area has been named. In the following sections, I will explain each one of them.

LEADERSHIP IS FAILING TO LEAD

Suppose the board of CWD wants to change the company. They have to take the first step. They have to point the company in the right direction and show their employees where they want to go. The board needs to have a clear strategy to communicate to others where they want to go with the company and how they plan to get there. And when they do have a solid strategy, they have to take the risk of investing in projects and initiatives that helps them with achieving their strategy. Currently, this is not what is happening at CWD. The strategy is unclear, and the board (the leaders) currently does not steer the company towards change.

THE RIGHT COMPETENCIES ARE NOT PRESENT AT CWD

There are many engineers working at CWD and have been working at CWD for a long time. Something that brought them success in the past. But at the moment, they are facing different challenges. With CWD setting the goals of creating three new PMC's a year and thereby moving to a more product organization, they have to consider if they have the right team for the job. Are the current employees of CWD able to develop feasible, viable, and desirable propositions for their clients? The interviewees believed not, engineers are valuable employees, but they are not trained in all the skills needed to launch a new PMC.

CORPORATE CULTURE DISFAVORS INNOVATION

CWD is a well-established and traditional company. They are like an oil vessel that keeps on going and they do not quickly slow down or change direction. Within the company, there are many people not interested in change, or they have no experience with change. There is also little motivation or incentive to change or innovate for them. Project managers are, for example, judged on their results. Providing black numbers at the end of the project is their primary concern. They are not judged for new propositions that they developed during the project. At CWD, they innovate on the side, and there is no budget for it. Some even like to keep their innovation underneath the radar to avoid running into resistance.

CWD DOES NOT DARE TO TAKE RISK

Since CWD is a capacity organization, they are not used to investing their own money. When a tender is signed they start the project, and all the costs and hours are covered with the client's money. But when you want to develop a new project or service, you have to invest your own money. Something CWD is not doing enough right now. If the board of CWD wants to innovate, they have to take a risk and invest in validated propositions to get the company moving and generate additional cash flow. During my interviews, I often ran into doubt about CWD's capability to take the risk to invest in promising innovations.

KNOWLEDGE IS NOT FULLY EXPLOITED

You could argue that CWD is a innovative company. As showed at the beginning of each chapter. For most of their projects, even small ones, they have to engineer one-of-a-kind solutions. They are resourceful again and again in every new project. But due to changing teams, the knowledge that is generated within a project dilutes. When a project is finished, all the team members split up and move to new projects, storing the knowledge from the previous project in their heads, where it fades to the background and could even exit the company when an experienced engineer leaves or retires. In other words, knowledge on its own is not the problem, but sharing it with others and developing that knowledge is. CWD would benefit from new tools and methods that can help them retain this knowledge and develop them into new propositions. These tools could also teach them a more innovative mindset which can help them validate their new propositions faster.

THE OVERALL BUSINESS MODEL IS FAILING

Everything at CWD is about hours. Every hour you spend working has to be assigned to a project. All the internal processes at CWD are built around minimizing the hours spent on a project to maximize the earnings of a project. This creates a situation where innovators want to work on their ideas, but they can not. This is because their innovations are not linked to a project, and they can not declare their hours. This leaves the innovators not feeling supported by the company to pursue new opportunities. There is another drawback to the hour model. What happens when clients no longer come to CWD to help them build a tunnel, for example? If the projects run out or are given to a competitor, CWD will go bankrupt. This stresses the need for CWD to focus more on selling products. So, they are not so dependent anymore on others providing them with projects.

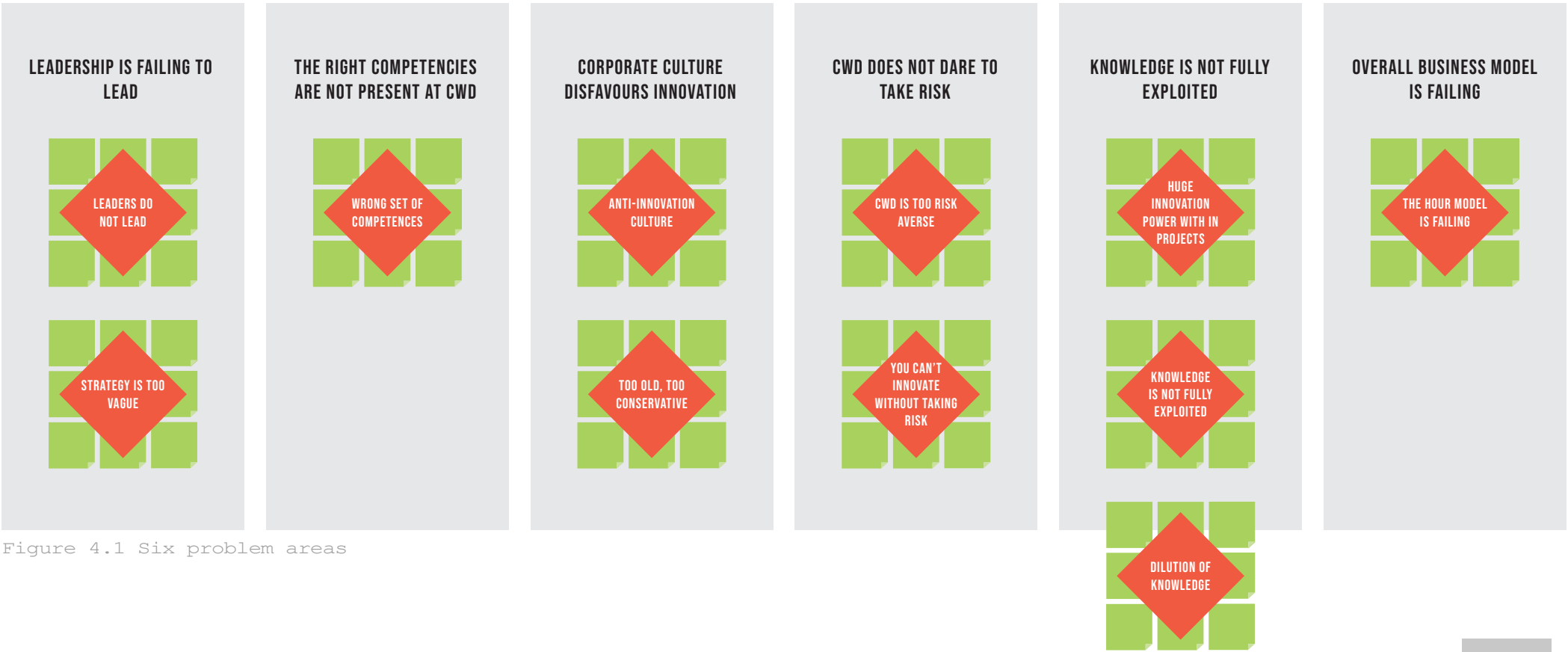


Figure 4.1 Six problem areas

PARAGRAPH 4.3

DESIGN DIRECTION

The purpose of the interview sessions was to involve stakeholders early in the process and to get in an insider's view into innovation at CWD. The stakeholders are the true experts of the innovation circumstances at CWD. Their insights provided me with an overview of the critical issues of innovation at CWD. In the previous paragraph, I identified six different problem areas. In this part, I will explain how I picked one area as a focal point for the rest of this case study.

HARRIS PROFILE

Picking one focus area is needed to scope the problem and formulate a specific design statement later on. It provides clarity and focus for the subsequent phases of the double diamond design method. To choose between the six problem areas, I will use the Harris profile. This method scores every problem area between -2 and +2 on different criteria. These criteria are explained below:

People: Does this problem area include working with people? Is this problem area something you can work on with others and solve together?

Strategy: Does this problem have touchpoints with strategic design? Is it relevant for a strategic design project?

Solvability: Is this problem small and specific enough to be solved in the limited time set for this case study? And yet not too small to be solved overnight?

Entrepreneurial: Does this problem challenge my entrepreneurial and innovative mindset, or does it involve teaching others about this?

Challenging: Is this problem area challenging enough? Does it provide enough of a challenge to be interesting to solve?

Personal interest: Do I have affection for this problem area? Is it something I would like to work on for the remainder of this project?

Before I decided, I excluded two areas problem areas. If you look back to figure 4.1, you see that the areas called: "The right competencies are not present at CWD" and "The overall business model is failing" are not mentioned that much by the interviewees. I believe these are underlying problems that exist but are not within this case study's scope. First of all, because it is not in my reach to make decisions about the workforce at CWD, and second because I can not change the entire business model of CWD with one project. Their hour model still needs to generate cash flow for CWD to provide the resources to transition towards a more product-based company. Nonetheless, I can still help CWD make the first steps towards a more product organization by working on one of the other problem areas.

THE RESULT

The result of the Harris profile is shown in figure 4.2. The remaining problem areas are labeled as Leadership, Culture, Risk, and Knowledge in the Harris profile, which corresponds to the problem areas of paragraph 4.1. From this, I concluded that "knowledge is not fully exploited" will best suit the remainder of this case study. After this step, I drafted a first problem statement:

"Croonwolter&dros solves technical problems with cutting-edge solutions over and over again. Each time they are starting from scratch. Croonwolter&dros fails to internalize past projects' solutions and not build on this knowledge. Croonwolter&dros would benefit from a process that extracts proven innovations from a project and continues to develop it to create new business."

I presented my findings to my team and showed them my first draft of the design statement. They agreed on the steps I took to get to this point and mentioned that this problem statement was not specific enough. They reminded me that I started this

project to coach others towards a more innovative mindset. Something they felt was missing from this statement. After a discussion, we concluded that further convergence was needed to define the pain points around innovation at CWD.

Still, we agreed that I should focus on creating a more innovative and entrepreneurial mindset through better knowledge sharing between engineers, designers (me), and managers. After the interviews and Harris profile, I realized that I could not fix CWD's entire innovation problem in one design solution. To make a difference at CWD, it is vital to focus on one specific aspect. As mentioned earlier, I needed to converge even further. In the next chapter, I will dive deeper into CWD's running innovation projects to see what kind of knowledge, support of resources the innovators are lacking that prevents them from growing their innovations.

PERSONAL INSIGHT

Focus is important. A deep dive into CWD's current innovations is needed to scope the problem better. To find out what the CWD employees need to improve the innovation output of the whole organization.

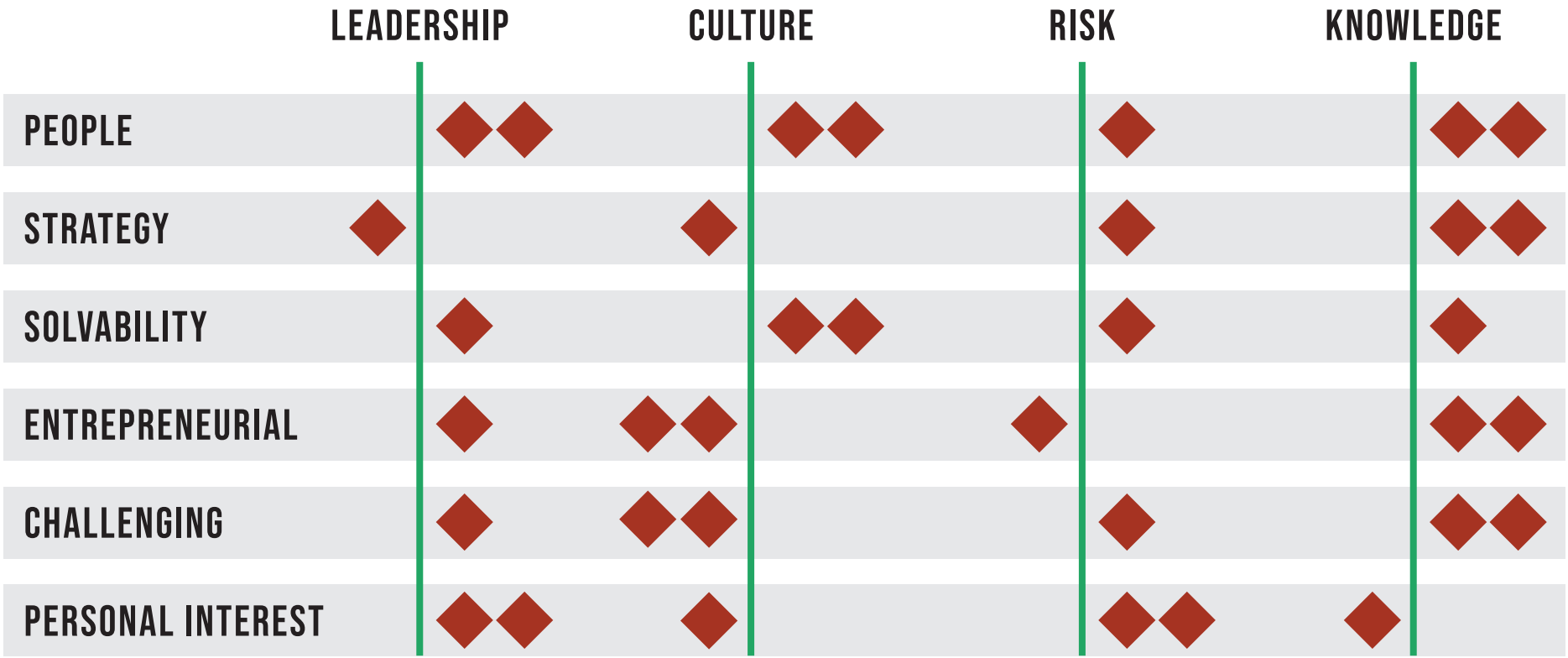


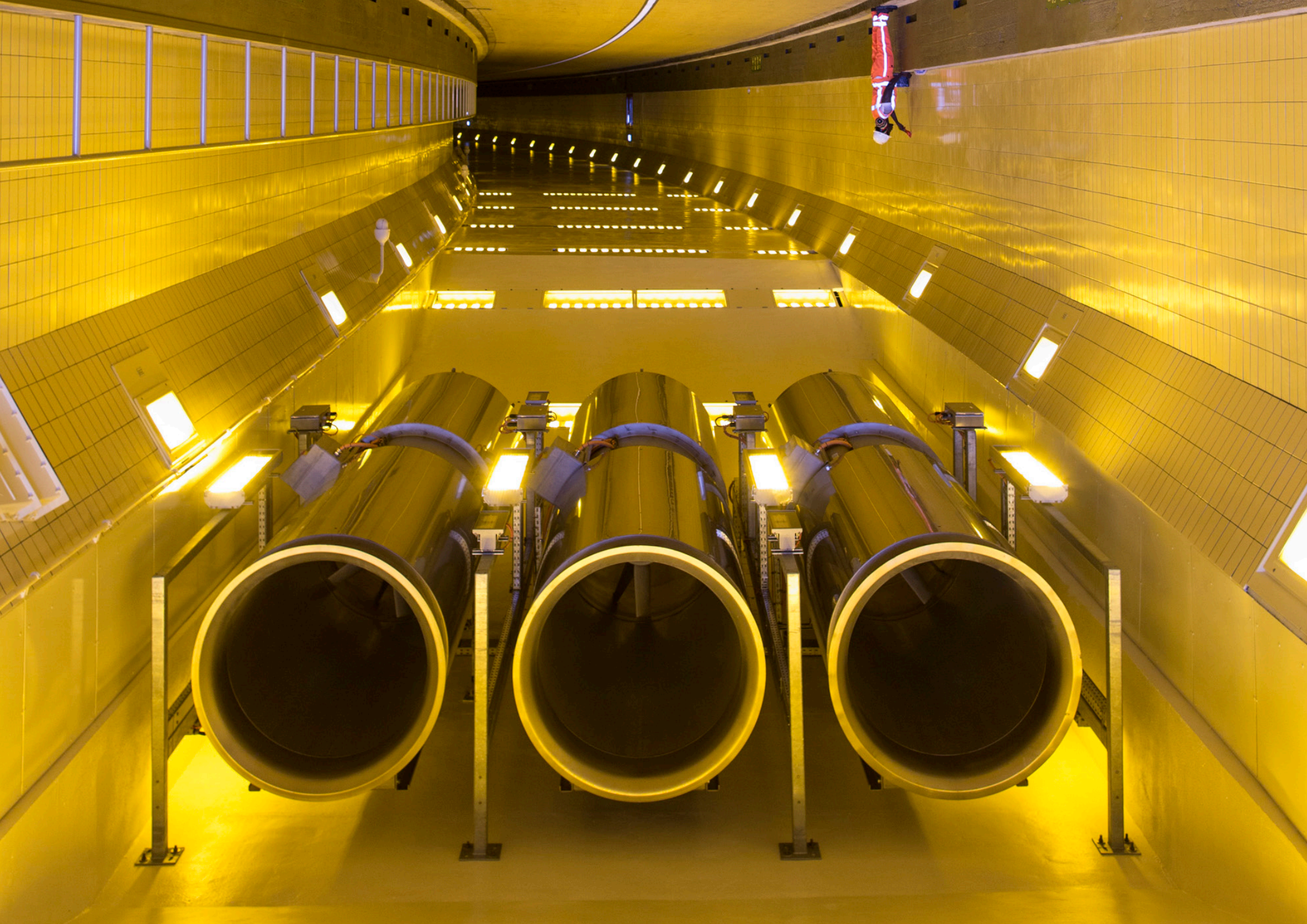
Figure 4.2 Harris profiles

DISCUSSION

Although the interviews were continued until saturation in the data was reached, there still was room for interpretation. For the interviews, I used an informal unstructured setup. This has its benefits but also results in a different interview with each interviewee. This makes the interviews harder to compare. Also, the interviewees were limited to employees that worked on innovation before. They were not a representative group of the entire CWD workforce. Still, they provided valuable data, and using the grounded theory method, the theory (problem areas) originated from that data. Later on, these problem areas were interpreted and explained by me.

CONCLUSION

Interviewing and clustering uncovered six problem areas around innovation at CWD. Two of them were not in the scope of this case study. The others all showed potential for further analysis, with the problem area of knowledge sharing sticking out the most. Although this is a sound basis to progress on, more research is needed better understand innovators' needs and formulate a proper design statement.



MAASTUNNEL IN ROTTERDAM

In August 2019, Croonwolter&dros together with Mobilis and Nico de Bont finished the renovation of the Maastunnel. The first traffic tunnel in the Netherlands. They managed to preserve the historic look & feel of the tunnel and upgrade it to the 21st century.

CHAPTER 5

INNOVATION MODEL

PARAGRAPH 5.1

BUSINESS MODEL PORTFOLIO MAP

To better understand CWD innovators need to progress their ideas, I need to understand better what they are working on. During COVID-19 times, it is hard just to go everywhere you want and talk to these innovators, and since I already spoke to most of them digitally in the interviews, I felt I needed a different approach. Luckily Douwe provided me with a solution. He invited me to a presentation session where the top-of-the-class innovation projects of this moment were presented to the board. Since the board was working on the strategy for the coming years, they were interested in these projects' current state. For me, this provided a chance to observe the innovators and analyze their innovations. This helped me figure out which parts of the innovation process were problematic for the innovators. Which knowledge gaps they experienced and how these affected their progress. To understand their needs, I wanted to map out the innovation projects in a framework that shows where an innovation stands in its development. For this step, I chose a model from the book: "The invincible Company," written by Osterwalder, Pigneur, Etiemble, Smith and published in 2020. This model is called the Business Model Portfolio Map (BMPM).

THE BUSINESS MODEL PORTFOLIO MAP

Before I start with the projects that I observed and the analysis, I first want to introduce the Business Model Portfolio Map (BMPM). An overview of the map is shown in figure 5.1. This model suits the situation of CWD because it focuses on existing companies with established business models (BMs). This model simultaneously visualizes, analyses, and manages different BMs within the company. This can both be BMs you are currently improving and growing (exploit) as BMs you are presently researching and testing (explore). Both quadrants have an x-axis and a y-axis.

In the explore quadrant, the innovation risk and the expected return are mapped (these will be explained later). In the exploit quadrant, the death & disruption risk and the return are mapped. Different innovation theories can back this model or can be related to this model. I will discuss some of these theories in the following paragraph. Since this project is focused on helping the innovators at CWD with moving their innovation forward, I zoomed in on the explore quadrant. All the BMs currently not generating a sustainable cash flow exist in this quadrant. Figure 5.2 shows the zoomed-in version of the BMPM. This figure schematically shows a business model's journey in the explore quadrant. During the explore journey, a business idea is checked for the desirability, viability, and feasibility of the idea, and pivots are made if needed. Every journey starts with discovery. Rough concepts are shared and tested here. These ideas arise from market opportunities and new technologies. At CWD, ideas might present themselves in current projects. Sharing ideas and knowledge between project teams can provide a steady flow of ideas into the discovery phase. During this phase, prototypes are made to collect initial evidence to check viability and desirability. Examples are storyboards, videos, and mock brochures. In the validation phase, you start to accumulate more solid evidence for the desirability and viability of your business idea. The first letter of intent could signal the willingness to pay, and a first analysis of the cost structure could

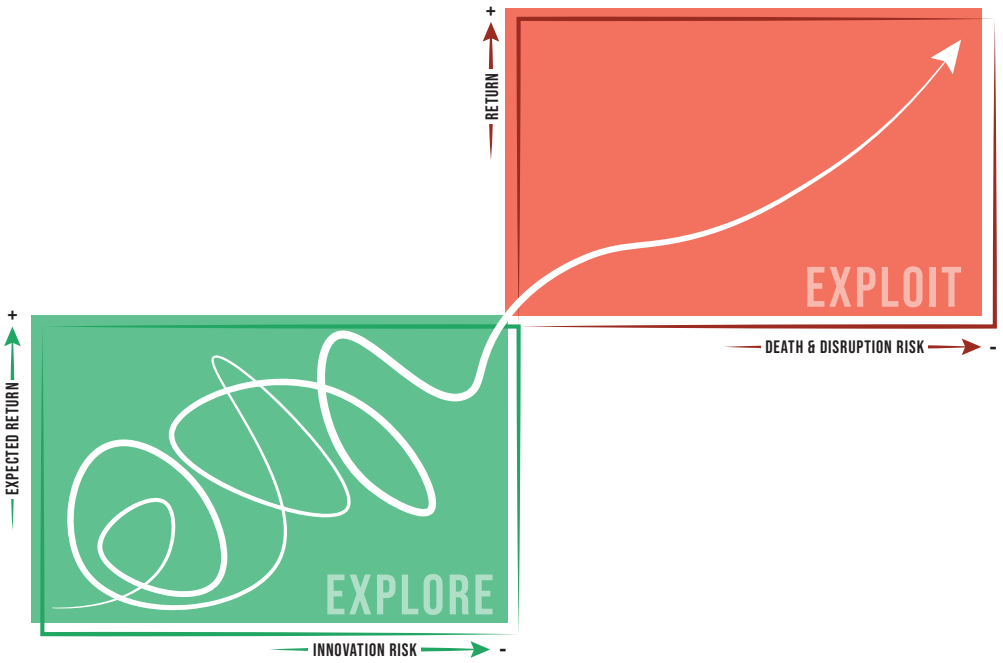


Figure 5.1 Business model portfolio map

show the profitability of a business idea. This is also the first phase where you check for feasibility. Via a technical prototype, you can check if the required resources are present in your organization.

In the final step of the process: acceleration, you aim to get a working prototype or a first product. Besides that, you search for evidence to deliver your value proposition to your customer on a limited scale with profit. To further stimulate growth, you search for evidence to justify further investments to scale your proposition and test your profitability at scale. If you successfully move through all these steps, you eventually transfer to the exploit phase. But you likely run into issues during the process. Through testing, you are faced with reality. New evidence might suggest that your idea will not work in the real world, despite promising early evidence. In this case, you are forced to pivot and change direction. After you made some significant changes, you can test your underlying hypotheses again and proceed with the same steps but with a new direction. In a worst-case scenario, you have to terminate your idea, but this at least prevents you from dragging the project along infinitely, and it frees up time to spend on a new idea (Osterwalder et al., 2020).

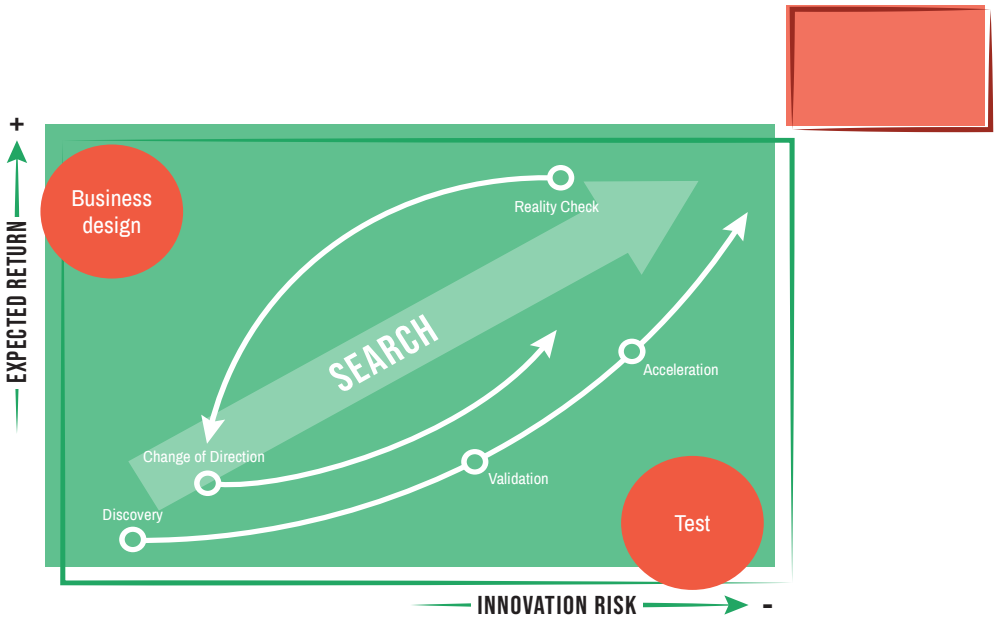


Figure 5.2 Explore quadrant

INNOVATION RISK

The explore quadrant has reducing innovation risk on the x-axis and expected return on the y-axis. Innovation risk is by Osterwalder et al. (2020) defined as the risk that a business idea is going to fail. The risk is high when there is little evidence to support the success chances of an idea. The risk decreases if the amount of evidence that supports the viability, desirability, and feasibility of a business idea rises. Evidence to reduce the innovation risk is mainly collected by testing the concept with prototypes. These tests are primarily focused on the desirability of the business idea.

EXPECTED RETURN

The expected return refers to how lucrative a business idea could be for the company if it turns out to be successful (Osterwalder et al., 2020). Evidence for the expected return is gathered through designing the business model around a vague business idea. Insights from testing and market research are synthesized into concrete value propositions and business models.

INTENDED USE

First of all, I intend to use the BMPM to analyze the different innovation projects currently under development at CWD. In which stage of the journey are they currently in, and how do they stand on the x- and y-axes? From the interviews I learned that I should stick to transferring knowledge. To do that, I need to know which knowledge gaps exist around innovation at CWD. This model could help me figure out what innovation projects at CWD need to reduce the innovation risk.

Later on in the project, this map can also be used in meetings and creative sessions as a conversation starter. It can help to make sure everyone in the room is on the same page and has the same understanding of the context. It would also be interesting to know where the innovators think their innovations stand on the portfolio map. Something to keep in my mind for later stages in the project.

Finally, this model can be used in the final stages of the project to help CWD's board visualize, analyze, and manage CWD's business portfolio. Assuming that they will end up with different kinds of business models in a few years with the help of this project.

PARAGRAPH 5.2

THEORY BEHIND THE BMPM

To better understand the Business Model Portfolio Map, I researched some keywords linked to this model. Keywords like: explore, exploit, innovation management, knowledge sharing, viability, desirability, and feasibility. During this exploratory research phase, I gathered different insights about the topic. These insights are my interpretations of the literature. They are explained briefly in this paragraph.

EXPLORE & EXPLOIT

The term explore and exploit originate from a design theory introduced by Hatchuel, Le Masson, and Weil (2004). It is called Concept-Knowledge (C-K) theory. In this theory, they distinguish between a concept space and a knowledge space. Figure 5.3 gives a schematic view of the C- and K-space. The Knowledge space consists of all the propositions that have a logical status. Think of these propositions as islands of knowledge in this space. All the knowledge, experience, and established business models exist on these islands. These are the business models you are currently exploiting. You can expand these islands by gaining more experience and knowledge. But creating new islands requires venturing in the C-space.

The C-space consists of all the unknowns, all the ideas, and business models that have not been implemented yet. You can venture into the C-space through testing concepts, pivoting, and creating new concepts. When a business model is ready to be implemented, it moves to the K-space, creating a new island. The C-space is where all the exploring takes place.

RESEARCH INSIGHT

The construction business is an exact science. Components need to work, fit and be reliable. The engineering of these components, based on knowledge and experience, happens in the K-space. Therefore it could be that engineers are not comfortable or used to exploring the C-space.

INNOVATION MANAGEMENT

In the BMPM, there are several steps to be taken before you can transfer a business model to the exploit quadrant of the BMPM. Some steps might even need a do-over after a reality check and pivot. This requires proper management to keep the process going, find the necessary resources, and keep the team motivated. According to Souder (1981), there are six conditions to increase the success rate of innovation projects.

Early identification of potential entrepreneurs

In Souder's study (1981), most successful projects were guided by one individual who championed the project. These individuals are well acquainted with the end markets, know the technology, and are known by many others throughout the firm.

The entrepreneur's formal license

A formal license gives an individual the mandate to carry out a particular function. This can simply be done by giving this individual a title like "project manager". Often these individuals will carry out their jobs more effectively if they are given such a formal license.

Informal influence of the entrepreneur

Entrepreneurs often rely on informal influence for help and assistance. Successful entrepreneurs build an informal network through peer respect and charisma. These are usually reliable resources for entrepreneurs.

Sponsorship

A sponsor is someone higher up in the organization that also champions the entrepreneur's project. Souder (1981) found that one-person shows, without a sponsor, often fail in large corporations. A good sponsor has a high degree of authority and informal influence. The sponsor should also be willing to play the role of coach.

Organizational location

Souder (1981) mentioned that the optimum location is still a problem. But one rule

of thumb is to position a project at the lowest consistent level at an organization. For example, if a project at CWD combines safety and data analyses, it should report to the lowest manager or director with a mandate in both departments.

Discretionary powers are given to the entrepreneur
The license granted to the entrepreneur should be adaptable to the project's changing conditions. According to Souder (1981), the best approach here is to provide the entrepreneur with a license or a broad scope, but with a restricted budget.

RESEARCH INSIGHT

Many elements play a role in the success or failure of innovation within an organization. It is a good realization that solving one thing will not necessarily lead to a boost of the CWD's innovation output. Earlier I stated that I could not solve the entire innovation puzzle at CWD with this case study. This has become even clearer after this section. In the ideal world, if different initiatives would work seamlessly together, they should set the right conditions for innovation at CWD.

KNOWLEDGE SHARING

Knowledge sharing occurs throughout the explore quadrant but is most useful in the discovery phase. By sharing knowledge and experiences of previous projects, CWD can learn as a company. According to Kim and Lee (2006), this is essential for survival. Unfortunately, CWD works in specialized teams that work in their divisions, away from other divisions. After a project is finished, the team splits up, and the knowledge remains in the heads of the team members. This system does not promote knowledge sharing. Yet, knowledge sharing, especially informal knowledge sharing, is regarded as a fruitful route to innovation (Taminiau et al., 2007). Informal knowledge sharing is defined as conversations you have at a coffee machine or at dinner and other activities that are not necessarily designated for knowledge sharing. Taminiau et al. (2007) mention different reasons why knowledge is not shared in consultancies. You can compare CWD with consultancies because, similar to consultancies, CWD is also a capacity company. The reasons not to share knowledge are listed below:

(1) A consultant feels the need to conceal valuable knowledge from colleagues
(2) A consultant might not have the time to share the knowledge since he or she is too busy with client work
(3) A proper knowledge management system is lacking

RESEARCH INSIGHT

CWD might benefit from more opportunities for informal knowledge sharing. By involving more people in innovation, ideas can spread easier throughout the company. This could create cross-pollination between divisions and increase the possibilities for successful innovation.

VIABILITY, DESIRABILITY & FEASIBILITY

Finally, I researched the terms viability, desirability and feasibility to make sure no misconceptions would exist in understanding the BMPM. Desirability refers to the needs and wishes of people. Does the outcome of the project fit the desires of the intended customer? And are they willing to pay for it? Viability refers to the business aspect of the project outcome. Can this outcome be sustained effectively in the company for the medium to long term to generate additional cash flow? Feasibility refers to making a project outcome tangible. Can it be made with the resources that currently exist within the company? (Calabretta, Gemser & Karpen, 2018). The sweet spot of strategic innovation exists at the crossroads of viability, desirability, and feasibility.

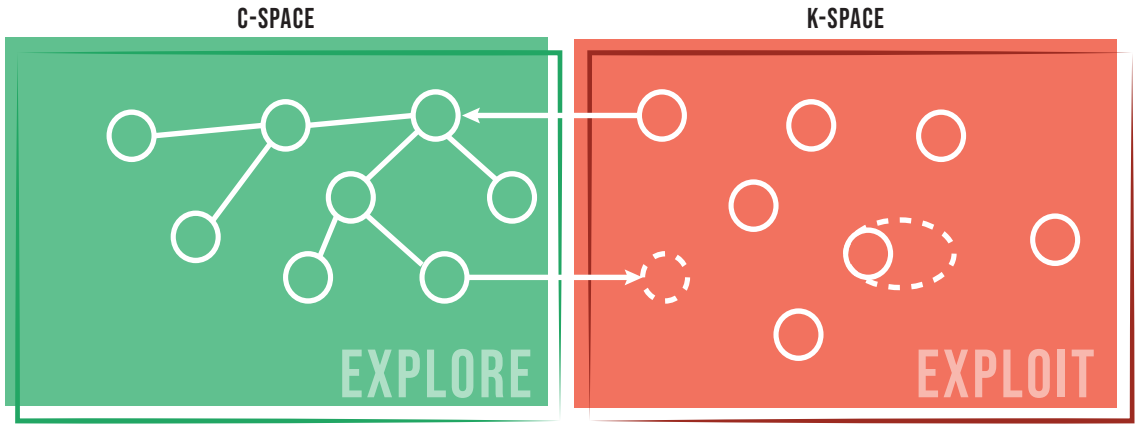


Figure 5.3 C-K Theory

PARAGRAPH 5.3

MAPPING THE CWD INNOVATIONS

The next step is to put the BMPM to use. As mentioned before, I got the chance to observe several innovations currently under development at CWD. These innovations were presented to the board of CWD and are labeled as the most promising innovation at this moment within CWD. In this part, I will go over each innovation and map them on the business model portfolio map. After this analysis, I will try to find a common problem or knowledge gap that I can focus on for the remainder of this case study.

Circulair RWZI
Circulair RWZI is a circular system for water purification. It is energy neutral and uses modular building methods and data to run and build the system cheaper and more efficiently.

IAM
IAM is a central knowledge center for infrastructure maintenance. IAM stimulates and facilitates continuous improvements by managing all best practices and the release of improvement reports for infrastructure contracts.

Modulair bedrijf
Modulair bedrijf is a potential spin-off company that focuses on prefabricated modules that can quickly be installed on-site, reducing construction time and saving money.

Sara
Sara is an intelligent asset management tool. That provides the owners insights into which assets they have, what condition these assets are in, and which configurations of these assets exist.

Sibyl
Sibyl is a data collection and management tool that provides insights into an installation. This data can be analyzed to predict maintenance and create data-driven tenders.

SI Energie
The energy infrastructure needs an urgent upgrade to facilitate the energy transition. CWD, together with Mobilis, can deliver comprehensive solutions to tackle this massive project.

TBI Watch
TBI Watch is a reaction to the increasing amount of unwanted visitors on construction sites. Currently, camera security systems are rented externally. TBI Watch is CWD's solution to this problem. It saves money and opens a door for a more product-based business model.

True state
True state is a dashboard that provides real-time insights into the performance of buildings and office spaces. Making it possible to guarantee a building is operational and enabling the use of modules instead of using custom solutions.

These innovations are judged by my observations on expected return and innovation risk. While at the same time keeping in mind the viability, desirability, and feasibility of an innovation. The result of this analysis is shown in figure 5.4. After the presentation, I received and analyzed the slide decks to back-up my observations.

From this analysis, I learned that all the innovations are focused on feasibility. Some of them have working applications (Sibyl, Sara), and others already have been built once (Circulair RWZI). I also learned that desirability is a given most of the time. Since CWD has close relations with companies like Rijkswaterstaat, they can easily find clients for their propositions, like the SI Energie innovation. Often these innovations arise from questions asked by CWD's clients. This makes it easier to find a launching customer. But it can cause a blind spot for the desirability aspect of innovation. Since CWD has such close relations with various clients, they are used to assuming they will have a launching customer. But if CWD wants to grow and move into new markets, it should

learn to think about new customers. Besides the usual clients, are others willing to pay for their new propositions? I also learned from this analysis that the topic of viability was skipped in every presentation. This could mean that this topic was not considered or that it was not meant to be in these presentations. But since the board is a key stakeholder, if you want resources to grow your idea, it would, in my opinion, make sense to show them how CWD could make money with their proposition. Nonetheless, the topic of viability was left out of all the presentations.

To further check my findings, I looked at the application form for the TBI I-fund (appendix C). This form is required to apply for resources from the I-fund. But after taking a close look, I noticed this form does not contain any questions that concern viability or desirability. Therefore innovators applying for this fund are not stimulated to think about these topics. They are simply not asked or expected to think about the business and the market. This provided me with enough confirmation to focus on the knowledge gap that exists on the topics of desirability and viability.

PERSONAL INSIGHT

An innovative mindset is based on thinking about the viability, desirability, and feasibility of innovation. From this analysis, I learned CWD innovators primarily focus on feasibility. Since CWD employees are mostly engineers, it makes sense for them to prefer working on feasibility. This does not mean this is true for every CWD innovator. But to improve the overall innovation output, I conclude that more focus on desirability and viability is needed.

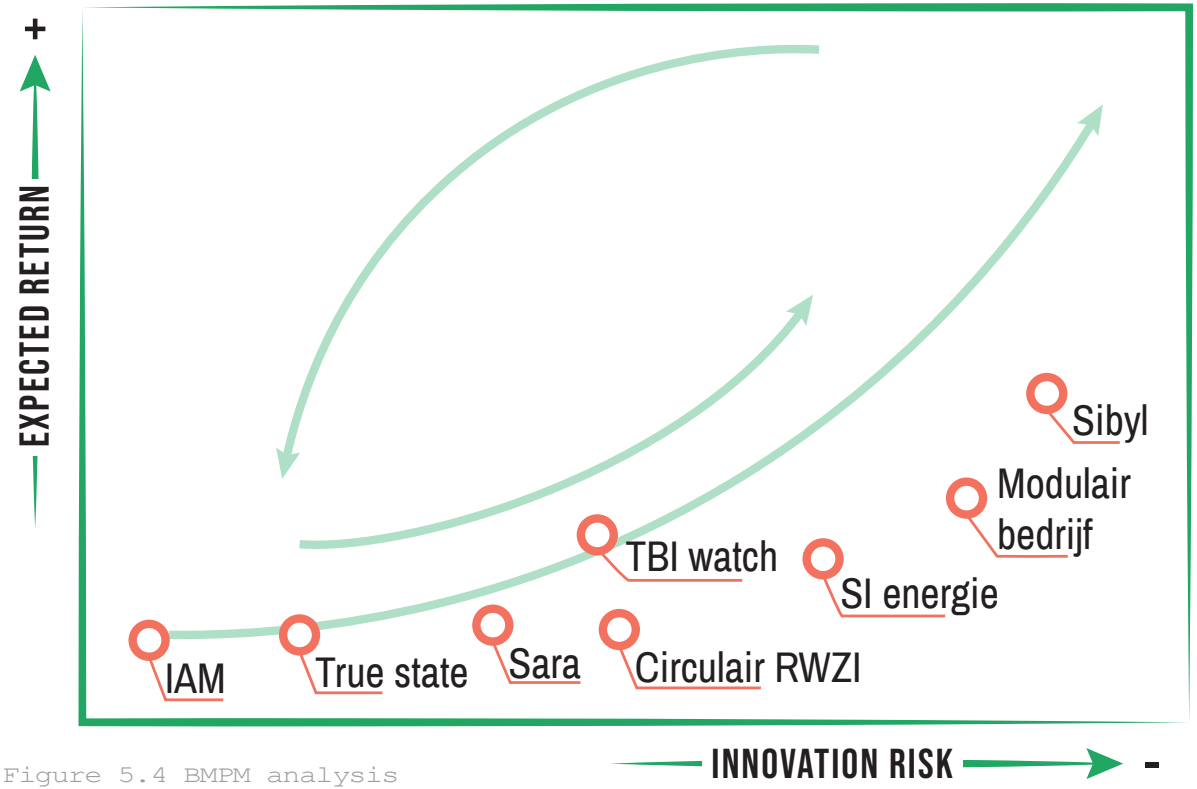


Figure 5.4 BMPM analysis

DISCUSSION

The analysis only showed the innovations that were presented to the board. These are not all the innovations that are under development at CWD. But since these innovations show the most potential, they are a representable sample. If these innovations show the most potential, it is safe to assume that other innovations do not perform better on desirability, viability, and feasibility. Also, these innovations are judged based on only my observations during the presentation, but to double-check my findings, I also analyzed the slide decks of each innovation. If CWD wants to further study these innovations, I recommend interviewing all these innovators to gauge where they stand on the desirability, viability, and feasibility.

CONCLUSION

The business model portfolio map showed that CWD's innovations mainly progress in the x-direction. This means that the innovation risk is decreased by testing the desirability and feasibility. These innovations show little evidence of their viability. Most of the evidence for the desirability is based on the assumption that CWD's close relations will buy the product or service. To improve the innovative mindset of CWD's engineers, I need to focus on helping them validate the viability and desirability of their innovation. This could help them convince stakeholders of the potential of their innovation.

NITROGEN REDUCTION A16

Croonwolter&dros as part of the construction combination: De Groene Boog, pilots the use of electrical machinery to reduce nitrogen pollution at the construction of a new part of the A16 highway near Rotterdam.

CHAPTER 6

DESIGN STATEMENT

PARAGRAPH 6.1

DESIGN STATEMENT

This chapter concludes the first part of this case study: the Discover and Define phase. Through different research methods like grounded theory, I explored the context of innovation at CWD. With the Business Model Portfolio Map, I discovered a lack of focus on the viability aspect of each innovation that is currently under development at CWD. And since they are used to having good relations with clients, they also pay little attention to desirability. This is essential if CWD wants to grow into new markets. This will probably happen if they're going to focus on the energy transition. Earlier I stated that I wanted to focus on creating a more innovative mindset. These factors contributed most to the design statement I wrote on the next page.

In simpler words, this statement translates to: designing a method that helps and coaches innovators at CWD to develop and test the viability and desirability of their innovations. Together with this method, the innovators should develop a more innovative mindset. Since viability is about thinking about how much money can be made with innovation, it can not go without thinking about desirability. If you do not understand the market and identify what they want and what they are willing to pay, you can not decide if it makes sense to invest in innovation.

The design statement was discussed with my team to ensure everyone is on the same page and agrees with the statement. This provides a solid basis for the next steps of this case study. The next step is the Develop phase. This is where the ideation takes place. Again, I want to involve the innovators from the interviews to help with finding possible solutions for the problem. This also creates support for the final concept and makes it easier to implement it afterward.

STATEMENT

At Croonwolter&dros, many new business opportunities are created based on current clients' desires. The innovators working on these potential innovations mainly focus on feasibility. But they forget to think about the viability and desirability aspects of the innovation. Therefore, they fail to convince stakeholders of the innovation's value. Innovators at Croonwolter&dros would benefit from a method that helps them better develop and communicate their innovations' potential.

SOLAR OPTIC FIBER

To decrease the energy consumption of a tunnel, Croonwolter&dros used smart lenses and solar optic fiber to capture sunlight and redirect it into the tunnel. Decreasing the amount of light bulbs needed to illuminate the tunnel.

CHAPTER 7
IDEATION

PARAGRAPH 7.1

IDEATION PROCESS

To start diverging again after finalizing the design statement. I wanted to brainstorm with different stakeholders and experts to get rich input on how to tackle my design statement. This paragraph will explain how I set up the brainstorming sessions and how I used these sessions to formulate different concepts.

THE BRAINSTORM SETUP

Due to the COVID-19 regulation, physical brainstorming with multiple people in the same room was not an option. Therefore I decided to use Miro again to organize a digital brainstorm. In figure 7.1, you can see a schematic presentation of the framework I created for the brainstorming sessions. I started with introducing my project to make sure everyone who participated in the brainstorm was up to speed on my project's topic. After the introduction, we started with an ice-breaker because not everyone in the brainstorm was familiar with each other. And also because online meetings tend to be less informal. The ice-breaker helps to loosen up the ambiance.

The brainstorm consisted of a diverging and a converging phase. First, we started by brainstorming about: "What kind of actions innovators could take to work on viability?" After that, we would do the same for desirability. And finally, we would brainstorm about: "What kind of reasons an innovator would have to work viability and desirability?" The actions and the reasons were then combined to build ideas. By doing this, every action an innovator could do to work on viability or desirability also has a reason to take that action.

In the final stage of the brainstorm, each participant was asked to pick their favorite combination of action and reason (idea) and develop this combination a bit further. This part aimed to create a pitch that would convince the other participants that their idea was the best idea of the brainstorm session. We ended the session by pitching everyone's idea to the rest of the group. It was my job to moderate the sessions and keep track of time. Therefore I did not participate in these sessions.

In total, there were three brainstorm sessions with a total of 11 participants:

- Students from TU Delft (3x)
- Business Controller
- Innovation Manager
- Manager Product Development
- Regional Manager
- Program Manager
- Visual Consultant at Flatland
- Innovation Consultant at Freshheads
- Lead Engineer

Each brainstorming session had different participants, and none of them participated twice. Fellow students from the TU Delft only joined the first session. Because this session also functioned as a test for the other two. Also, students tend to provide more radical ideas, and they are less biased since they have no connection with CWD. Besides colleagues from CWD, two external experts joined the session. They both worked on innovation at CWD before and provided a valuable outside-in look at the situations.

THE RESULT

The brainstorming sessions' full results can be found via the QR-codes in appendix E. The results are in Dutch because all the participants were native Dutch speakers, and I did not want to create an extra barrier to join the brainstorming sessions. Sketches of the pitches resulting from the brainstorming session are shown in figure 7.2. After evaluating the results, I was not yet pleased with the results. Although I believed the sessions were as good as they could have been, I was not satisfied yet. The online environment of the brainstorm caused a threshold to actively react and build on each other's ideas and suggestions. Discussions were not as interactive and inspiring as

they would have been in a physical brainstorm. To combat this within the COVID-19 regulations, I organized a physical brainstorm with only myself and one participant. Together we brainstormed about similar questions as I did in the online brainstorm. The result of this brainstorm was two additional ideas to build my concepts on. These ideas are shown in figure 7.3.

I used the ideas and input from the different brainstorms as building blocks for my concepts. By combining elements of different ideas, I formed three more elaborate concepts. These concepts are explained in paragraphs 7.2 to 7.4.

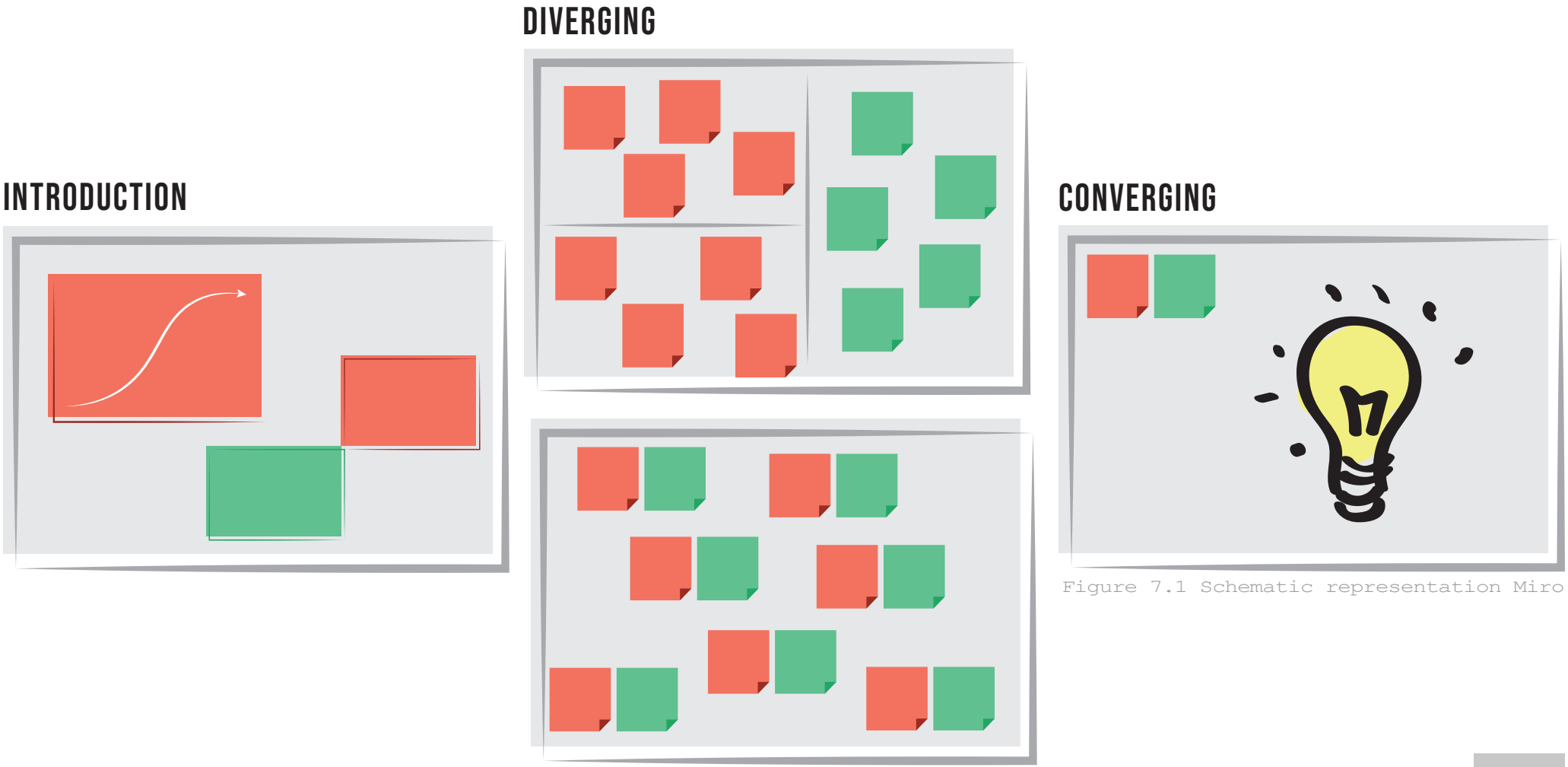
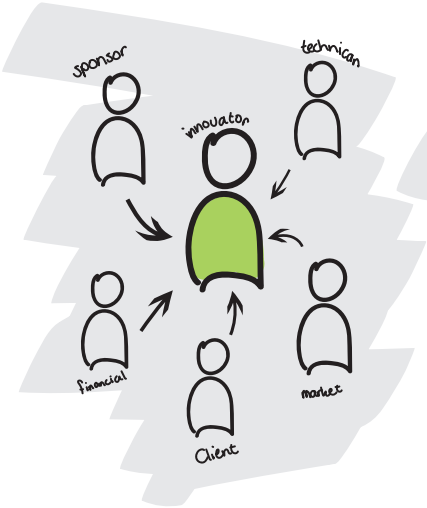


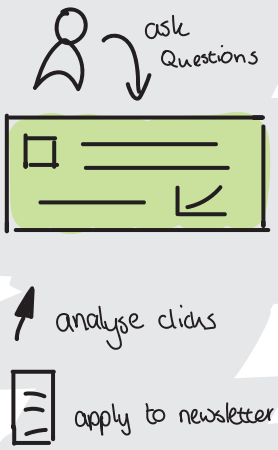
Figure 7.1 Schematic representation Miro

An expert team around an innovator

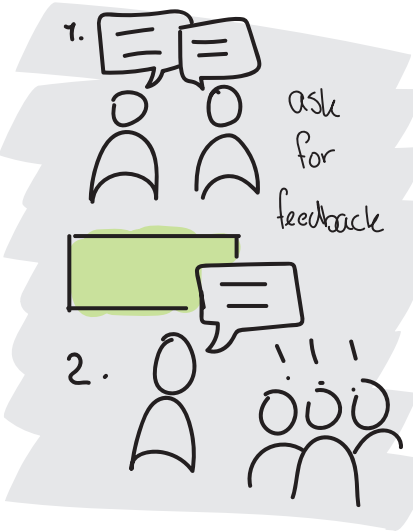


Highlight problem, sell solution

Online innovation platform

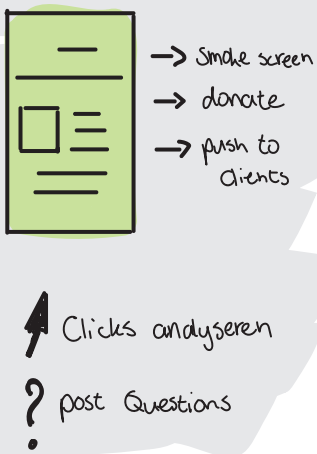


Ask input before pitching

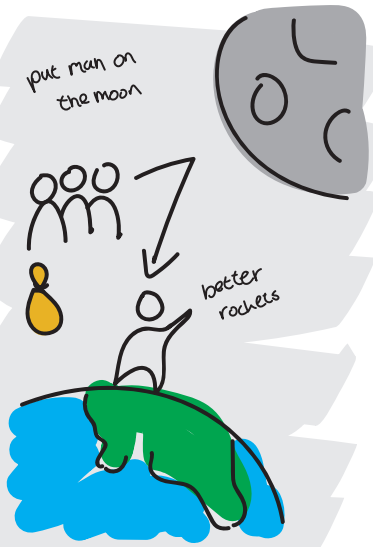


Innovation desk to "buy" ideas

Landing page to test engagement

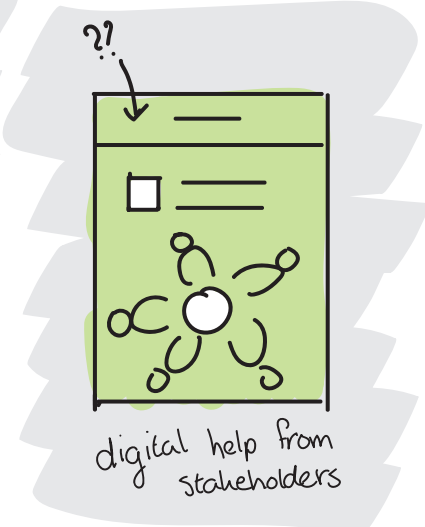


Reflect idea to corporate vision



Vision based on sustainable development goals

Online platform to co-create



Use strengths to build a new company

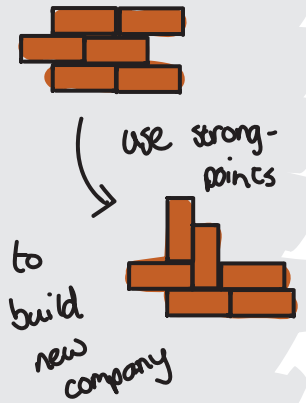
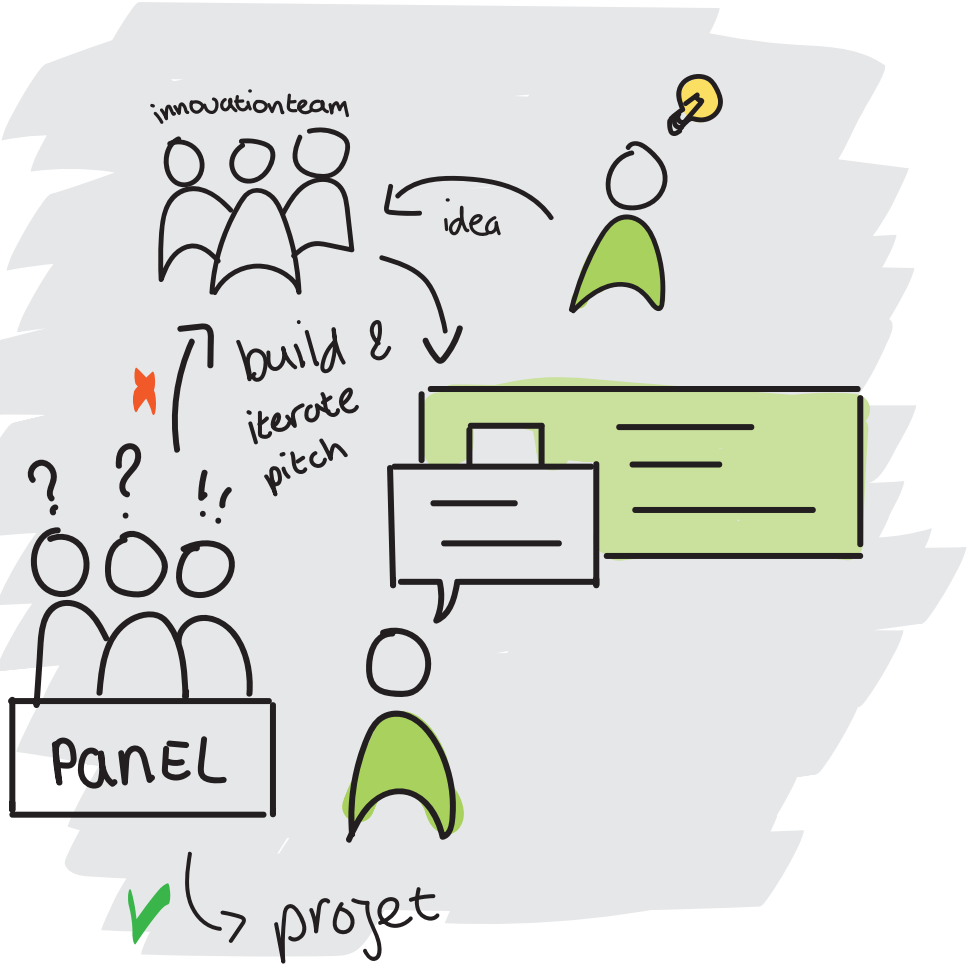


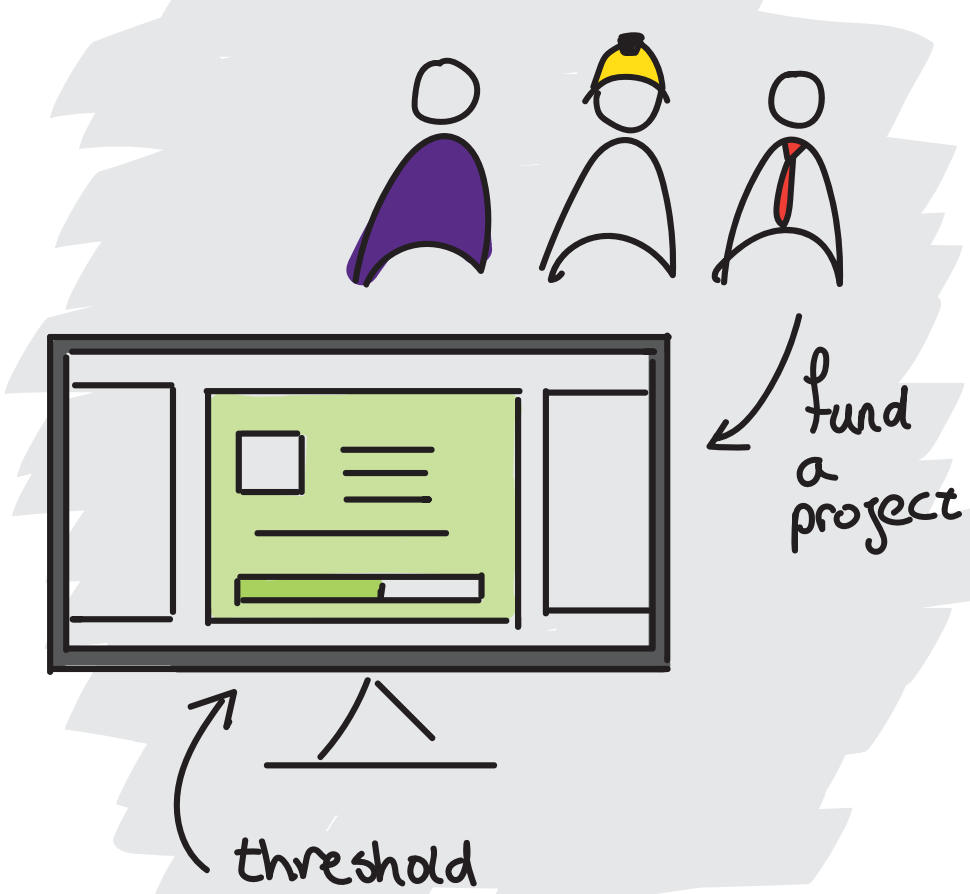
Figure 7.2 Sketches from the brainstorm

INDEPENDENT PANEL TO JUDGE IDEAS



Together with an innovation team you work on a pitch for the panel. If they reject you iterate and try again. If they accept you have a new funded innovation project.

CROWDFUNDING IDEAS WITH EMPLOYEES



Through presenting ideas online, colleagues can choose to fund your project with some credits. When enough colleagues back your innovation you can get physical resources to grow your innovation.

Figure 7.3 Sketches from physical brainstorm

PARAGRAPH 7.2

CONCEPT 1: THE SMOKE TEST

A smoke test is used to test ideas and concepts in the market. It works as a smokescreen. On a web page, you show and explain your ideas. They are presented as a working product. Stakeholders, like potential clients, colleagues, and end-users, can visit these pages, leave responses, and maybe subscribe to a newsletter to follow the product's development. But it is important to let all the visitors of the web page know this is not (yet) a working product.

When an innovator thinks of an idea or runs into a problem he or she wants to fix, they can pitch their idea to the business development team. This is a new team within CWD. It can, for example, consist of web designers, U.I. developers, and entrepreneurs. Together with the innovator, they can: explore the idea, research the business, the market, and technical parts of the idea to create a complete story to show on the web page. The web page is built by the web developer of the business development team. After the page is finalized, it is launched online and pushed to different stakeholders.

While the web page is online, the development team collects data from the page. Who is visiting the page? What are they looking at? What are they clicking on? And how many people subscribe to the newsletter. This data can validate assumptions around the viability and desirability of the idea. If many people are interested in the page, it is safe to say there is a desire for the idea.

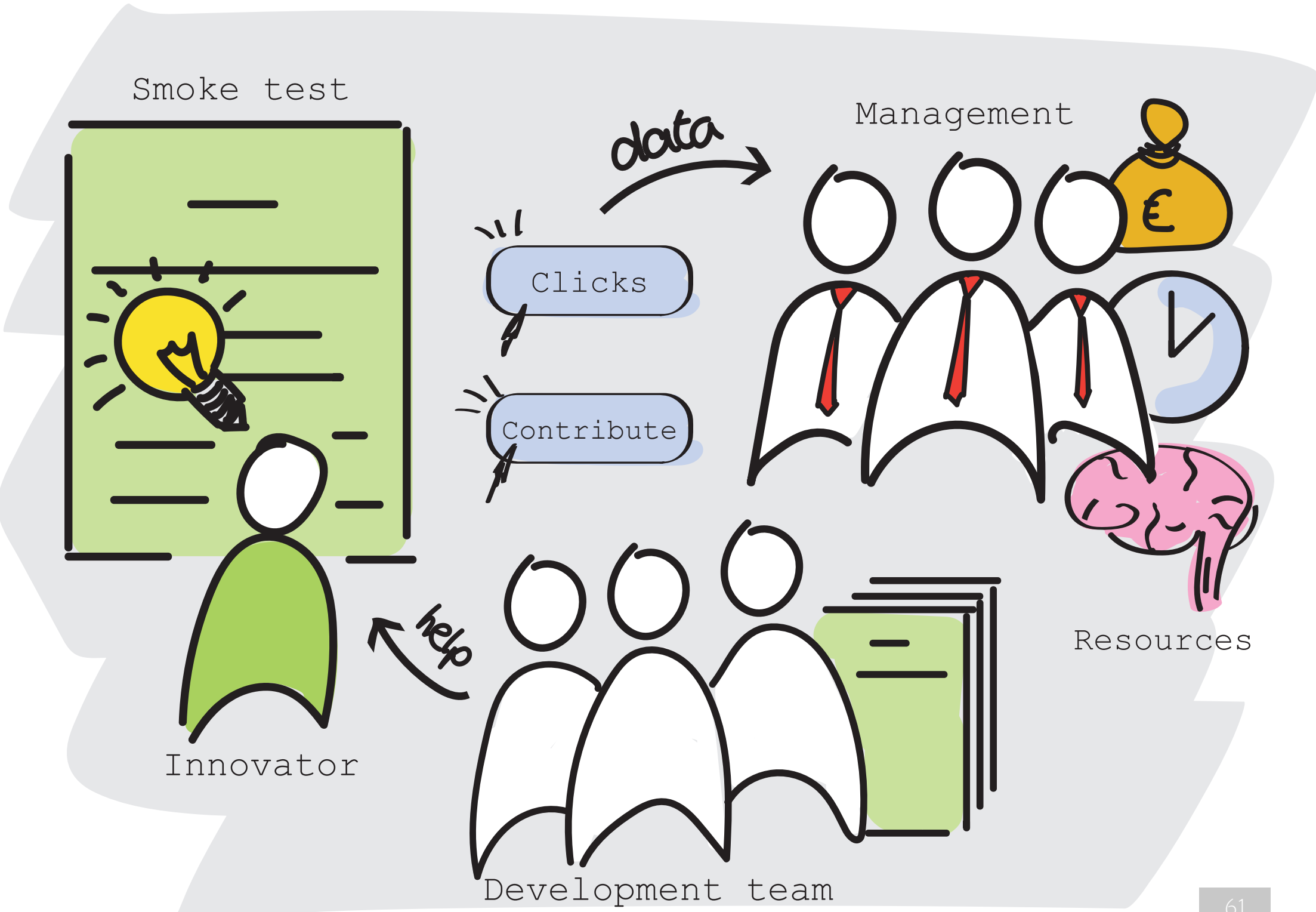
After the page has been online for a given amount of time, it can be evaluated by the innovator and the business development team. During this evaluation, they can update the page if there has been progress. They can evaluate the collected data and visualize it or decide to terminate the page if there is little to no interest from stakeholders. If they choose to continue, they can use the insights they got from the smoke test to convince managers to provide them with the needed resources to develop the idea further.

Another advantage of this concept is that the ideas within CWD are shared more broadly within the company. This could boost cooperation within the company or even provide new opportunities for a new collaboration. If everybody at CWD is aware of the innovations going around within the company, chances are higher you find someone who needs your idea. You could even take it a step further by adding a 'contribute' button on the web page. By clicking this button, colleagues can let the innovator know they want to help in any way they can. This increases the chances that an innovation will succeed because they feel more supported.

This concept connects to the design statement because using the smoke test will help innovators validate their assumptions around viability and desirability. If web pages generate a lot of traffic, you know there is interest in your idea, and you will have a better story for your management to convince them to provide you with adequate resources. And on the other hand, with the new business development team, the innovators will have extra hands to help them with their idea. This team will ask the innovators questions about their idea and share their knowledge about innovation. This can help progress their ideas and make sure the innovators do not have to do everything independently.

ADDITIONAL IDEAS

- The business development team could also train the innovators to focus on viability and desirability instead of mainly on feasibility.
- Showcasing CWD's innovation could give their brand an innovative boost that may attract new clients.
- These web pages could also function as a starting point for future sales processes.


Smoke test
data
Management
Clicks
Contribute
Resources
help
Innovator
Development team

PARAGRAPH 7.3

CONCEPT 2: INNOVATE WITH US

Not everyone at CWD is trained to be an innovator or entrepreneur. Most of them are engineers that like to solve technical problems. This is probably why CWD hired them in the first place. This makes it understandable that they mainly focus on the technical parts of innovation. CWD can organize co-creation events to help these innovators develop their innovations further. Every innovator is highly recommended to join these events.

At these co-creation events, all the innovation projects that are currently under development will be presented to a sizeable audience. The audience will be colleagues who join out of interest and experts on different topics and potential clients. After all the presentations are done, all the attendees' names will be collected in a large bowl, and small groups will be selected at random by pulling a small number of names out of the bowl.

These groups will sit together, and each group is joined by one of the innovators. Together they work through a co-creation session. An experienced creative facilitator moderates this session. The session's goal is to progress the innovation project that joined the group. Since different projects are at various development stages, every session will be different. During the co-creation session, the attendees can ask the innovator questions and share their knowledge about the topic. Together they can find solutions for problems the innovator ran into in the past. It is the moderator's task to set a creative ambiance, where everyone is free to share their ideas, and judgments are saved for a later stage.

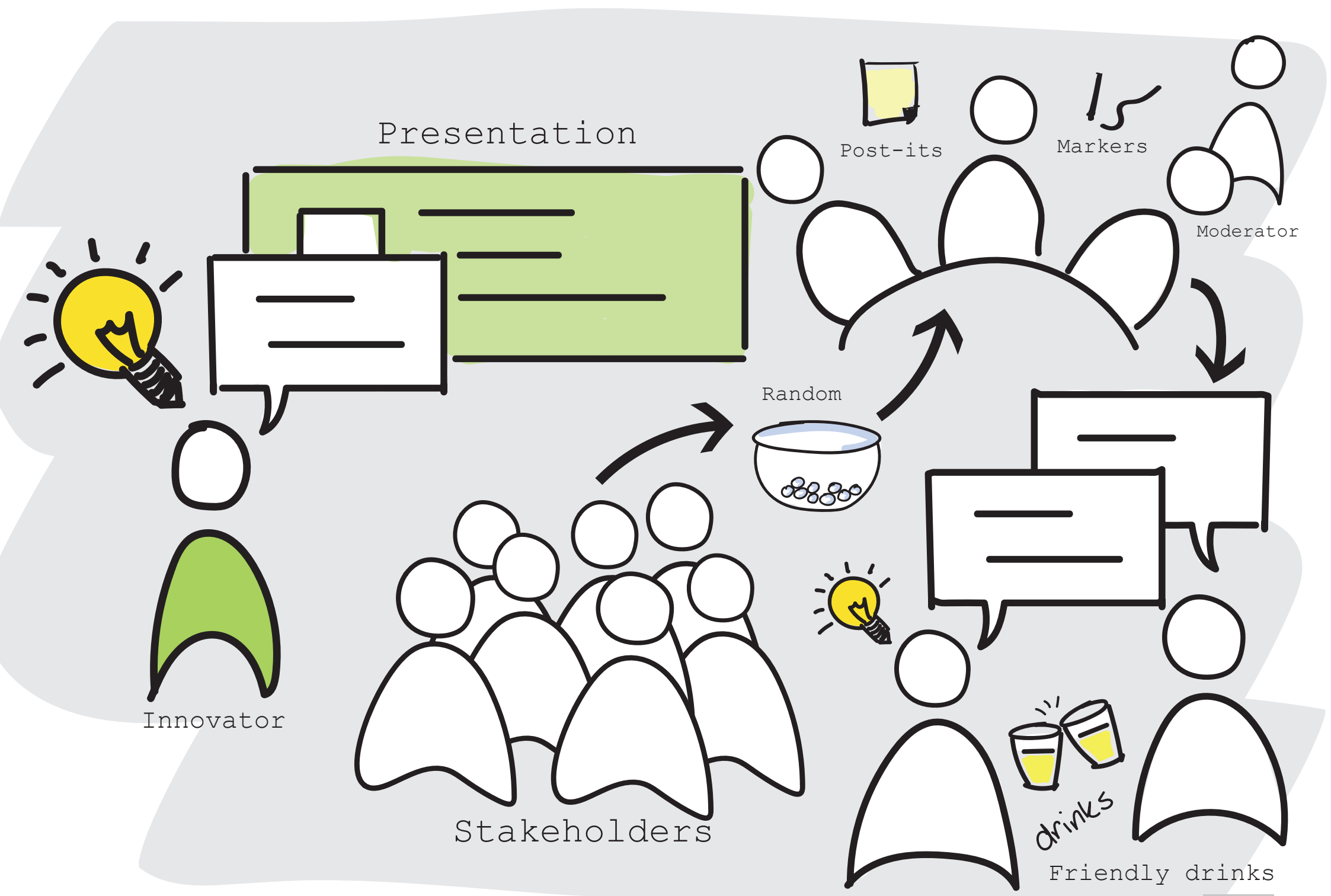
After the sessions, there will be drinks and time to have a friendly chat with everyone that joined the session. This is when innovators can talk to each other and other attendees from different groups. New collaborations between attendees can form during this period, and they can informally share knowledge between different divisions of CWD.

Implementing this system could be the first step for CWD to get rid of the 'divisions culture', where each division is mainly worried about its performance. Innovations will be spread more widely throughout the company, and more and more people will support the innovation projects because they contributed a little during the co-creation session. This can create a more innovation-friendly culture within CWD and make innovators feel more supported during their development phase. It is also a moment to show their progress to the management and a moment they can use to get additional resources.

This concept connects to the design statement because it helps innovators sharing their ideas with others. The questions of the attendees will test their innovations. The innovators can also use these sessions to validate their assumptions and talk with potential clients. After the sessions, the innovators can incorporate the feedback they received in the subsequent development steps. CWD could also choose which experts they want to invite. If they think there needs to be more focus on viability, they can ask internal and/or external experts on this topic to join the sessions and ask specific questions around that topic during the co-creation sessions.

ADDITIONAL IDEAS

- Colleagues from every level of the company can be invited to share their knowledge and experiences.
- These sessions can also be used for user tests.
- These sessions can also be brainstorms that lead to new ideas and innovations.


Presentation
Post-its
Markers
Moderator
Random
Innovator
Stakeholders
drinks
Friendly drinks

PARAGRAPH 7.4

CONCEPT 3: THE INNOVATION FAIR

If you are running a start-up, you are often limited in resources. You often depend on third parties to provide you with the necessary financial resources to grow your business. To convince these parties to invest in your idea, you work on your product. You make sure it works (feasibility). You also work on the business model (viability), how much money you need to bring your product to the market, and when you expect to generate your first cash flow. And finally, you research the market (desirability), how big is the market you are targeting, and what are you selling to this target market? With this information, you build a convincing story that persuades third parties to invest in your idea.

For this concept, I want to internalize the process of finding investors within the CWD organization. Innovators at CWD get the possibility to present their idea at the CWD innovation fair. Multiple innovators will present their ideas to the visitors of the fair. All employees of CWD are invited and encouraged to visit the innovation fair. Each visitor will have several credits they can invest in the innovations presented at the fair. If an innovator collects some credits from the visitors, they can go to their manager and exchange them for real-life resources. With these resources, the innovator can grow the innovation and bring it closer to market launch.

Investing in an idea does not only benefit the innovator. It will also benefit the visitor/investor in the long term. Since they believed in the innovation at an early stage, they will be share in the profits later on if the innovation turns out to be a success and generates new business for CWD. You can look at it as dividends paid out by large companies to their shareholders. Everybody who believes in the company shares in the profit. For CWD, this profit does not have to be financial by nature. It could also be extra days off or a budget to celebrate the new success with a nice dinner.

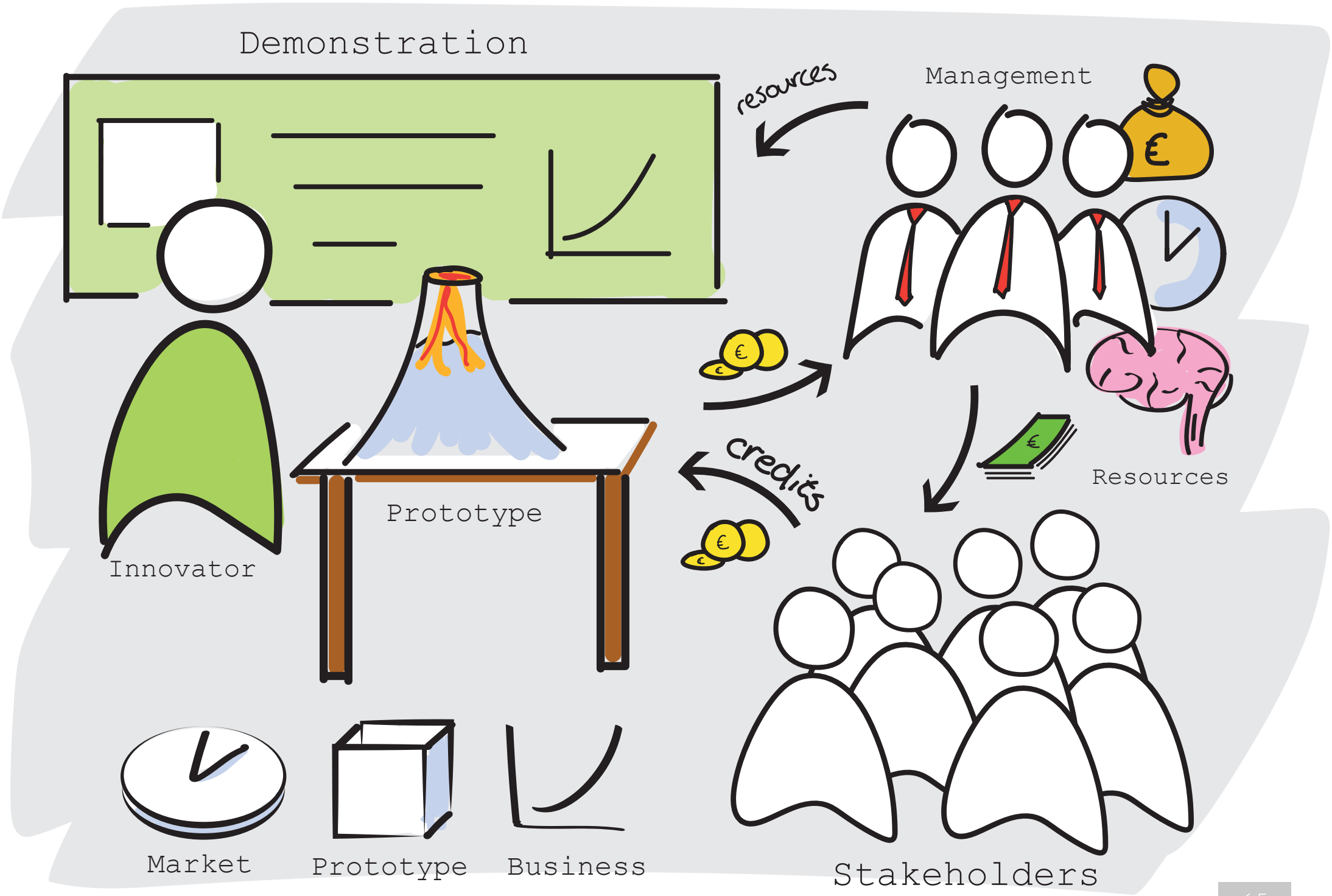
Because the investor can also gain from investing in an innovation, they are more likely to support the innovation they backed. They become stakeholders in the innovation and may help out where they can to boost the innovation. Maybe they will be more open to implementing the innovation in the next project they are running, giving the innovator room to build and test a prototype. Across CWD, more and more employees will be involved in innovations. This can create a more supportive mindset towards innovations and increase collaboration between different CWD divisions.

There is also another side to this concept. If an innovator fails to collect credits at the CWD innovation fair, it could signal that their story is not convincing enough. Too few colleagues are convinced of the potential of the innovation. This does not mean the innovator has to pull the plug on the idea. Still, they know that they have to work on their story on viability, desirability, and feasibility to have a better story at the next innovation fair.

This concept connects to the design statement because it encourages innovators to have a complete and convincing story at the fair. Because there will be various visitors at the fair, the visitors will ask different questions before deciding to invest. This pushes the innovators to think about their innovations' viability and feasibility and not only on the feasibility part.

ADDITIONAL IDEAS

- Innovators have to hand-in an entry form before joining the fair. This entry form already exists of questions around viability, desirability, and feasibility.
- To increase the investors' involvement, CWD could decide to create a system where employees can invest real money into ideas at the innovation fair.
- CWD can decide to invite external experts and/or clients to the fair to see where they would invest in and which idea has the most potential according to them.


Demonstration
resources
Management
Resources
credits
Innovator
Prototype
Market
Prototype
Business
Stakeholders

PARAGRAPH 7.5

SIX PRINCIPLES FOR INNOVATION

In paragraph 2.3, I discussed the current situation around innovation at CWD. Their innovation strategy is not set in stone and is still vague. But they are working on it, and in paragraph 2.3, I already listed the pillars they want to focus on.

To decide between different solution spaces, I need a frame of reference to compare each of the solutions I explained earlier. At this point, I can not use the innovation strategy as a frame of reference for my decision as this is too vague and ambiguous at this point and does not clearly state where CWD wants to go in the near future. This makes it impossible for me to judge if any of these solutions will help CWD reach its innovation goals.

Instead, I turned it around, and I figured if the goal of your (innovation) journey is still unclear, it is essential to know at least where you are coming from and what your starting point is. This is why I formulated six principles for innovation at CWD. These principles will be the basis of my decision and could be the starting point for all future initiatives CWD needs to take to reach its goals. These principles are based on the current innovation strategy of CWD, the insights I got from working with experts and colleagues from CWD, and on my research on CWD. Each principle is explained in the next section and is shown in figure 7.4.

WE INNOVATE WITH OUR OWN PEOPLE

In their innovation strategy, CWD states that they want to innovate with their people. This means they want to give their employees the freedom to think of new ideas and explore them. It also means they will not spend lots of money on fancy innovation consultants or hire innovation experts. They prefer to trust and train their employees to do this job.

WE FOCUS ON THE ENERGY TRANSITION

The focus on energy transition is also mentioned earlier. CWD sees a lot of market potential in the new infrastructure needed to prepare the Netherlands for the future of energy. This is also something that is close to their core business and something they excel in. This direction is vital for all future innovation initiatives and pushes CWD to new and valuable markets.

WE BUILD WITH OUR STAKEHOLDERS.

The clients of CWD are one of the most significant assets CWD has. CWD can benefit from listening to their needs and using their expertise to push CWD's innovations forward. This can set CWD apart from its competitors. Projects that CWD is doing with clients can act as a field labs to test new ideas.

WE THINK ABOUT MARKET, BUSINESS & TECHNOLOGY

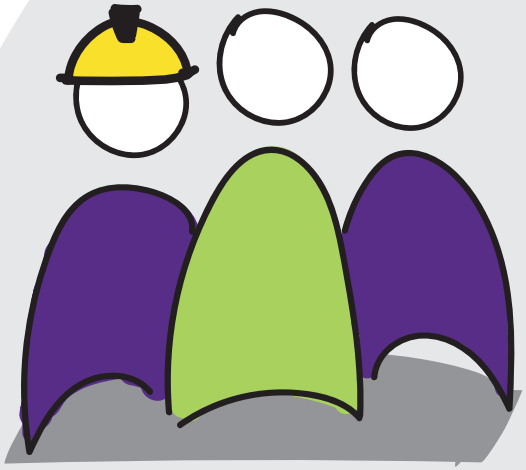
Earlier I stated that CWD is mainly focused on innovation's technology side. This principle can not be left out. It reminds the innovators of CWD to keep an innovative mindset during their innovation process or ask for help if they find it hard to explore the business and market on their own.

WE SUPPORT OUR INNOVATORS

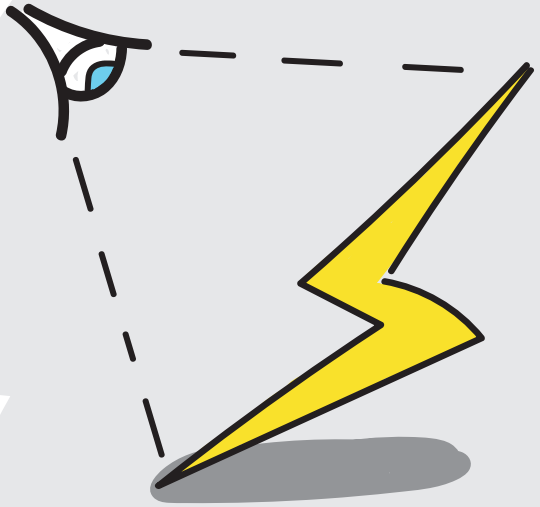
If CWD wants their innovations to succeed, they must cherish their innovators. They have to make sure they feel at ease working on their ideas, have the right resources, and have room to fail. This prevents an "it will never work'-mentality among CWD employees and boost motivation.

WE CELEBRATE OUR INNOVATORS

CWD needs to show and celebrate its innovators and their innovative successes and failures to generate a continuous stream of new innovators. This sets a good example for the next generation innovators at CWD. It shows them that innovation can be done and that it is okay to fail, adjust and try again.

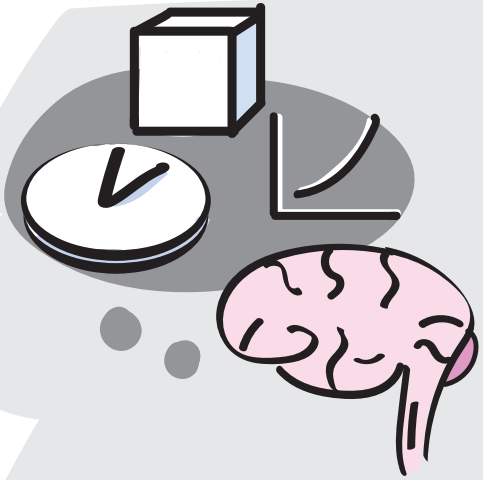


We innovate with our own people

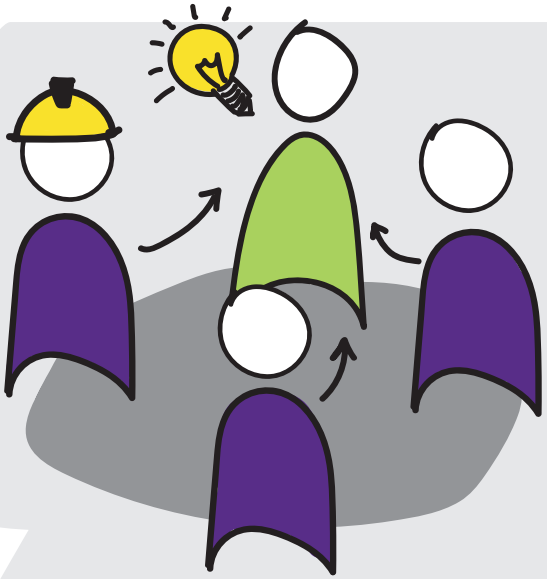


We focus on the energy transition

We build with our stakeholders



We think about market, business & technology



We support our innovators

We celebrate our innovators

Figure 7.4 Six principles of innovation

PARAGRAPH 7.6

DECISION MAKING

HARRIS PROFILE

To choose between the different concepts, I will use the six principles of innovation for CWD. These principles will function as the requirements for the concepts. Together with the Harris profile, I will test how well each of the concepts fits the principles. Since I think these principles should be at the basis of every initiative surrounding innovation at CWD, my final concept should also fit in with these principles.

Using the Harris profile, I will score every principle between -2 and +2 for every concept. The concept with the highest score moves on to the final stages of this case study. The second principle is not so much about the innovation initiative but more about the subject of the innovation. So, I decided to score all the concepts equally on this principle. The results of this method can be found in figure 7.5.

In figure 7.5, we can see that concept 3: The innovation fair scores the highest points in the Harris profile mainly because there is more attention for innovating together in this concept. Investors will, in the long-term, also profit from the innovations they invested in. This brings more incentive within the company to have an open mindset towards these innovations. Concept 3 also focuses on thinking about the market, business, and technology. Since this concept is centered around convincing investors, there is more incentive to have a desirable idea and viable business case. This will make it easier to get investors on board.

Concept 3 also has some things to consider. The first principle is about innovating with CWD's people. This concept makes creating a successful innovation approachable for everyone, but it does not involve as many colleagues in each innovation project as concept 2. Concept 3 could also spark rivalry within the company. Investors in one innovation may not be so open to other innovations that are under development at CWD. Because an investor can also gain something if the innovation they invested in succeeds in the end. The last consideration is that there is little support for the innovators before they have their first investors. There is probably a lot of work that needs to be done before doing their first presentation at the CWD innovation fair. This can make the threshold for participating and presenting at the innovation fair too high. This would defeat the purpose of these concepts. It is meant to boost participation in innovation at CWD and not make it harder.

INTEGRATION

Nonetheless, I still firmly believe in the potential of concept 3, but I do not want to leave these considerations unattended. That is why I chose to integrate the smoke test and development team into concept 3. Doing this will decrease the threshold for everyone with an idea to take the initiative, because the only thing they have to do to ask the development team for help. It will also increase the quality of the projects presented at the innovation fair because the innovators receives help and feedback from the development team and from the smoke test. A low threshold is needed to keep the flow of innovators with new ideas going and to prevent that innovators keep their ideas under the radar.

Everyone with an idea can go to the business development team and ask for help. The team can help shape the initial ideas of an innovator. They can also teach the innovators about business modeling and market research. This is important because you can not expect everybody at CWD to know everything about innovation and do everything independently. They may not even want to do everything alone. Maybe they only like to solve technical problems. In this case, the development team is there to help with the viability and desirability. When the initial idea is developed a bit further, the development team can create a web page for the innovation to perform the smoke test. This also puts the idea out there for everyone interested. It gives them the possibility to react, help or even contribute to the innovation.

Integrating the smoke test into concept 3 also creates a stage-gate before an innovation can join the innovation fair. If a web page does not generate enough traffic, the development team can decide not to invite them to the fair. Instead, they can advise the innovator about what to improve to get to the next stage. The smoke test also helps

to create awareness of the innovation at an early stage of its development, making it possible for people that may want to invest later to follow the development from an early stage. It is also a tool to test viability and desirability early, making the whole concept fit better to the design statement.

In the next paragraph, I will visualize how the concepts will fit together. Before that, I think it is good to mention that concept 2 still has many advantages for CWD. Even choosing to integrate concept 1 and 3 does not mean concept 3 is worthless. This concept can co-exist with the other concepts. In my opinion, the main benefit of concept 2 is the fact that this concept boosts cooperation between different divisions within CWD. CWD can always decide to try to integrate concept 2 in their innovation ecosystem at a later stage. For now, I will focus on developing the integration of concepts 1 and 3 to get to a final concept for this case study.

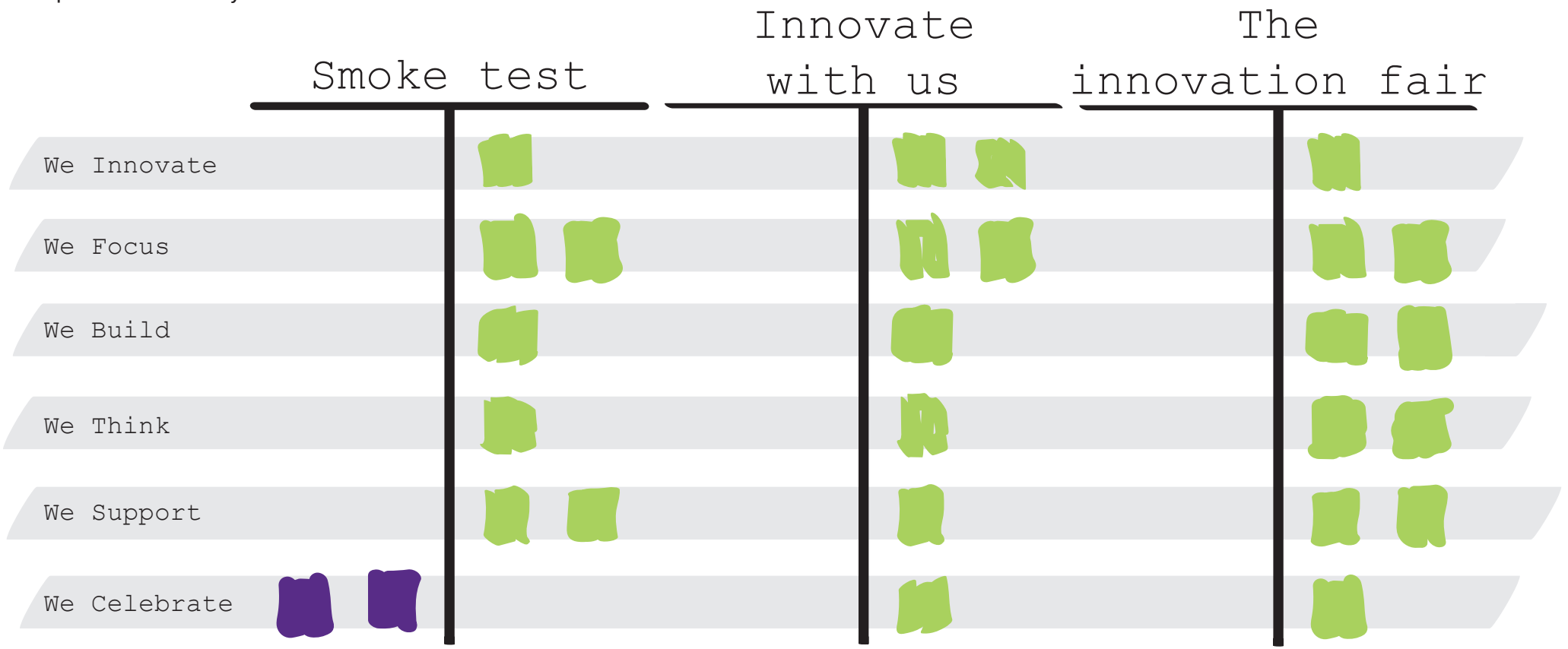


Figure 7.5 Harris profiles

DISCUSSION

Unfortunately, I was not able to organize physical brainstorms with everyone. Brainstorming online limits the interaction you with others during the session. Therefore it limits the result of the session. Interactive discussions and building on each other's ideas are integral parts of brainstorming. These parts were hard to recreate in an online brainstorm. Still, the results were sufficient and led to valuable concepts. The ideas for these concepts mainly came from the stakeholders that attended the brainstorms. These ideas were later combined and interpreted by me.

CONCLUSION

With the help of different stakeholders, I created three concepts. The smoke test, Innovate with us, and the innovation fair. All of them to improve the innovative mindset of CWD's innovators. To decide between these concepts, I formulated six principles of innovation for CWD. These principles act as a possible starting point for all CWD's future innovation decisions. Based on these principles, I decided to combine concepts 1 and 3. This combination leads to a low threshold to come forward with your idea and provides help, feedback, and support for the innovator during the development process.

SWECO

Sweco is a trusted partner of Croonwolter&dros. Their combined expertise and software can guarantee energy cost reductions. Several real-estate companies chose for the combination of Sweco and Croonwolter&dros to reduce the energy bill of their assets.

CHAPTER 8

CONCEPTUALIZATION

PARAGRAPH 8.1

INTRODUCING: IVI

With the decision made in paragraph 7.6 to integrate concept 1 and concept 3, I now move on to explain this new concept. Introducing: IVI. IVI is an approach to boost the innovative mindset of engineers in established companies (like CWD). IVI supports innovators in the early stages of their innovation process and builds company-wide interest for innovation. IVI stands for Iedereen Voor Innovatie, which translates to Everyone for Innovation. Meaning everyone is pro-innovation and that we need everyone within the organization to innovate. This paragraph will explain how the IVI approach works, and it will talk about how similar methods worked for other organizations.

STEP 1: DEVELOPMENT TEAM + SMOKE TEST

The approach consists of two steps with a selection moment between them. Figure 8.1 shows the first step of the IVI approach. When someone in the organization runs into a problem, thinks of a new idea, or has a valuable solution from a previous project, they can go to the business development team. This is a team of dedicated CWD employees to help everyone with their ideas and innovations. This team could consist of innovation experts, developers, and marketing experts. The innovator works on his or her idea. The development team will ask them essential questions to understand how the idea works, how it delivers value, and how it can generate future income. If the team is satisfied, they will build a web page (smoke test) for the idea. This web page shows the concept to its full potential as if it already exists. But with the side note that this idea on the page is still under development. This web page is pushed to different stakeholders and shared with colleagues but is not public. This already creates more awareness for the company's diverse ideas.

Everyone who visits the page can read all about the innovation, leave questions and recommendations, and can even sign-in to contribute to the idea if they are interested. The data generated by the web page, through reads, clicks, and comments, is gathered and analyzed by the development team. Since the development team helps everyone who has an idea, they will release new pages frequently. With the data they get from all these pages, they can compare which pages generate the most interest and make educated assumptions about an idea's desirability and viability. After a while, the development team can even start analyzing trends. They might find, for example, that ideas and interest around hydrogen are on the rise, and ideas and interest around tunnels are declining. In the long run, this can provide CWD input for their strategic choices in the future. But initially, it is essential that web pages can be compared to see which ideas spark the most interest with stakeholders. In anticipation of the innovation fair (step 2), the best-performing web pages (innovations) are selected by the development team and invited to the fair to present and demonstrate their innovations for everyone interested.

When a web page is not selected to join the fair, the innovator can go to the development team and, together with them, decide what the next step will be. It could be the idea needs some more work and validation to make it more valuable and understandable. Or they could decide together to terminate the idea. This saves time for the innovator and the team. This makes it possible for them to work on new ideas that may be better than the previous one. The most important part that a failure from the past never influences the innovator's innovation drive and the team's judgment towards that innovator.

STEP 2: INVESTING AT THE INNOVATION FAIR

Now we proceed to step 2. This step is shown in figure 8.2. When innovators are invited to the innovation fair, they are expected to present their idea in a fair-like setting. They can demonstrate a prototype, talk with colleagues and other visitors at the fair. The goal of the fair for the innovators is to convince as many people as possible of the potential of their idea. The people who visit the fair are colleagues, (potential) clients, and other experts invited by the development team. All these people already had the chance to read about the different innovations presented at the fair by going through the web pages. Everyone who visits the fair has a given amount of credits. They can invest these credits in a single innovation or spread their credits between different innovations at the fair. The credits gathered by each innovator can later be exchanged for physical resources to grow their innovation. It is important to note here that the value of all the credits that are in circulation at the fair should never be higher than the budget

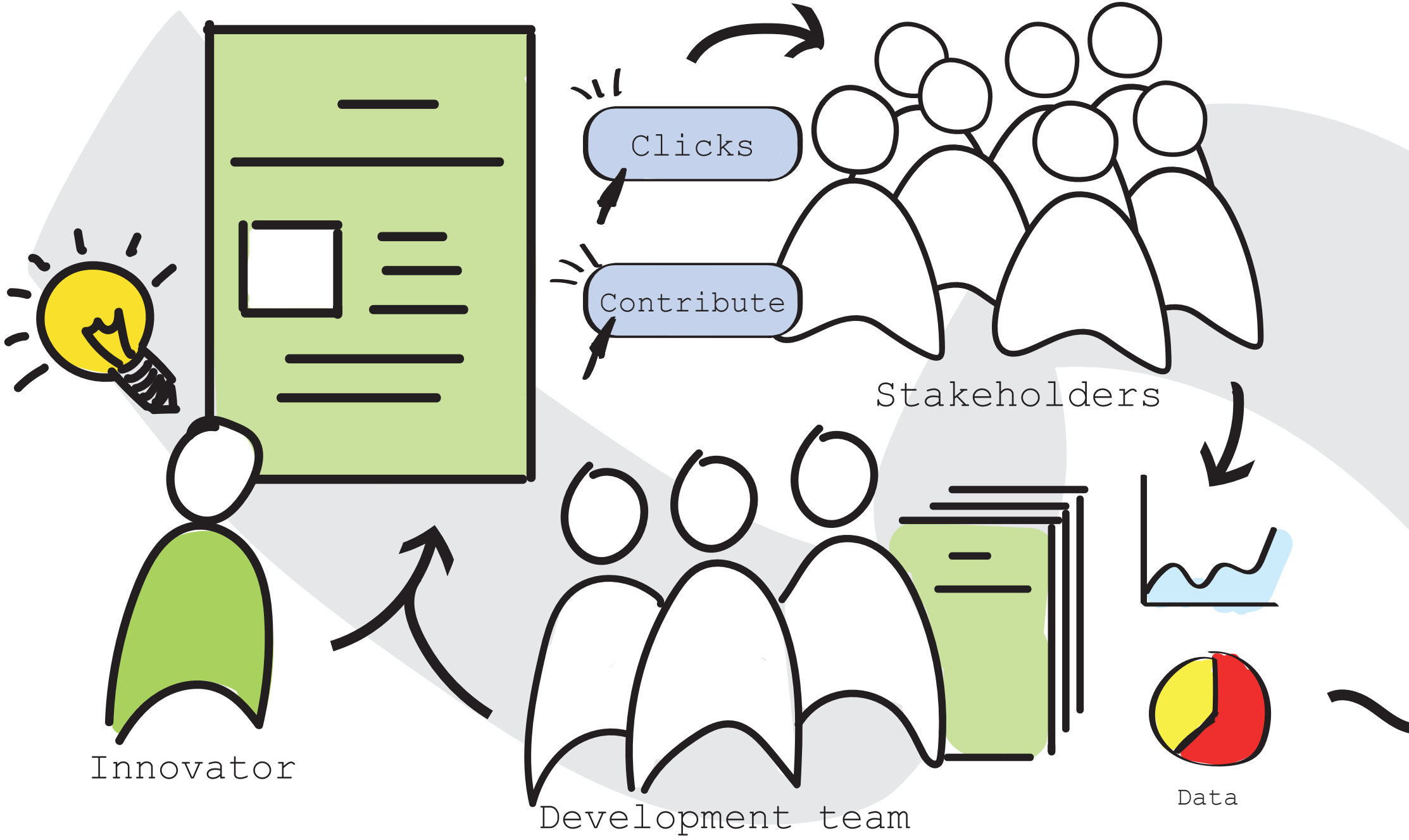


Figure 8.1 IVI part 1

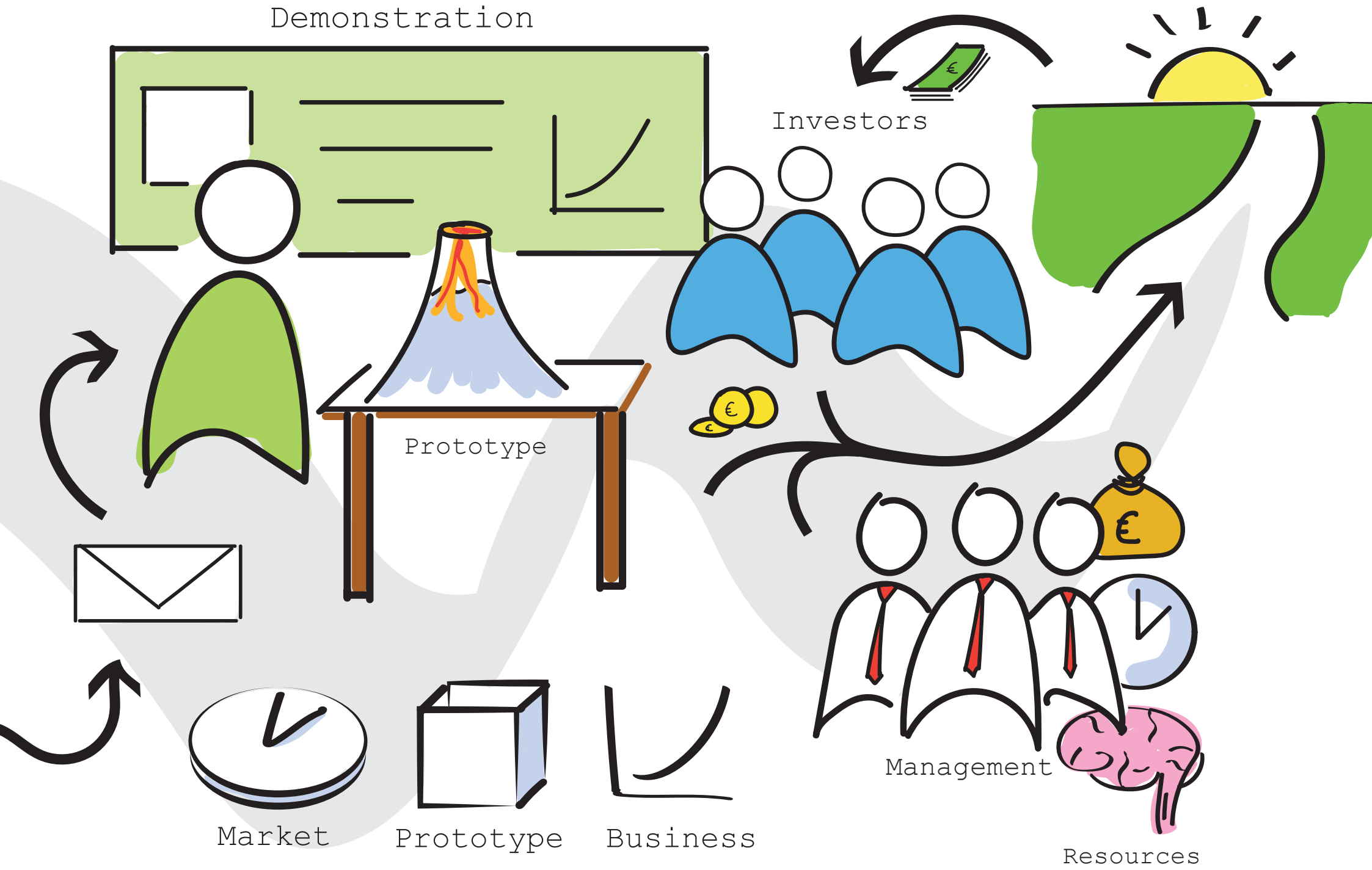


Figure 8.2 IVI part 2

CWD has allocated for innovation projects. There should never be a situation where innovators have to compete for physical funds. This prevents rivalry between different innovation projects at CWD.

So, it is in the innovator's interest to gather as many credits as they can. This stimulates them to have a complete and well-rounded explanation of all the aspects of innovation: desirability, viability, and feasibility. If they can explain how their innovation will reach customers and earn money, the innovation's potential will grow. More and more investors will see its potential and invest in the innovation.

Investors also stand to gain something if the innovation turns out the be a success. That is why it is called 'investing'. When innovation starts generating cash flow and grows into a new revenue stream for CWD, everyone stands to gain something: the innovator, the investors, and the whole company. The innovator and investor might get financial encouragement, extra days-off, or a nice dinner. CWD can later decide this. And the entire company, of course, gains additional revenue and security for the future.

Because the investors also stand to gain something when the innovation they invested in turns out the be a success, they could be more open to helping the innovator in the later stages of their development process. These investors may feel a lower threshold to use their project as a field lab for the innovation. Or they are generally more interested in how it is going with the project. They might chat with the innovator more often, share ideas, and make the innovator feel more supported throughout his or her entire project.

STORYBOARD

To better illustrate IVI and how it works on a timeline, I created a storyboard that shows how an idea moves through different steps of the IVI innovation approach. This storyboard is shown in figures 8.3 & 8.4 on the following pages.

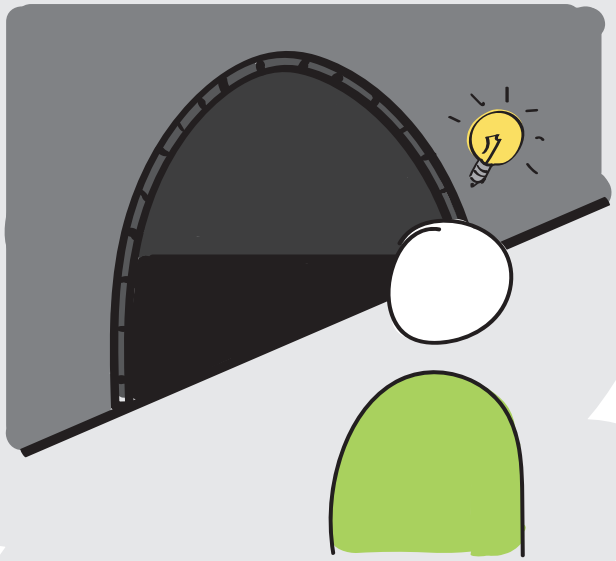
EXPERIENCES FROM THE PAST

After the initial explanation of the concept, many questions are left unanswered, but the most critical question is: Will this approach to innovation work for CWD? Testing and validating will help answer this question, which will be done at a later stage. For now, I did some additional desk research to see if there are experiences and studies from the past that talk about similar approaches to innovations.

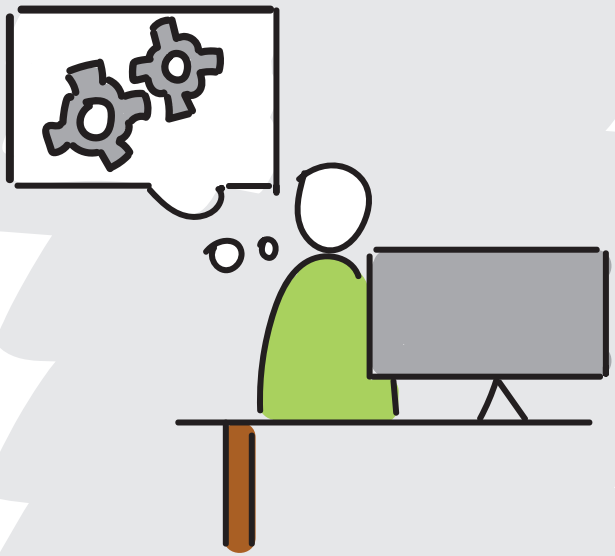
In an article from the Harvard Business Review, written by Nilofer Merchant (2009), he writes about everyone having a creative capacity and that creativity is not a specialized skill; you need to be creative. Merchant (2009) explains how a company had the opportunity to spend additional money on new initiatives. Instead of spreading these funds across the already existing initiatives, Merchant suggested to the company's board to invite every co-worker to present what they would do with money. The outcome was phenomenal. Creative ideas appeared from every corner of the organization. This shows that everyone can have an idea and be an innovator. Involving everyone at CWD in the innovation process and being open to ideas from all kinds of directions can positively impact the innovation power of CWD.

A study has also been done into enterprise crowdfunding. This is similar to regular crowdfunding, but it takes place on the companies Intranet, and it only features employee initiatives. It also differs from IVI because enterprise crowdfunding only takes place online. Innovations are only presented on a web page and are not physically demonstrated. This study found that employees' proposals addressed diverse individual and organizational needs. Participation rates were high for every level of the organization, sprouting extensive interdepartmental collaborations (Muller et al., 2013). We can not copy this one-to-one to IVI because the concepts are different, and this study has only been done with one organization.

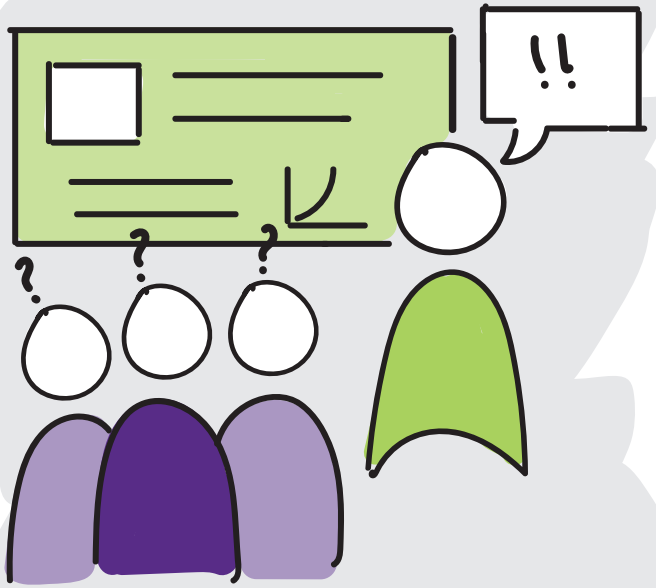
Besides this, it looks promising for IVI at CWD. In theory, IVI could boost the innovation output of CWD. It could also uncover creativity from different and unexpected corners of the company, boost the involvement in innovation across the organization and even kick-start interdepartmental collaborations, which CWD is also struggling with. Testing and validating will still be needed to get the most out of the IVI concept.



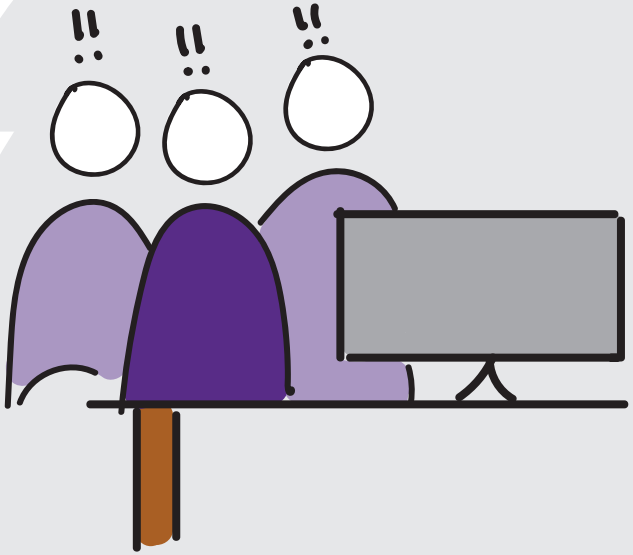
1. An innovator runs into a problem



2. He/she works on a solution/innovation

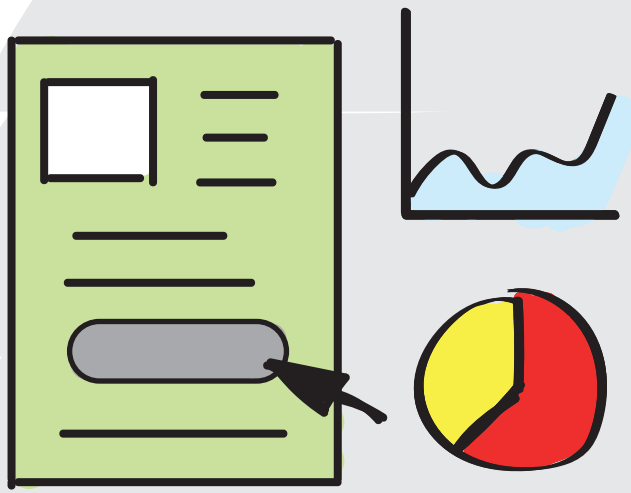


3. The innovator pitches his/her idea to the development team



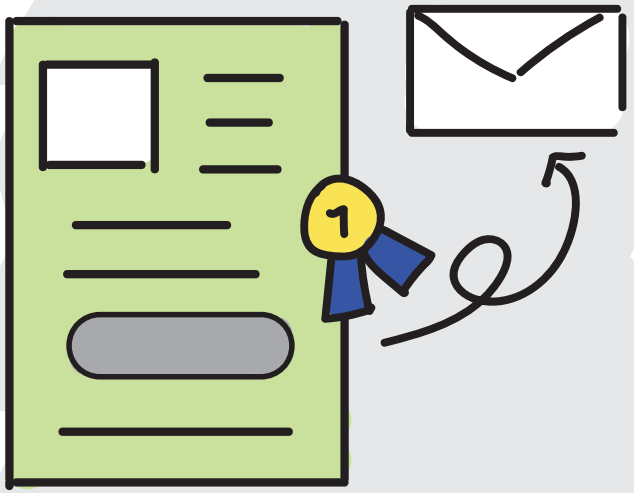
4. The development team works on the web page

5. The web page is launched and pushed to stakeholders

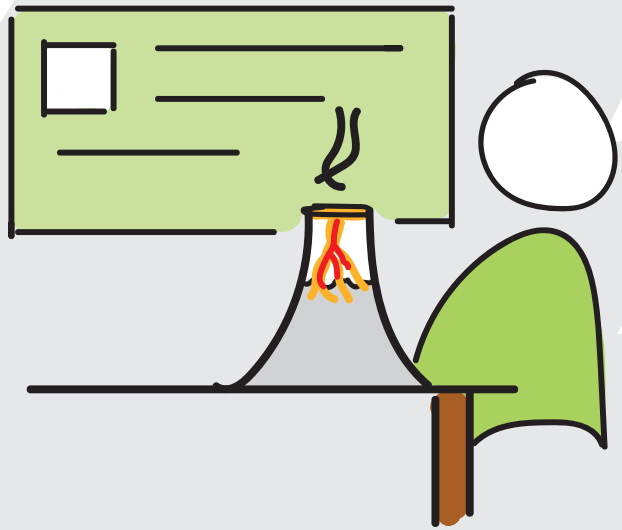


6. The data of the web pages is analysed

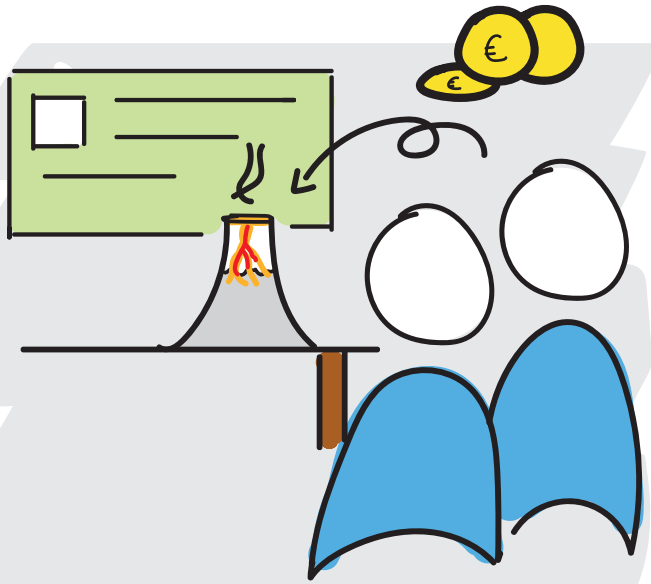
Figure 8.3 Storyboard part 1



7. The best web pages are invited to the innovation fair

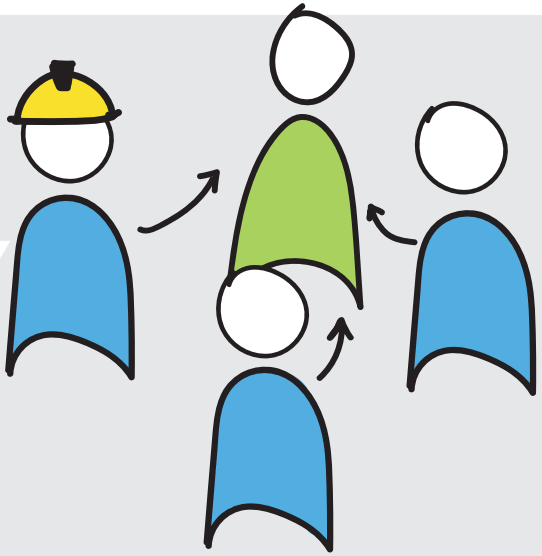


8. Innovators present their ideas to visitors of the fair



9. Employees, experts & others invest their credits

10. Innovators exchange their credits for physical resources



11. Innovators progress their idea with help from investors

12. CWD, innovators & investors share in the succes

Figure 8.4 Storyboard part 2

PARAGRAPH 8.2

PROTOTYPE SMOKE TEST

WEB PAGE FOR “SLIMME INFRA METER”

The smoke test is an essential part of IVI. It is the first time innovators show their ideas to the outside world. To further develop this part of IVI, I created a web page prototype that can be used for a smoke test. I based the web page on an innovation currently under development at CWD. It is called: “Slimme Infra Meter”. This translates to “A Measure for Smart Infrastructure”. This application enables clients to overview their infrastructure assets. It shows them how future proof they are and if they will meet the clients’ climate goals in 2030 and beyond? If these assets do not meet the clients’ climate goals, the application will suggest updates for these assets. CWD can then plan and engineer these updates and realize them if they meet the clients’ desires. I used an existing innovation as a basis for this web page because this web page will later be used to validate IVI by doing a test run for the concept. These validation sessions are explained in paragraph 9.1.

PROTOTYPING

To create this prototype, I used Adobe XD. With Abode XD you can quickly create mock-ups of your interface and make it possible to interact with these interfaces. This prototype is designed to understand what content needs to be on the page and get feedback from stakeholders later on during the validation sessions. It is not created for user testing or interface design.

An overview of the prototype is shown in figure 8.5. Here you can see that it starts with a short introduction of the innovation. If you scroll down, you can learn more about the innovation. This is explained in the following pages. But they do not show the entire prototype. Suppose you are interested in the prototype as a whole. In that case, it can be found by scanning the QR-code in appendix D. Since all the participants of the validation were native Dutch speakers, only a Dutch version of the web page is available.

Figure 8.5 Smoke test prototype

1. THE PROBLEM

Identifying the problem, you are trying to solve with your innovation is essential during the innovation process. That is why explaining the problem is the first part of the web pages. This section aims to ensure that the readers understand the context of the innovation and push innovators to think about the problem and explain why it is a problem. Later on, the readers can judge if they see a proper problem-solution fit and believe this innovation will help solve it.

2. TECHNOLOGY

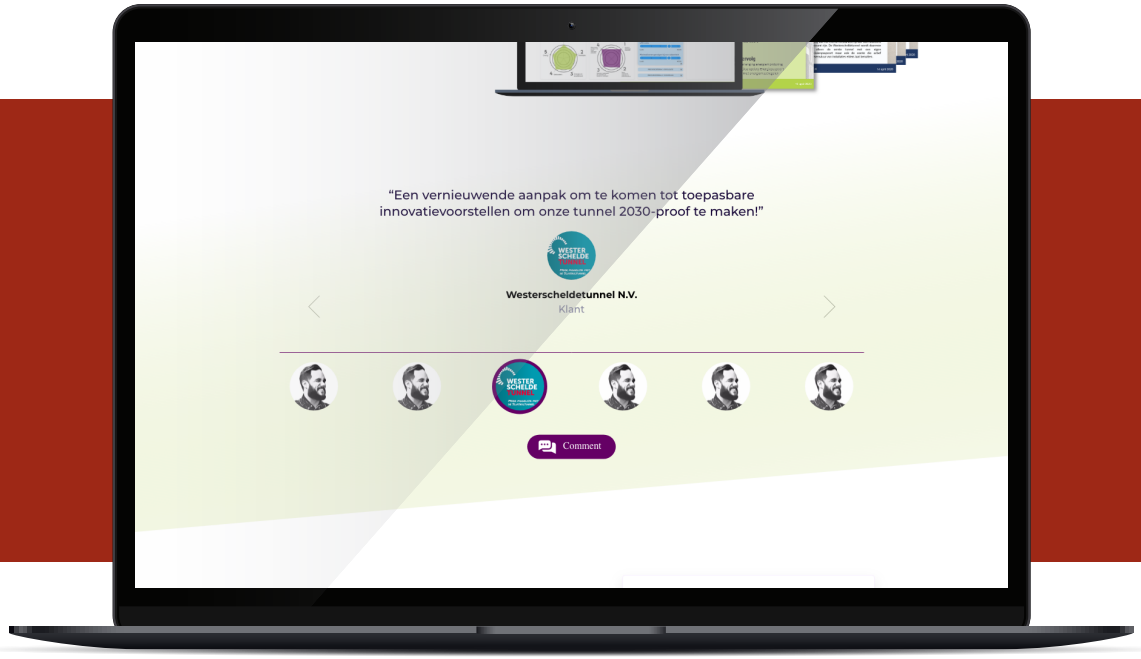
This section of the web page is about the feasibility of the innovation. It shows the reader the inner workings of the innovation and shows relevant details of the product. In this case, a step-by-step process is explained. This section aims to convince the readers that it is possible to create this innovation and make it work.

3. MARKET

This section contains the desirability of the innovation. What will be the target group? How will this group be approached? What is the total size of the market? What kind of market share should we expect to obtain? Answers to these kinds of questions are important to show the potential of an innovation to stakeholders. This section aims to ensure innovators to not only work on the feasibility but also think about the market and their future clients.

4. BUSINESS

This is the last section that contains information about the innovation. Here, the viability part of the innovation is explained. How will this innovation generate revenue? What kind of investments are needed in the early stages of the process, and when do they expect to return on those investments? This section aims to push the innovators to think about the business model around their innovation. For possible stakeholders, sponsors or investors, this is crucial information to judge if this innovation can generate sustainable cash flow in the future.

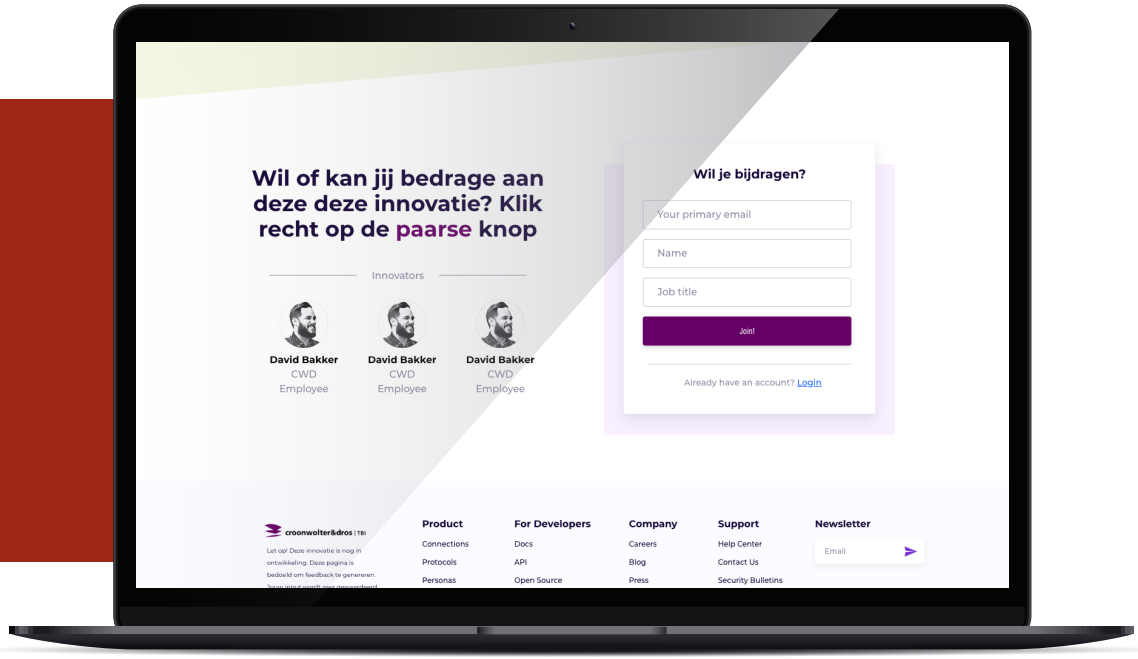


5. COMMENTS

Gathering feedback is valuable for every innovation project. That is why I added a comment section to the web pages. Visitors can leave comments, suggestions, and questions here. This feedback will be shown on the page for others to react to them. This engagement data could work as a validation for the innovator. If lots of people are interested, chances are the desirability is high. This data is also collected to decide later which innovations move on to the next step: The innovation fair.

6. CONTRIBUTE

If visitors of the web pages are interested and able to help and contribute to the innovation, they can sign up to help out the innovators. This promotes cooperation between different divisions and could lead to exciting collaboration or potential launching customers. This data will also help decide which innovation moves to the next step.



DISCUSSION

Although, IVI is created with various stakeholders and should fit within their needs and wishes. There is no evidence that IVI will achieve its desired goals. During the design process, I made several assumptions around IVI. For example, that CWD employees will regularly visit the web pages to leave comments and suggestions, and so on. For now, there is little evidence that these assumptions are valid. Therefore I think that this is not the final version of IVI. The chances are high that iterations will be needed after several validation sessions, during and after this case study, to make IVI a reality.

CONCLUSION

IVI is an approach to boost the innovative mindset of CWD employees. IVI helps these innovators from an early stage of their innovation process. The development team creates a smoke test together with the innovator to generate feedback and show the innovation to a broader audience to involve more CWD employees in innovation. Via the data collected through the smoke test, the development team evaluates the innovations, and the best performing innovations are invited to the innovation fair. The innovators present their innovations at the fair, and investors can invest credits in innovations they see potential in. These credits function as evidence to the management of the innovation's potential. This helps the innovator get additional resources from the management to grow their innovation.

GOVERNMENT BUILDING MAASTRICHT

In 2023 all offices are required to have an energy label of C or higher. This changes to A or higher after 2030. Croonwolter&dros is proud to have realised a C-label for the government building in Maastricht.

CHAPTER 9
VALIDATION

PARAGRAPH 9.1

VALIDATION

In chapter 8, I explained how IVI works on paper, but that is based on several assumptions. An important aspect of innovation is testing and iterating on your concept to improve it and make sure it will work in the real world. To see if IVI will help the innovators at CWD create a complete and well-rounded story around their innovations, I decided to do a test run of the concept. This paragraph explains which assumptions I tested, the test setup, the results, and the impact of these results.

ASSUMPTIONS

One of the Lean Startup method's fundamental principles (Ries, 2019) is to test your riskiest assumptions. For IVI, the riskiest assumptions are:

1. IVI helps innovators create a complete story around their innovation, focusing on feasibility, desirability, and viability.
This is, of course, the main goal of IVI, in line with the design statement from chapter 6. If this assumption turns out to be false, it is not worth checking the others, and a pivot is needed to find another solution for the design statement

2. Interest in the smoke tests from the audience remains high even after more and more are launched regularly.
Suppose the interest in the smoke tests falls to near zero. In that case, the smoke test will not generate the desired feedback for the innovators, slowing down their progress and making it impossible for the development team to decide which innovations can progress to the innovation fair and which innovations need more work.

3. The credits have value in the eyes of the innovators, investors, and management.
Suppose an innovator gathers plenty of credits at the innovation fair, but these do not prove anything in the management's eyes. In that case, they will still not be convinced to invest resources into the innovation. Like the investors, if the credits have no value, they will not make calculated decisions on investing their credits.

4. Investors are more likely to help an innovator if they invested in that particular innovation.
Currently, there is a lack of cross-divisional collaboration at CWD. IVI aims to tackle that by creating an incentive for an investor to help an innovator. But if it turns out that these people will not help each other, then a lot of value of IVI is lost. This is also why investing in an innovation should be beneficial for both the innovator as the investor. This way, there will be more incentive for the investor to help the innovator.

5. CWD's management is willing to invest in innovation
An innovation can be as good as possible, but if the management is still unwilling to take a risk and invest their resources, then the whole concept will not work. It is the innovator's job to make the risk as low as possible, but it will probably never be zero. At some point also the managers should take a risk to make innovations happen within CWD.

These are not all the assumptions around IVI. At this point, they are the most important and riskiest assumption that I want to test in my validation session. Suppose CWD chooses to continue with this concept after my project is done. In that case, they should continue to test assumptions and tweak the concept until IVI reaches the desired goal of helping innovators with creating a more innovative and entrepreneurial mindset.

THE TEST SETUP

To validate these assumptions, I decided to do a test run of IVI. I invited a team of innovators to present their innovation (Slimme Infra Meter) to a group of colleagues. I used the prototype of paragraph 8.2 as a smoke test and organized an online meeting where everyone was asked first to check out the smoke test, and then the innovators presented their innovations. Afterward, all participants were asked to fill in a feedback form. In this form, they were, first of all, asked if they would invest their credits in this innovation, and secondly, they were asked to answer some questions to provide me with feedback on IVI. An overview of the questions can be found in appendix F.

For the test, I invited a mix of colleagues that contributed to my project earlier by participating in the interviews and the ideation sessions. There were also some new faces that expressed their interest in the concept earlier and wanted to contribute.
There were three innovators present at the test, and seven colleagues joined. They consisted of an:

- Innovation manager
- Business controller
- Manager product development
- Trainee
- Innovation consultant at Freshheads
- Design manager
- Program manager

LIMITATIONS TO THE SETUP

There were also some limitations to the test setup. Due to time restrictions, it was impossible to present more than one innovation. Creating a second or third smoke test would take up too much time. Thus, the audience could not choose between different innovations and judge which innovation had the most potential. To cover this, the participants were not only asked how much credits they would invest, but they were also asked to explain their decision and share if they were convinced by the feasibility, desirability, and viability of the innovation and they were or were not.

Besides that, everyone was given an arbitrary amount of ten credits. These credits have no value yet, so there is nothing to lose for the participants if they decide to invest their credits. That is why it is even more important to know their considerations.

And finally, because everyone had to only check out one smoke test, you can not measure if the interest in the smoke test would remain high after a while. I could only ask if they believed that enough colleagues would be interested in checking in the smoke tests. Similar to the willingness to help out each other. Since this is only a one-time test, I can not actually measure if the cross-divisional collaborations would increase with this concept. I can only ask if they believe that this concept would boost collaboration. At least there is enough testing that needs to be done if CWD continues with IVI.

THE RESULTS

In total, I got nine responses, seven from the audience and two from the innovation team. The innovation team's responses only include their feedback on IVI and do not cover the questions about their innovation. In total, the innovation received 70% of the available credits. Of course, this number is meaningless now, but it is an excellent start. All the responses can be found in appendix G. In this section, I will summarize the results based on the assumptions I wanted to validate.

Overall the concept was received positively. Everyone believed that IVI could help the innovation output of CWD. Someone mentioned:

> *"I definitely think so. It gives a nice buzz to innovation and brings it to everyone's attention."*

Also, the part of the development team was received well. They believed that this would provide the needed help for the innovators. But there were also some concerns. It was stressed that high participation rates are necessary to make IVI a success, and the credits should really mean something within the organization. This could make or break the concept. Now we know that overall the concept was received positively, lets look at what was said about the assumptions I listed earlier.

1. IVI helps innovators create a complete story around their innovation, focusing on feasibility, desirability, and viability.
In general, it is believed that IVI will help with achieving this. Five participants responded that IVI would accomplish this, three others had some doubt and suggested some tweaks, and one mentioned that time would tell. The need for the development team is seen as a critical aspect in helping the innovators. The data gathered by the smoke test is believed to provide valuable insights for the innovators to help them progress their innovation.

2. Interest in the smoke tests from the audience remains high even after more and more are launched regularly.
There is a lot of doubt around this assumption. One respondent felt the smoke tests were a kind of newsletter that nobody reads. No-one was completely convinced that the smoke test would generate enough interest as it is now. Someone reacted:

> *"Creating enough interest will be difficult, what is in it for them? Maybe if the innovations are insightful and informative it will work."*

More reactions suggested that there should be an incentive for colleagues to visit the smoke tests. They also suggested a solution for this point. A personal referral link could be used alongside the smoke tests. If you share a link to a smoke test and someone visits the page via your personal referral link, you will earn a point, for example. If you gather enough points, you will be rewarded with extra credits to invest at the innovation fair. This is only an example, but it is worth keeping this in mind for later stages of the concept's development. It is clear that this assumption needs more work before IVI is launched in the real world.

3. The credits have value in the eyes of the innovators, investors, and management.
Having fictional credits was considered a good thing for now. It prevents administrative hardship but still gives the innovators good support when convincing the management. But there was also some criticism on the fictional credits. One respondent felt it would remain a game if the credits were fictional. Another suggested using hours instead of credits. This would create more responsibility on both sides. On one side, the investors should think about where their hours are well spent. The innovators should ensure the hours they collected are spent on valuable activities. From both sides, the commitment towards the innovation would be higher. This is an interesting thought and is definitely something to consider later on. But then the question arises if this is doable within CWD's current business model and financial situation.

4. Investors are more likely to help an innovator if they invested in that particular innovation.
Three of the respondents did not think that they would be more likely to help if they had invested in an innovation. This was partly based on the function they had. They doubted if their help would be helpful or thought they would only help if their specific expertise was needed. Two others thought they would be more likely to help if they had invested in an innovation. If they invested, the innovation would have already got their attention. This would make them likely to help. But also here, the value of the credits is essential. One respondent said:

> *"Yes, if I have "skin in the game". Then I would, otherwise there would be no incentive and even if I wanted to the priority would be too low."*

Again this shows the credits are a crucial part of the concept. This could be the decider if IVI will work or not. Collaboration is vital for both innovation and IVI. It is worth evaluating the fictional credits and seeing if the idea with hours would work better.

5. CWD's management is willing to invest in innovation
This assumption could not be validated within this test since all the participants were not able to make claims about this assumption. Luckily I got the chance to present IVI to the board of CWD. At this presentation, the whole direction team was present. They gave me 15 minutes to talk about my concept and tell them why they needed to implement it. During the presentation, I explained my research and my concept. In the end, I stressed that at some point, they have to take risks. Otherwise, nothing will happen.

Afterward, they were optimistic about my concept. This is, of course, a great compliment. They liked the fact that I involved different colleagues, and they appreciated the mirror I held up for them. They did not say that they would invest more in innovation, but I think the initial reactions are promising. It is definitely worth giving IVI a go to create more elaborate stories around the innovations that exist within CWD.

CONCLUSIONS FROM THE VALIDATION

What have we learned from the validation session? In general, it is safe to say that the overall reactions were positive both from the validation as from the presentation to the board. They all received the concept well, and there are no major game stoppers for IVI at this point.

The development team is an excellent addition to help the innovators create a complete story around their idea. They make a low-key way to come forward with your idea and help get feedback on your idea from an early stage of the process using the smoke test.

Maintaining enough interest in the smoke test will be a point of attention. It should be avoided that the smoke tests would be too newsletter-like. From the validation, I learned that it would be a good addition to create an incentive for everyone to share the different smoke tests. The suggestion was made to work with personal referral codes. In this way, you can earn something if you involve more people in CWD innovations by sharing several smoke tests.

The use of fictional credits could work, but there are many questions if they will hold enough value to convince the management if an innovator managed to gather plenty of them. Like the investors, do they have enough 'skin in the game' if they only invest fictional credits? Would that incentivize the investors enough to boost the collaboration between the investor and the innovator? The suggestion to work with hours instead of credits would create more value and responsibility for both the investor and the innovator.

Helping each other is an integral part of every innovation, and IVI aims to boost cross-divisional collaboration within CWD. There were mixed reactions on this part of IVI. Not everyone was convinced that IVI boosts collaboration. The value of the credits also plays a crucial role here. The investor should again have enough 'skin in the game' and should be able to gain something if, with his or her help, the innovation grows to be a success.

With the opportunity to present my concept to the CWD board, I feel more confident that they will invest in more innovations if the innovators reduce the innovation risk by thinking about the viability, desirability, and feasibility. And I believe that they can achieve that with the use of IVI. I am optimistic about the validation results, and there are some promising signs that the concept will work after it has been implemented. But before that, more assumptions need to be validated. Unfortunately, I can not do that within this project due to time restrictions.

ITERATION

From the validation, I learned that the credits' value plays a significant role in the success of IVI. It gives responsibility to both investor and the innovator. When brainstorming on the concept, I wanted to avoid using real resources because it would create a lot of administrative work and cause a lot of pushback from the management. But after the validation and the presentation to the board, I changed my mind about the fictional credits. Now I am convinced that it would be wise to change the fictional credits to hours. The number of hours each CWD employee can invest is a question for later.

After the presentation to the board, Douwe mentioned that two colleagues liked the idea of working with hours and wanted to move on with that concept. One of them works as a business controller and is an expert on the proceedings around CWD's hours. He mentioned that it is actually relatively easy to implement a system where one colleague can give part of his available hours to another colleague with the current procedures. Besides that, the idea of working with hours was not met with resistance when I suggested it to the board. These factors contributed to my decision to switch from fictional credits to hours.

You may ask yourself how that will work? For example, everyone at CWD is given two hours to spend on innovation. Instead of spending them yourself, you can decide to invest them in innovation you encountered via the smoke tests and the innovation fair. Now the innovator of the innovation you invested in has more time to work on his or her idea. Keep in mind that every hour at CWD still needs to be declared. In this way, the innovator can declare his hours as 'innovation time', and the more colleagues invested in his or her innovation, the more 'innovation time' he or she has. This gives the innovator time to work on the viability, desirability, and feasibility before they present to the management to get their support. It democratizes the hours spent on innovation at CWD because all the CWD employees get a say over a small part of CWD's total innovation budget.

PARAGRAPH 9.2

IMPLEMENTATION

To make sure that CWD, if they are interested, can move on with IVI. It is necessary to think about how IVI can be implemented in the current organization of CWD. To do this, I asked some questions about this subject at the validation session and the presentation to the board. I also discussed it with Douwe. I used the feedback I got from them to write a suggestion on how IVI could be implemented. This paragraph will explain my suggestion and why I think this can work.

WHERE TO START?

The start is already the most challenging part of the implementation. In my opinion, it is best to start with putting together the development team. If you have the team complete, they can be tasked with implementing the rest of IVI. They would become the product owners and become the driving force behind IVI within CWD. They can start looking and asking around to find the employees who walk around with promising ideas to get the ball rolling. To eventually have people come to them with new ideas. After discovering their first ideas and innovators who want to work with them, they can create the first smoke tests and put the infrastructure in place to get these smoke tests to a broad audience. After a while, when the feedback from the smoke tests comes in, they can start to organize the first innovation fair to get the process of investing going. For this step, there is probably some work needed to keep track of the hours invested. But if the development team has full responsibility to make this work and has the expertise to do so, I believe they can make it happen.

But this is already a difficult step because the team members should, in my opinion, work full-time on implementing IVI, helping innovators, and organizing the smoke tests and innovation fairs. This requires resources from CWD. It will not be possible for the development team to declare their hours on a project because they are not working on a project or with external clients. Therefore I would recommend judging the team not on billability but other metrics. Like: the number of innovations launched or the number of colleagues they engaged in innovations. But in the end, it is up to the CWD board to commit to the development team and make sure the hours are available.

COMPOSITION OF THE DEVELOPMENT TEAM

During the validation session, I asked all the participants what kind of people they thought should be in the development team. All the reactions can be found in appendix G. They provided me with some exciting suggestions. One of them was already interested in joining the team. Most agreed it should be a mix that also reflects the whole organization. Other experts they mentioned were a:

- Marketeer
- Web developer
- Business developer
- Creative expert
- Lean startup expert
- Project manager
- Innovation manager

These are all excellent suggestions, but sticking to the lean startup method, I would recommend starting with the essentials. In my opinion, they are:

An innovation manager
The innovation manager leads the team. He or she focuses on getting innovators on board, communicating with higher management, and is responsible for the overall implementation of IVI.

A web developer
The web developer creates the web pages together with the innovators, collects and analyzes the data from these web pages.

A Marketeer
The marketeer is in charge of engaging a large audience with the smoke tests and the innovation fair. He or she is responsible for sharing the IVI concept and drawing new ideas in.

LEVERAGING EXISTING INFRASTRUCTURE

If the development team is complete, they can start with implementing IVI. Fortunately, they do not have to start from scratch. There are existing platforms and initiatives in place they can use to kick-start IVI. Building on this infrastructure will make IVI more accessible and easier to implement.

For the TBI innovation award, as described in paragraph 2.4, a web page was developed that shows where in the Netherlands they are working on a specific innovations. This could be either at another office or a construction site. A screenshot of this web page is shown in figure 9.1. The development team could use this web page as a hub to showcase all their live smoke tests. Visitors can scroll through the map of the Netherlands and click on the links, shown as diamonds or light bulbs in figure 9.1, to visit the corresponding smoke tests.

Before an innovator can present at the innovation fair for the first time, already quite some work needs to be done. The hours required to do this work still need to be declared by the innovator. In the current situation, this could slow down the innovation's progress. Every employee has some hours each year to spend freely, but if these are not sufficient, the innovator needs to get them from somewhere else. One solution for this situation is that the innovator, with the development team's help, applies for the TBI innovation box. With this box, the innovator has extra hours and resources available to them. These hours can be spent working on innovation, and the resources are meant to cover initial costs. This makes it possible to keep working on the idea until they can join the innovation fair.

After my presentation to the board of CWD, they also told me they are working on a similar innovation box only for CWD. This would benefit the innovators of CWD because, in this way, they do not have to compete with ideas from the entire TBI organization.

And finally, as mentioned in paragraph 9.1, the current proceedings around hour administration should make it relatively easy to give everyone a couple of hours for innovation. They can either invest these hours or spend them on their idea. How this exactly will work within the organization needs to be developed further. Talking with different business controllers should provide the development team with enough information to make this work.

GROWING THE CONCEPT

After the foundation of IVI is laid out, the ideas are pouring in, and the first innovation fairs are in the past, CWD can decide to grow the development team to boost the innovation output of CWD. At this point, there are several things they can do to increase the value of IVI.

From the beginning, the goal of IVI has been to improve the innovative mindset of the engineers at CWD. Besides helping the innovators with their ideas, the development team could start setting up training and coaching sessions that teach these innovators about viability, desirability, and feasibility and how to validate these aspects of innovation. This could even boost the innovative culture at CWD and create a more open mindset to innovation within the organization.

If overtime, more and more data is gathered from the smoke tests, the development team could start to analyze this data over more significant periods. Doing this could uncover larger trends that play a role either in the organization or in the market. CWD could use this data to steer its organization more towards these trends that generate more engagement via the smoke tests. This could result in identifying niches where CWD can deliver unique value to their clients.

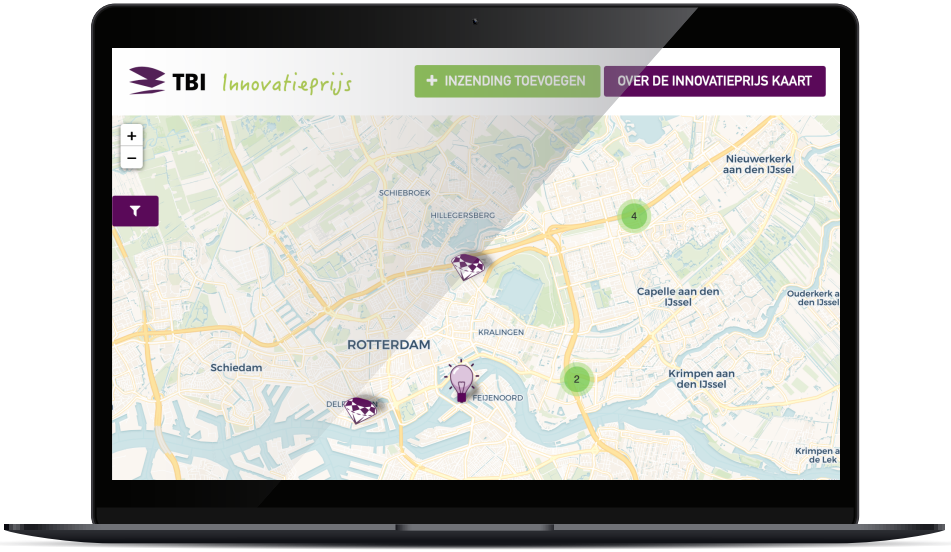


Figure 9.1 Innovation map

DISCUSSION

There was not enough time to validate all the assumptions that surround IVI. During my validation session, I picked to riskiest assumptions according to me. Others may have a different opinion here. Also, the validation was done with a limited number of people and only one innovation. This means that the whole concept is not tested yet. This should be done later before IVI is ready to be implemented. The validation results may have been influenced by the fact that people in the audience also contributed to earlier stages of the case study. This could cause them to like the concept better than others that did not contribute before. And it is good to consider that the implementation is only a suggestion based on input from CWD employees. It is not proven that this implementation strategy can be done.

CONCLUSION

The validation session of IVI showed promising results. Both the reactions from the CWD employees and the board were positive. For now, there are no major game stoppers for IVI. But there were considerations around the interest in the smoke tests and the use of the fictional credits. For the smoke test, it was suggested to use a referral system to incentivize employees to share the smoke tests. And I made an iteration to change the fictional credits to hours. This creates more responsibility or 'skin in the game' for both the innovator as the investor. Finally, I suggested implementing IVI by first putting together the development and then using CWD's existing infrastructure to implement the rest of IVI.


P
taxi
ZIEKENH

MST ENSCHEDE

The new hospital in Enschede: Medisch Spectrum Twente is a state of the art medical facility and one of the biggest in the Netherlands. It was finished in 2016, making it one of the last projects that involved both Croon and Wolter & dros before the merger.

CHAPTER 10
DISCUSSION

PARAGRAPH 10.1

DISCUSSION

Chapters two to nine covered the case study of CWD. They want to boost their innovation output to three innovations launched each year. IVI aims to help CWD achieve this target by helping CWD's engineers create a more innovative mindset. IVI achieves this by setting up a development team. Together with the innovator, this team creates a smoke test to test the desirability, viability, and feasibility of the innovation. In the next phase, the innovations are presented to a broad audience where the innovators aim to get investors on board to get the hours they need to develop their innovation further. Suppose the innovation shows promising evidence that it is viable, desirable, and feasible. In that case, it will be easier for the innovator to get engagement on the smoke test and get hours from investors. If the innovator does not get enough engagement or hours, it is a signal that they should improve their story around the innovation. The development team can help with that. It could also be a signal to pull the plug on the innovation. This is also okay because it frees time to work on something else. This feedback loop and help from the development team should improve the innovative mindset of CWD's engineers and boost CWD's innovation output.

In this paragraph, I discuss whether the findings of this case study can have applications in a broader context and I discuss which limitations exist to these generalizations. Finally, I will reflect on the design tools I used and what my influence has been on the result of the case study.

GENERALIZATIONS

In chapter one, I introduced the question: How do you teach, help, and/or coach employees to be more innovative or to have a more innovative mindset? IVI is an approach to do this. Partly by introducing a democratic system within the innovation process. By giving every CWD employee a small part of CWD's total innovation budget, a small portion of the decision-making power is handed from the management to the employees. Similar to the voting system in democratic countries. Democratic innovation is not a new phenomenon. The literature defines it as the ability to innovate by the customer. This phenomenon mainly exists around information-related products and services. Through increased accessibility to hardware and software, customers are more and more able to create their own innovations (von Hippel, 2009). Instead, IVI has more resemblance with crowdfunding. Or as Muller, et al. (2013) called it, enterprise crowdfunding. Could this enterprise crowdfunding also be beneficial to other organizations?

As implemented in IVI, enterprise crowdfunding forces innovators to present their ideas in an early stage of development. This makes them face reality, gather feedback and test their assumptions. Testing is a valuable part of an innovation process, and the sooner you start, the easier it will be to make changes. Therefore IVI helps them with creating a complete story around innovations. But IVI is centered around and designed for CWD. How would this work for other companies?

Other companies that could also benefit from IVI or enterprise crowdfunding are companies that are also organized around billability and tend to focus heavily on either viability, feasibility, or desirability. I think that a focus on feasibility is the most common one, assuming that other construction companies also employ many engineers. Still, as a first step after implementing IVI at CWD, TBI holdings could consider implementing IVI for the entire holding. This could improve the innovation output of all the organizations within the holding. A future scenario could be that the development team grows into an internal innovation consultancy firm that works on internal projects and advises other companies to improve their innovation output.

LIMITATIONS

Generalizing the insights from the case study into possible applications for other companies or other situations comes with limitations to the claims you can make. The insights were only based on a single case study, and during this case study, the concepts are not thoroughly tested. There is evidence that it might work for CWD, but there is no proof yet. Besides that, a single case study also comes with its limitations. The most significant limitation of a single case study is its inability to provide a sound basis for the generalization to study findings, according to Donmoyer (1990), Kennedy (1979),

and Yin (2009). This is often caused by the inability to extend the case study to other cases. If CWD chooses to continue with this project, they could consider increasing the case study's data points. More interviews, more ideation sessions, and more validation sessions improve the rigor of the findings in the case study (Donmoyer, 1990; Kennedy, 1979; Yin, 2009).

Also, the case study was limited by the participants. All the insights that led to the design statement were from CWD employees. This makes the case study focussed purely on CWD. The concepts were also developed and tested with CWD employees. There was little input from outside the company to shed a different light on the situation.

Finally, there was also a time limitation to this project and the case study. With more time, there would also be more time for interviews, ideation, and validation. This limitation could therefore have influenced the outcome of the case study.

DESIGN TOOLS

The tools used in this project, as explained in paragraph 3.2, played a substantial role in the outcome of this project. Most of the tools I used are based on design theory and are well known in the design community. But I also introduced a less common tool: The Business Model Portfolio Map introduced by Osterwalder, et al. (2020). It lets you plot existing business models on a framework to see where they stand in their development process and how they score in viability, desirability, and feasibility. This fitted well to my project because I was looking into creating a more innovative mindset through working on the different aspects of innovation: viability, desirability, and feasibility. One drawback is that the interpretation of the results of these tools is dependent on how you judge each business model. Someone else might judge a business model differently and thus could have a different interpretation of the result. My role in this will be explained in the next section.

Besides the BMPM, I preferably use standard design tools like interviews, Harris profile, and brainstorming. From the beginning, I believed that innovation should involve people. They are the ones that have to innovate in the end. That is why I partly chose tools that allow for the involvement of people like the interview, the brainstorm, and the validation. I still think this approach was a good decision, and the tools were used correctly to serve this approach. Some adjustments could be made to improve the results of these tools in the future. First, you can increase the number of participants in the interviews, brainstorm, and validation. Second, the interviews used an unstructured and informal setup. This has its benefits but also decreases the scientific value of the interviews. This makes it harder to generalize the insights from the interviews. And finally, you could invite more outsiders to participate. This increases your chances of finding theories that extend beyond CWD and are thus easier to generalize. Still, I think the tools served their purpose and contributed to the results in the way they were meant to.

MY ROLE AS A DESIGNER

One last factor that contributed massively to the outcome of the case study and, therefore, the outcome of this project. That is me; my role as a designer is an essential factor in this project. Therefore I want to discuss what my influence has been on the project. First of all, I decided on the subject of this project. Given my interest in innovation and entrepreneurship, it makes sense that this project also focuses on these subjects.

Furthermore, I decided on the approach, the methods, and many other things. This also contributes to the inability to recreate this case study for other cases, as I discussed earlier. Since I decided on who to interview, who to involve, and what to choose for the final concept, you can never know if I would make the same decisions in the following case.

Design methods in this project heavily depend on the designer's experience, preference, and insights. The Harris profiles, for example. Here, the designer chooses the conditions on which a concept is judged and how a concept scores on those conditions. This depends heavily on the assumptions made by the designer. I also acknowledge that a different designer would have probably have made other decisions when filling in the Harris profile. Every designer has their background, experience, and preference that could create a bias towards one option or another. This influences the outcome of tools like the Harris profile. I also think this is an inherent trait of every designer and can never be entirely excluded from a design project. This also gives every project its unique outcome and one-of-a-kind solution to a given situation or problem.

PARAGRAPH 10.2

RECOMMENDATIONS

Due to limited time and the corona regulations, I was limited in researching, testing, and developing during this project, mainly caused by online communication limitations. Therefore I want to leave some recommendations for the future development of IVI and future research. I also want to leave some recommendations for CWD on how they can move on from here and what possible steps they can take next to reach their innovation goals.

FUTURE DEVELOPMENT OF IVI

There are still several uncertainties around IVI. From the validation session, we know that the desire for IVI is there. There were positive reactions from the board and no major game stoppers. But the feasibility is still uncertain. There is evidence that hours can be used instead of the fictional credits, but more exploration is needed to know this for sure. Creating a development team that can focus all their time on implementing IVI, collecting ideas, and helping innovators are not proven yet. Also, the viability of IVI needs more attention. At the moment, there is no evidence that IVI will make sure that more innovations successfully move through the innovation S-curve. Over time the progress made by innovators by using IVI needs to be monitored. Does this approach boost the innovation output of CWD? I would recommend doing small-scale test runs of IVI, to further develop and validate the concept.

FUTURE RESEARCH

In paragraph 10.1, I made some careful generalizations about my case study findings. These generalizations could act as foundations for future research. IVI kind of democratizes innovation by making it possible to invest your hours into a colleague's innovation. The decision on how to spend innovation resources is handed to everyone involved. It would be interesting to research what kind of implications this kind of democratizing of innovation has on an organization. How does it affect the company's innovation output? How does it affect a company's innovation culture? What is the role of leadership if the people manage innovation funds? Questions like these could spark new insights into the way companies innovate in the future.

NEXT STEPS FOR CWD

Of course, the first step I would recommend is to implement IVI. They should start by putting together the development team, as I suggested in paragraph 9.2. By doing this, they create ownership over IVI within the organization. This prevents the concept from drowning under all kinds of other things that are going on within the organization. The implementation of IVI should also include internalizing the six principles of innovation. After doing that, these principles should form the starting point of everything CWD does around innovations.

They can then put the innovation principles to work by revisiting their innovation strategy and long-term goals. CWD should ask itself where it wants to be in thirty or so years. What is the vision for the company? This can be a starting point for a new strategic design graduation project. If CWD has a clear vision, it can inspire its employees to work together to make that vision a reality. I always take the vision of Bill Gates for Microsoft in 1980 as an example of a vision that can inspire others:

> *"A computer on every desk and in every home."*

And finally, I want to recommend CWD to take a risk. With IVI, the innovators at CWD will have extra support for reducing the innovation risk of their ideas. They do this by researching the viability, desirability, and feasibility of their ideas. But the innovation risk will never be zero. At some point, they need more substantial resources to grow their innovation and to start bringing in additional cash flow. This does not mean that CWD should begin to gamble with its resources. It just means that CWD acknowledges that innovating costs money and that CWD is willing to take a risk if an innovation shows real potential. This will also give CWD's innovators a motivational boost because they will get the feeling that things will work and the wind is blowing in their backs.

CONCLUSION

IVI is an approach to improve the innovative mindset of CWD's innovators. It helps CWD's innovators with thinking about viability, desirability, and feasibility to make it easier for them to convince stakeholders of the potential of their innovation. IVI does this by involving more people in innovation by using the smoke tests for gathering feedback and through the innovation fair to show the innovations to the public and collect hours from investors. This pushes CWD's innovators to have a complete story around their innovation from an early stage. IVI also includes a development team that helps the innovators develop the smoke test. By making it possible for CWD's employees to invest hours in innovations they see potential in, IVI introduces an enterprise crowdfunding system that, after more validation, can also be helpful for other organizations.

PARAGRAPH 10.3

PROCESS REFLECTION

If I look back on the process, I went through from September to April, I find it hard to grasp how I managed to do everything I did. And how I managed to move through my project with relative ease and little stress? Even people around me noticed and mentioned that to me. But for me, it felt like an uncertain process with a lot of variables and unknowns. Sometimes I was bothered by the feeling that I could do more even if I worked a whole day on my project. But I am happy that it is in the past. Now I can reflect on my process to see what I did right and what I can improve.

PLANNING

From the beginning, I had laid out what needed to be done roughly every week. This provided some guidance for the first part of my project. But along the way, the steps I took started to differ more and more from the steps I planned out, which makes sense because you make choices during your project that affect the next steps of your project. I did not update my overall planning along the way. Instead, I wrote down what I wanted to finish before specific deadlines like the midterm meeting, the green light presentation, and the final deadline. Before a deadline, I would discuss what a good target would be as a goal for that specific deadline.

For example, together with my team, I decided that the design statement would be the target for the midterm meeting. With that target set, I worked backward to see what needed to be done each day to reach that target on time. This resulted in an increase of time worked on the project every time a deadline approaches. But I feel that this structure worked for me, and it resulted in reaching the targets on time without additional stress to make the deadline.

During my process, there was one delay in November. During this period, the corona regulations in the Netherlands were tightened by the government, and my motivation was low. This was caused by the mental stress that working from home brings and because, at this point, there was still a lot of uncertainty and fuzziness in my project. This cost me around one week of work. Luckily, I solved this by delaying the midterm meeting a bit and catching up later during the spring holiday in February. This was possible because, for understandable reasons, my winter holiday was canceled. I am glad that my planning worked out in the end and that I could finish my graduation project within the 100-day time frame.

INVOLVING STAKEHOLDERS

From the beginning, I wanted to involve others in my project. I believed, and still do, that innovation and entrepreneuring can never be done alone. A project about innovation and entrepreneurship can also never be done alone. That is why I involved stakeholders in my research, ideation, and validation. I feel I did the best I could with the corona regulations by using online tools to create interaction between me and the audience. But this process was also limited by working online. I felt like a more personal connection with the stakeholders was lacking. Besides participants in my project, they were also my colleagues. Since all the coffee machine conversations and other informal events were canceled, I could not connect with these colleagues. Some of the project's value is lost due to the lack of casual conversation with stakeholders. But there was little I could do about that.

Another point here is that I was dependent on Douwe to introduce me to interesting people to involve in my project. With little possibilities for me to meet new colleagues at events or the office, I was limited by people I knew via Douwe. Looking back now, I think I could have done a better job here, by taking more initiative in reaching out to others on my own. Still, I am happy that I could still work with some amazing people during my project. Involving them from an early stage helped create more support for the concept once I presented the final concept to them, which was a goal from the beginning.

Finally, I just want to mention that I missed the vibrant ambiance of the IDE faculty. I am grateful that I could work there for two days a week, but it was very quiet and lacked people who bring inspiration to the faculty.

PARAGRAPH 10.4

PERSONAL REFLECTION

In the past months, I faced what felt like the biggest obstacle in my life: My graduation project. Doing a 100-day project on my own felt like a bridge too far. But when I was writing this paragraph, the end was in sight, and by the time you read this, I am already past this obstacle. An incredible achievement if you would ask me. But looking back on my project, I want to take this opportunity to reflect on different parts of my project.

THE PANDEMIC

Of course, the corona situation can not be left unmentioned. It had a significant impact on my project, from start to finish. It changed the context of my project. It changed my work environment and limited the possibilities to engage with stakeholders. Looking back, I feel like I made the most out of the situation. I was able to work two days a week at the faculty, where I could connect with a few fellow graduate students. I learned new methods and tools to engage and involve stakeholders online, and I found a good balance between graduating, exercise, and social life. This allowed me to keep making progress on my project. But there were also plenty of days just did not feel like working. Those are the moments when you mentally feel the strain of the corona situation. But from this, I learned that if at some point you are stuck, you just have to let it go for a little while. Go out, take a walk or get a coffee, and sometime later, you get back on it with fresh energy, and working from home allows you to do that at any moment you need it.

LEARNING GOALS

Before I started my project, I formulated learning goals. I wanted to know what it is like working with a large company. I wanted to learn how to use my design and entrepreneurial skills to help companies with innovation. I wanted to learn how to use my coaching skills to coach others towards a more innovative mindset. I am glad that I could still work with a large company, like CWD, on the subject of innovation. In the beginning, I was afraid that innovation would come to hold due to the recession caused by the corona regulations. But thankfully, CWD was still interested in tackling this subject with me. Still, I did not get the chance to submerge myself in the corporate culture of CWD. That is a bit of a disappointment but also understandable given the current situation.

Furthermore, I can be satisfied with what I learned during my project. I used my design skills to help others create a more innovative mindset, and I expect that by using IVI, the engineers at CWD will realize more and more innovations. The only comment I have here is that both designing and coaching are about engaging with people and with each other. This is something I missed during my project. But it is probably something we all miss.

WRITING

Even before the kick-off, Sander already mentioned that I should make time during my project to write the report, which I did. I planned it in advance and throughout my project. But already, from the beginning, I was postponing writing. It is not my best skill, and I do not particularly like it. But Sander kept stressing it, and afterward, I am grateful that he did. But it took until after he mentioned that: “It would be nice to have 50% of the report at the mid-term” that I finally started writing. I had set the goal for myself to hand-in something more than plain text, which worked for me. Both my mid-term report as my green light report had a complete layout and looked appealing to read. Doing this was the best decision of my entire project. It made it more fun to write and massively decreased the stress I had in the days running up to the deadline of my final report. Although I am still not an excellent academic writer, I am pleased with my progress with this skill.

All in all, it was a fantastic journey that flew past. I am glad that I successfully finished my project on time during corona times. I am proud of what I achieved, and I feel like I am ready to take on the next challenge. This challenge is still unknown, but I know that the experience I got from this project will be useful for my entire future career.
Thank you for reading!

HIGH VOLTAGE REPLACEMENT

AVR (Afval verwerking Rijnmond) has a supply obligation to the Sophia hospital for children. CWD built a heat buffer to change and upgrade the old installation at AVR without having to interrupt to heating supply to the hospital.

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