

Understanding the Value Perceptions of Stakeholders of the Chainless DGTL-Drive from a SCOT Perspective

Author: Robin Kamphuis
University of Twente
P.O. Box 217, 7500AE Enschede
The Netherlands

ABSTRACT,

To date, bicycles rely on traditional chain drive systems, which restricts bicycle design and use opportunities. Van Raam, a company that designs, produces and distributes special bikes for various target groups, developed a chainless drive technology, called chainless DGTL-drive. This technology promises many advantages over traditional chain drives in terms of user friendliness and design opportunities. However, is there a market? What do various target groups think of this new technology? The purpose of this research is to examine these questions, building on a Social Construction Of Technology (SCOT) perspective to show the relationship between several types of stakeholders and their opinions on this novel drivetrain innovation. The participated stakeholders in this study have been divided into their respective social groups to enable a structured and objective approach towards their value perceptions of the product. These groups consist of users, producers, advocates and others and have been identified based on Lee Humphreys' view on the original Pinch and Bijker SCOT theory. Semi-structured interviews were conducted with several stakeholders, and the transcriptions have been coded into themes to investigate what, according to these stakeholders, are the most valuable contributions and the largest risks of the chainless DGTL-drive now and in the future. This research explicates the most common and most remarkable results of these interviews and translates the individual responses to constructed group opinions. These value perceptions of social groups of stakeholders are the building blocks for advice on the strategic direction of the future of the Chainless DGTL-Drive to the management of Van Raam. In short, the interviewees were enthusiastic about the innovative drivetrain and acknowledged its potential, but most were able to identify some fears or downsides as well. Nevertheless, the more some of these stakeholders image the technology in use, the more enthusiastic they become, but they fear that all these possibilities come at a price. Making sure stakeholders experience the differences between the status quo and all that this drivetrain has to offer, while emphasising the benefits of the reduction in components, and therefore keeping maintenance costs low, will be crucial to the product's success.

Graduation Committee members:
Dr Raymond Loohuis & Dr Yasin Sahar

Keywords

SCOT, stakeholder perception, innovation valuation, chainless drive, value construction, qualitative research

1. INTRODUCTION

Van Raam is a Dutch bicycle manufacturer specialising in adaptive and custom-made bicycles for people with disabilities or special needs. As part of their innovation efforts, they are developing a chainless digital drivetrain (DGTL-drive) that replaces traditional chain systems with an electrical energy transfer system. This drivetrain converts the rider's mechanical energy into electricity and then reconverts it into mechanical propulsion via a rear motor. It is controlled by software that simulates a traditional pedalling experience and enables new possibilities such as programmable infinite gearing.

The DGTL-drive was originally developed as part of a PhD project and later continued within Van Raam. Though functional and promising, especially for complex use cases, which currently have many chains like Van Raam's Fun2Go bike, it is presently costly to produce. Its scalability depends on identifying broader market opportunities and a clearer understanding of the innovation's perceived value.

In the practical sense, the product is new, and not much is known about it. Only the people who know it is being produced have any perception of the value at all now. The knowledge of this value perception is not only rare but also unstructured. Multiple people within Van Raam may think it could be revolutionary, but they may not think so for the same reasons, and they have limited knowledge of what the outside world and potential markets think of their innovation.

In the theoretical sense, the SCOT framework is generally used as a retrospective case study, whereas this research explores the current state of an innovation and all of the problems and solutions experienced by social groups right now and in the near future during the build-up of the product. They also rarely explain what happens to the perception of value over time. This research will apply the framework in combination with market-facing views and technology commercialisation challenges from a real-world perspective. Through these aspects, a significant knowledge gap will be filled.

The decision to use the SCOT framework instead of a traditional marketing approach was made because of the nature of researched innovation. Traditional marketing approaches to market research usually assume that the product at hand has inherent value and aims to either push this onto a market or identify what markets the product will have a good fit in. By opting for the SCOT framework, we assume that the value of the innovation is not fixed but rather socially constructed through different groups' needs, expectations and interpretations. This is especially useful for the product in the early stage, as it is still being shaped and there is a lack of alternatives available at present.

To justify further development and potential market expansion, it is essential to understand how stakeholders perceive the value of the DGTL-drive. Different stakeholder groups, ranging from engineers and buyers to end-users and policymakers, may interpret the technology's benefits and drawbacks differently. These varying perspectives will influence the adoption and long-term viability of the innovation.

This study is aimed at assessing how different stakeholders perceive the value of this technology over time. The research will use the Social Construction of Technology (SCOT) framework to investigate how interpretations and expectations of the innovation differ and evolve.

1.1 Research Question

Considering the need for information on the perceived value of Van Raam's chainless digital drivetrain, so that an educated

estimation can be made of what the future of the product will look like, this research will focus on answering the following research question:

"How can we understand the value perceptions over time of stakeholders of the chainless DGTL-drive from a SCOT perspective?"

To systematically attain the needed information to answer this question, this research is divided into the following sub-questions:

- *What are the stakeholders of the chainless DGTL-drive?*
- *What do the stakeholders think of the chainless DGTL-drive and its applications?*
- *How do these opinions relate to one another and change over time?*
- *What are the implications of these value perceptions in the context of the future of the product?*

1.2 Academic and practical relevance

The research contributes to Science and Technology Studies (STS) by demonstrating how SCOT can be used to study the emergence of a technology and the evolution of perceived value. It expands the theory's application to innovation management and stakeholder research.

The study helps Van Raam identify which values are attributed to their innovation and by whom. This will support strategic decisions about scaling and market entry and may offer insight into cost-reduction strategies through demand aggregation.

2. THEORETICAL BACKGROUND

This study is grounded in the SCOT framework developed by Bijker and Pinch (1984), which proposes that technologies are not solely the result of technical advancement but are shaped through social processes.

The framework introduces the concept of interpretive flexibility, meaning that a technology can have different meanings and values depending on the perspective of the relevant social groups. For instance, the chainless DGTL-drive may be valued by users for its ease of use, by engineers for its technical sophistication, by channel partners for its profitability and maintenance, resource controllers for the accountability and safety, or by policymakers for its accessibility implications.

SCOT, therefore, stresses the role of relevant social groups. Each group frames the technology according to its specific needs and interests. Over time, competing interpretations can lead to closure and stabilisation, when one interpretation becomes dominant and the technology's form and purpose become standardised. However, this process does not eliminate other interpretations; it simply means one has gained more traction or institutional support. SCOT sees technologies as embedded within broader socio-technical systems, where their development is affected by organisational structures, political conditions, and cultural values. It also emphasises historical context, as innovations often arise in response to specific societal problems.

In 2005, Lee Humphreys published his views on the theory by Pinch & Bijker. The theory builds on the original SCOT, but Humphreys (2005) devised solutions to some of the main criticisms towards the original theory. This research applies SCOT to investigate how different groups construct and reconstruct the value of the DGTL-drive, both currently and over time, particularly in light of its novelty and lack of a defined market application. Taking these extra steps into account, an even more complete image can be given of the value perception over time of the various stakeholders.

This revised version of SCOT introduces temporary closure and structural flexibility to operationalise stabilisation using a cognitive categorisation approach. Humphreys devised meta-categories of relevant groups called producers, advocates, users, and bystanders, delineated by stake holdings. These four categories form a framework with which one can analyse artefacts throughout their continued development instead of just their innovation. Enabling the “over time” perspective of the research. That paper also reconceptualises the stability and closure principle that Pinch and Bijker introduced. Humphreys argues that most problems can resurface, and such stabilised and closed artefacts should therefore allow for reopening. An instance of a certain artefact can remain what it is, but the framework can be reopened for new iterations, leading to new artefacts and solutions to returning problems.

Using the above theories, this research aims to provide a new theoretical framework. Using Humphreys’ view of Pinch and Bijker’s theory, a representation of the value perception over time of the chainless DGTL-drive will be created. The technical aspects of the innovation will be investigated, and the groups of stakeholders, their problems, solutions and sentiments will be identified. With clearly formulated interviews and surveys, the interplay between the various actors, facts and artefacts will be mapped. This way, a mental and visual SCOT representation of the perceived value of the chainless DGTL-drive will be constructed with the theoretical building blocks constructed in the steps before.

3. METHODOLOGY

To structurally answer the research question, this proposal outlines a multi-step approach combining exploratory research, stakeholder mapping, and qualitative data collection.

3.1 Contextual Exploration

The research begins with an analysis of the technological and market context. This includes a description of the chainless DGTL-drive’s technical characteristics, use cases, competing technologies, and innovation drivers.

3.2 Stakeholder Identification

Stakeholders such as current customers, potential users, healthcare institutions, partner firms, and public authorities will be identified based on their influence on or interaction with the DGTL-drive.

In this instance, it is important to use a social group-based stakeholder identification. Although power-interest grids or silence models are more common for marketing studies, it is important to acknowledge the fact that we are going to build a SCOT framework. Not to forget, we are looking at the SCOT framework by Humphreys, so we divide these groups into producers, users, advocates, and bystanders.

The stakeholders list is built by asking questions such as:

- Who directly uses the product?
- Who pays for the product?
- Who maintains the product?
- Who influences public perception?
- Who regulates or frames its usage?
- Who influences the perceptions of the value of the product? (framing the discourse)

This leads to the following stakeholders in the project per Humphreys’ category.

The producers are the company engineers. The only group truly eligible for the producers category is the people who are in the

process of designing the product. Company management can be taken into this category as they have a large influence over the final form the innovation takes and have expectations that should be managed as such.

The advocates are a larger group consisting of urban transport planners, sustainability organisations, cycling associations, and regulators. These are the main groups that influence rules and regulations.

In this case, the potential user category consists of E-bike commuters, traditional cyclists, bicycle mechanics/dealerships, and rehabilitation centres. This category deserves the most attention in the next stage of the project, as this has not strictly been determined.

Lastly, the bystander category consists of (E-Bike) media/bloggers/influencers, as well as the broader public. These groups do not seem to have a major influence on the process, but in the end, people will need to want to have it. The main way many people will want to have a product is when the general opinion of the product is positive.

3.3 Data Collection

Semi-structured interviews and surveys will be conducted to capture stakeholder interpretations and expectations. Questions will be based on Kvale and Brinkmann (2009), focusing on what stakeholders value in cycling technologies and how they view Van Raam’s innovation.

Kvale and Brinkmann’s approach was opted for because of its excellent fit with the premise of this research. They emphasise that interviews are not just data collection tools but co-constructed meaning-making dialogues. This focus on the creation of value matches with the same ideology of the SCOT framework.

According to Kvale and Brinkmann, the interviews should have a semi-structured nature, which also fits the SCOT framework, and social groups well. The interview can be grounded in these while still being open to emergent ideas.

In this way of building and analysing interviews, multiple truths can exist simultaneously, not necessarily in line with each other. What someone means is more important than what they say. Both of these aspects also connect nicely to the rest of the research’s viewpoints.

The questions should be clearly formulated, as open-ended as possible, and flexible. They will align with the key themes, and a pilot interview will be conducted to establish the effectiveness of the interview and whether there is any ambiguity in the questions that needs to be removed before the real respondents are contacted.

3.4 Data Analysis

The analysis will be conducted using Framework Analysis (Ritchie & Spencer, 1994). Stakeholders will be grouped based on SCOT categories, and their responses will be systematically compared to identify converging and diverging patterns of value perception.

The steps taken to analyse the data based on this framework are as follows.

- Familiarisation with the transcripts and mentally highlighting sentiments and themes.
- Identifying a thematic framework, a list of key themes and subthemes, based on the research questions and emerging patterns.
- Indexing each transcript and applying the thematic codes to segments of text.

- Charting the indexed data into a summary ensures that the gained information is clear and can be compared.
- Mapping and interpreting the patterns, relationships, and contrasts.
- Reflecting on the social construction of technology framework.

The interviews are recorded and transcribed to allow the necessary coding and temporarily hold the information from which to draw conclusions. After the information is extracted, it will be destroyed for privacy reasons.

This way, the SCOT framework becomes an iterative version. It defines the social groups based on the preliminary information search and then refines those, the problems, and the sentiments based on the answers given in the data collection phase.

3.5 Visual Mapping

The interplay between artefact features, stakeholder needs, and contextual drivers will be visually mapped using draw.io to support interpretation and theory development.

4. RESULTS

As mentioned before, the collection of data was primarily via interviews. These semi-structured interviews, which focused on the experiences, thoughts, and ideas of the interviewees, were conducted throughout the majority of May, and the interviewees included representatives of the following groups of stakeholders in this technology: general cyclists, users of Fun2Go, Van Raam Management, Van Raam engineers, Van Raam sales, rehabilitation/healthcare organisations, bicycle dealer/repair shops.

The identified stakeholders that have not been interviewed due to time restraints or inability to establish contact have been sent a questionnaire to still get a general idea. The same questionnaire has been filled in by several subjects, having an idea of what the research is about, to establish a stronger image of the general public.

4.1 Stakeholders

As mentioned in 3.2, the stakeholders were identified and placed into the groups that were derived from Humphreys' view on SCOT, which was presented in her paper. These producers, advocates, users and others have been contacted and asked to give their opinions about the innovations at hand. All of the stakeholders that were expected to be relevant beforehand turned out to be relevant in practice, although not all were thoroughly contacted for reasons that will be discussed in the reflection section.

4.2 Applications

Getting into some clarification of what the drivetrain will be used for, can be used for and was spoken about is a factor to clarify. The research was reduced to the core reason for which the Chainless DGTL-Drive is being produced, namely the replacement of the many chains on Van Raam's Fun2Go bicycle. Other options were explored by informal inquiries within Van Raam, personal thoughts and experience, online research and in the process of the interviews.

From Van Raam's Fun2Go bicycle, the step to other Van Raam bicycles or other duo-bicycles is easily made. Since Van Raam does not intend to sell the system to competitors, one of these uses can be dropped already, leaving the other bicycles to Van Raam itself. The other bicycles have one main disadvantage compared to the Fun2Go, as far as the compatibility of the Chainless DGTL-drive goes. At the current time, the system is

more costly than the chained alternative. Because a Fun2Go has no less than seven chains, all protected by chain guards and driving gears, there is an increase in costs and wear, and there is an increase in energy loss. In a standard bicycle, the product could be used to replace the drivetrain as well, but it would reduce seven times fewer problems at around half the price. Nevertheless, other Van Raam bikes are seen as a reasonable application for the future, as a larger production would reduce the costs and the bicycles already have many customisation options available.

Another application of the novel drivetrain is its use in cargo bikes. This was validated online through competition using their alternatives in such a way (*Chainless Compact Cargo E-bike*, 2024) (GoLo, delivering the future!, 2025). Since these vehicles are already almost exclusively e-bikes, the step towards the new drivetrain is smaller. Because the bikes and their loads are heavier, they are subject to more wear and tear. Lastly, they are often purchased by companies instead of individuals, which means the total cost of ownership is generally more important than the purchasing costs. Since no maintenance or replacement is needed, the product will likely be cheaper in the long run, although more expensive at the time of purchase.

Another possibility is the use in the home trainer industry. The product could offer some great advantages in this area, such as the fact that it could be completely wireless since it uses little power, which could be generated by pedalling. More importantly, the feeling of cycling on such a bicycle feels different from a real bicycle because of the counterweight you are spinning instead of propelling yourself forward. This could be hugely increased by the fact that the Chainless DGTL-drive is created to provide a great cycling experience, but instead of powering the motor to propel the user forward, it powers the interactive training system. The number of adjustments that can be made will also increase drastically, and it could even be matched to the software that simulates, e.g. going up a mountain, with the pedals reflecting the increase in slope accordingly.

Lastly, and more of a personal train of thought, since contacting these parties did not have priority during the research process, there is the application of sharing e-bikes offered by companies such as BOLT or Tyr. Once again, these companies hugely benefit from not having to do any maintenance on their bikes and would likely be able and willing to pay a larger starting fee for this.

4.3 Codes

After conducting and coding the interviews, numerous value perceptions have surfaced through experiences, opinions and expectations. After reading and dividing the transcriptions, some categories emerged to code the transcriptions. Some of the statements fit multiple sections, but to avoid unclarity, they have been placed in the groups they fit best. Besides the codes for relevant social groups in accordance with SCOT theory, the coded categories are:

- Economic
- Social
- Environmental
- Legal
- Emotional
- Functional
- Technological
- Technical

An interview quote accompanies each code explanation as an example for the category.

Economic refers to the statements made about the financial aspect of the value of the innovation. Interviewees mentioning that it may be expensive, may save a lot of money in service, or even mention some sort of trade-off between something else, all fit under this code. *“Whether I would be likely to use this depends on the price tag.”*

Social means relating to the aspects relating to the act of cycling together, getting together or whatever social status having such an item would provide. *“There is a certain stigma on tricycles and such things. **This [drivetrain] could also be a big step towards normalising those.**”*

Items tagged with the environmental code are statements referring to the reduction of emissions by reducing the number of parts, but also aspects such as the potentially lengthened lifespan of the bicycle. *“We focus a lot on sustainability these days, so a longer lifetime of a bicycle and more opportunities to re-use them would be a big plus for us.”*

Instances of interviewees mentioning legal factors such as the definition of an e-bike or regulations regarding speed, eligibility of subsidies, etc, *“laws and regulations could turn out to be a problem, I’m not sure if this is even allowed as a bicycle.”*

Emotional statements were counted when someone seemed to base an opinion on a feeling or when it was just the experience that was mentioned. The expectations of how certain additions would make them feel are core examples of this. *“The first impression is amazing, so I am confident this will work out.”*

Functional statements relate to the function of the drivetrain. The subject wants the artefact to do something or to give a certain experience, and it either complied or did not, but it refers to what it is supposed to function like. *“To me, the range of action is very important; I want to be able to go for a long drive.”*

Technological is related to technology in a broader sense. That means relating to the technological components or drawing a comparison between this technology and the technology they are used to. *“Starting from what the mechanical setup can already do and not letting us say reinventing the wheel is always a good point, and then from there you can look further at what could be possible afterwards.”*

Technical is the code relating to the statements about how exactly the product works and how it is built, but also remarks about the physical properties of the innovation or the bicycle. *“We know how strong a human being is, so developing the generator system so that it can break your own input force down to zero is like a hard requirement.”*

General remarks about the coding must be made in the sense that in a semi-structured interview, some participants steered one way while others steered another. The attempt was to pry out whatever was in the questions, but the interview allowed the interviewees to drift away to what they seemed to find important. This meant that the conversations did not include the same amount of time and energy about each piece, and in the numerical sense, the answers appear skewed. Another important fact to notice is that sometimes a statement does not literally say something while it is being counted as such. Sometimes it is information that has been gathered from outside of the interview, but in some cases the recipients made their opinion very clear ‘in between the lines’.

4.4 Value perceptions

The interviews gathered valuable information that can be viewed in numerous ways, but this research will look to answer the question of what the stakeholders have recognised as being important to them and what Van Raam can do with this information. Therefore, the decision has been made to view what

type of value statements were given most often during the data collection and what that means.

Some useful value perceptions and practical ideas were brought up during the interviews that have not made it to the report, as the responses regarding the drivetrain should remain the centre of the research, and several statements were about the product around it. These will be mentioned to Van Raam separately.

4.4.1 Most mentioned value perceptions

The functional aspects of the Chainless DGTL drivetrain were mentioned most often and most clearly throughout the conducted interviews and the filled-in questionnaires alike. Unsurprisingly, the ideas and opinions on what the drivetrain should do and what promises it should fulfil comprised a very large part of the responses, and this will be the first section that the research explores.

More specifically, the range of action was mentioned by the majority of the respondents. People often worry that the range of action would disappoint because the lack of the chain would mean the motor will have to do more of the work, and that would deplete the battery much quicker. In a more neutral sense, interviewees would state that they were not afraid that the range of action would be too short because of a sense of trust they experienced, but felt the need to mention it as an important issue anyway.

Second was the display, as it is feared that it will be too complicated. Especially knowing the target group of the current model and the majority of Van Raams products are either impaired or aged. Most of the interviewees made sure to mention that they felt like the elderly would not understand a complex display and would quickly give up. Others mentioned that several Fun2Go users drive this type of bicycle because they have visual or physical limitations, which would also mean they would experience difficulties in handling the settings of the system if the display were too small or too complex. *“I’m afraid that older people will be more wary of those electronics at some point. So it really has to be Jip and Janneke style operation device.”*

The last aspect every interviewee mentioned was the economic one. Although people are enthusiastic, every stakeholder mentions the costs. It is striking that these are mentioned in hugely different contexts. The majority of the discussions mentioned that the cost of purchasing the system or the bicycle on which the drivetrain is should not become too expensive, as individuals already view most of Van Raam’s offerings as expensive. The more business-minded people like those within Van Raam or Medux mostly thought about the total cost of ownership that would decrease through a reduction in maintenance costs and a longer lifespan of the vehicle.

Notably, the stakeholders were clear in what they wanted to see in terms of the range of action and the display options. However, their economic fears were less substantiated. Everyone worried about the price, while nobody was able to tell exactly what they perceived would be a reasonable amount or percentage of price increase. *“That’s already a good 4 grand more [for the current Fun2Go compared to an earlier version]. Look, I think that the higher the price, the less people will buy it of course. Because it is already a threshold for many people.”*

4.4.2 Most remarkable value perceptions

Some of the statements stood out from the rest because they were strongly mentioned by some participants, while others had contradictory ideas about them. Other opinions and experiences stood out for unexpected rarity or the contradiction between interviewees.

The balance between the purchasing price and the total cost of ownership was mentioned, but most stakeholders worried about the price upfront. The core of the sentiment was that eventually everyone recognised how important it would be to have adequate pricing and to carefully inform potential customers about the trade-off. *“On the parts side, servicing, etc. That it's definitely going to help us a lot in that. Yes, saving a lot of time and money.”*

A factor that significantly stood out was that the more experienced the subjects were with the Chainless DGTL-drive, the more enthusiastic they became about the product. Management and engineers are internally strongly believing in the future of the product, while the people who had to be shown what it was showed the most scepticism. Everyone in between would almost directly be equally enthusiastic as they were experienced. This is a phenomenon that was not unpredictable in any case for any innovation, but the strength of the relationship was striking.

There are possibilities to this innovation which seem difficult to grasp at first and which were not expected to be explored beforehand. One of those is the fact that a bicycle could potentially look fundamentally different if you were to get rid of the chain. An underlying reason for bicycles to look the way they look is that the bottom bracket needs to be connected to the back wheel and therefore within a fixed distance from the wheel for the chain to hold the required tension to work, while also being at a place the feet can reach. Some of the discussions were able to produce some ideas of what could be changed or added already, which was surprising. The most important mention was the adjustable placement of the bottom bracket so that, in theory, this could be placed wherever the driver wishes. The questionnaire started off by asking how extensive the recipients' knowledge of the concept was, and more familiar recipients tended to give higher ratings. However, some of the respondents without prior knowledge were remarkably able to see some in-depth possibilities. *“Without a chain, you can develop more options to make the concept of a bike even more ergonomic for mobility-impaired people.”*

One of the many potential applications is the possibility of using a three-wheeler bicycle with this drivetrain as a home trainer. The complete functionality of the system could be used without the motor propelling the bicycle forward. That means it has its uses when it rains or when someone wants to move but is unable to find a main driver for the Fun2Go. The responses to this were either enthusiastic or diminishing, and nothing in between. Also, it is the only time when different members of the same social group significantly differed in their opinion about the possibilities of the product. One of the Fun2Go drivers saw themselves using it, while the other reportedly would never. *“I already have a bike to pedal in place. It's standing in the attic and I barely ever use it.”* While the other mentioned: *“So I can even cycle on this while it is raining outside, or I have nobody to go with, that sounds very interesting.”* Notable difference is that one of them has been able to test the system, and the other has not.

4.5 SCOT visualisation

A diagram was created which gives a visual insight into the process of the co-creation of value through this model. The model can be viewed in the appendix and represents the basis of the interactions between some relevant social groups, represented by stakeholders and how their issues and the solutions to those issues shaped the process of the creation of the new drivetrain at hand. The diagram can be found in the appendix, together with the original figure by Pinch and Bijker for reference.. Note that, as the report proves, there are many

more stakeholders involved and many more problems and solutions. However, the purpose of the diagram is to give a clear overview of some of the most important actors, problems and artefacts and the way the current stabilisation has been reached.

5. CONCLUSION AND DISCUSSION

In conclusion, Van Raam's Chainless DGTL-drive is a novel drivetrain with numerous potential uses, but for this research, it was mostly viewed as the drivetrain for the Fun2Go bicycle. Viewed from the social creation of technology(SCOT) perspective, the product is in an interesting phase in which it is truly shaping up and becoming an artefact that is able to solve problems which stakeholders are experiencing with the previous iterations of the chained drivetrain artefact.

The involved stakeholders have been identified by asking fundamental questions about the use and development of the innovation. In accordance with the social construction of technology theory by Pinch and Bijker, these have been divided into relevant social groups in order to establish a clear view of what social factors were, are and will be shaping the artefact through time. Lee Humphreys published a view on this theory, mentioning that an artefact can reach a state of stabilisation instead of closure and could be reopened through time to revisit the implications and social influences. Humphreys also argued that these social groups should be categorised, and this was also done during this research.

The numerous stakeholders of the product, ranging from the engineers who are creating it to the prospective end-users, were grouped in these sub-categories being users, producers, advocates and others. All of these subcategories were contacted, and in most cases, participated in semi-structured interviews which thoroughly explored their opinions about the innovation. What were their first impressions, what were their fears, and what were their expectations for the future? Some of those unable or unwilling to participate did fill in a questionnaire to still share some of their ideas.

The general opinion of the product was in line with expectations. People were somewhat sceptical, especially those who had just heard about the existence of the principle. Those who had had the opportunity to try it were enthusiastic. The feeling and looks of the bicycle and its experience were widely complimented, and the advantages of fewer parts and less maintenance were clear and received praise. The respondents acted in their role, and as one could imagine, sales were busy with what the customer would think of it, the actual customers were busy with the practicals, the engineers bothered with the technical views and social support was thinking about how the reduction in parts would mean a reduction in costs and how they would be able to supply more users with the opportunity of mobility. Even though the general opinion was in line with the expectations, the added value of certainty and realising that there was potential and demand for this was interesting and of high importance for the future of the product. One of the key takeaways was the enormous focus towards the costs, where some mostly saw the positive influence on the cost over the years, and others primarily noticed the likely increase in purchasing price.

Some of these opinions and perceptions were perfectly in line with each other, and others were not. Assuming the collected data is complete and representative, some conclusions can be drawn from this. The different categorisations of social groups seemed to matter, as there were clear differences and similarities between the perceptions of similar actors. Something that became visible through coding and analysing the results as well is that the concept is difficult to grasp for people, and human nature seems to fear the unknown, as has been discovered many times before. (Carleton & Anxiety and Illness Behaviours Laboratory,

Department of Psychology, University of Regina, Regina, SK, Canada, 2016) The more experience people tend to have with the product in this research, the less sceptical they appeared to be, which also gives off a strong signal to the future construction and sale of the product. *“If you confront people who have very limited technical knowledge with such a new and complex system, they may be confused or even scared to use it.”*

Some more opinions that were different from each other or not in line with the expectations included different opinions about the usability of the product for different applications. Some respondents felt like this could be used anywhere, and others were much more close-minded. One of these surprisingly creative answers is mentioned just before, but there were several more in disagreement over the potential uses. After mentioning potential alternative applications of the product, such as

The future of the innovative drivetrain is looking bright if we view the responses to the use, but as the management advice section mentions, there are several focal points to steer the value perception looking into the future. People will have to experience the product in order to feel like the extra investment is worth it and to gain trust that the product will not let them down; assurances are in place. Subjects indicated that it was important for them to try the product or hear from others who experienced it to tell them it was good. Most audiences denied the possibility of buying after viewing a commercial or a pamphlet. The product must be ready before it is launched because if some early lifecycle issues appear, the image of the product could incur irreparable damage.

6. MANAGEMENT IMPLICATIONS

The advice that can be given to Van Raam based on this research is extensive and comprises multiple subjects.

As for the completion of the product, Van Raam can feel confident that the Chainless DGTL-drive is well underway, becoming a true enhancement of at least the Fun2Go bicycle. Several suggestions for the bicycle have been made, but those will be presented to Van Raam separately. The adjustments to the drivetrain, specifically, were either minor or strongly technical and therefore largely out of scope of the conclusion of this research paper.

As for the strategic placement of the product, every stakeholder was enthusiastic about the possibilities, but there is some fear that if the presented product is not perfect, that the general opinion could take irreversible damage so it would be strongly recommended not to roll out the product with less than full confidence it does its job perfectly.

People are seriously afraid that the product will become expensive, so the advantages that the innovation offers should be very thoroughly advertised. The lack of maintenance was perceived to be the major selling point, from the perspective that this saves both a lot of time and a lot of money.

There is some fear about the novelty of the concept, so in line with what the plan already is, it should, in principle, look and feel as much like a standard bicycle as possible in order to temper the fear of the unknown and all of the additional functionalities can come after.

Although being mentioned very rarely in the research until now, environmental gains by eliminating several parts could be a supporting factor in both shaping public opinion and reaching the next generation.

The need to be able to experience the product before buying is very strong. A picture or a flyer will at most convince people to try, but it looks too irregular and unknown for anyone to buy this without having cycled on it.

7. LIMITATIONS AND FUTURE RESEARCH

Contacting even more people would have been valuable, but also having more thorough contact with some of the recipients would likely have proven to be a useful addition. Using the prototype has proven to yield a huge increase in engagement and usefulness of the answers.

Lack of time was a major constraint for this short project. For example, there are online communities for e-bike enthusiasts and even communities for online cyclists. This first group could play an important role in shaping the general public's opinion. The latter could potentially be a group of customers completely different from the markets that will be focused on initially. However, there has been too little time to set up a meeting with a number of these people to see what they have to say about the Chainless DGTL-Drive and we will have to steer on the more closely related groups.

Not a huge number of people were successfully interviewed for this research, but they were largely representative of their group. This was proven by the fact that every following Fun2Go user had largely the same issues as the one before, and the same goes for every social group. Nevertheless, some more research would be better because there is always the possibility that these were coincidentally the people with similar opinions.

It is crucial to make sure that future conversations are held with the people who have driven the prototype, as these respondents were able to give much more in-depth answers to the questions that were asked and especially in a later stage, the respondents must know what they are talking about clearly. It has appeared to be more difficult than was expected to explain what the product looks like, feels like, and how it is supposed to function. This goes especially for the older participants. This research attempted to anticipate this by no longer doing interviews over the phone but using Microsoft Teams and giving a brief presentation with pictures that clarify what is expected. However, this still felt like there was too much to tell, and therefore, the interviewer has the risk of putting too much out there. People have a hard time filling in whatever the innovation can do, so when the interviewer is doing too much of the talking, the answers may be influenced.

Now that the results of the research are known, a confident statement can be made about what various types of stakeholders find important and how these relate to one another, but more information is always welcome. In practice, not much will be needed as the many answers are aligned with expectations, and even though not formally set, the hypothesis is looking to be true.

The next steps, looking into the future of the product, are possible. Finding out the total cost of ownership of the product on the hand of several offset quantities would be a large step towards a realistic view of the financial future. This research can tell you that people tend to think they will want to use and sell it, but before the large investments are made, it would be recommended to have more financial information. Clarity in the amount or percentage that people are willing to pay more for a vehicle with the Chainless DGTL drivetrain seemed impossible to extract at this moment. The respondents were in agreement that this must be worth more money than a traditional mechanical drivetrain, but more research is needed to gain insight into the numbers.

Some of the applications for this research have already been explored throughout the interviews. Several alternative applications could still be investigated. Identifying characteristics, such as the market size and how easily these markets could be entered, will have to be discovered to create an understanding of the total possibilities of the product. Keeping

an eye on the competencies of other emerging innovations cannot be forgotten throughout this process.

This research has already gathered some insights into what ways of promotion would fit according to the interviewed stakeholders. How this will be sold is yet another important factor to consider for the future. Whether this will be sold under the name of the current producer or through a new firm should be investigated.

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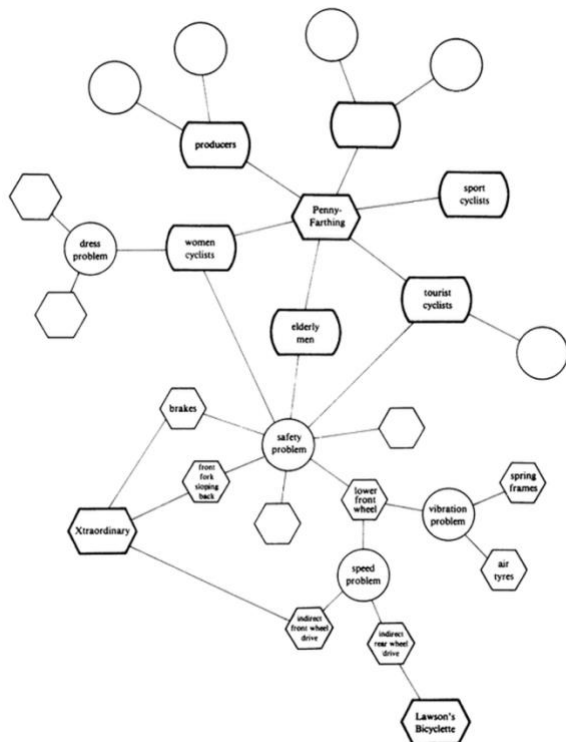
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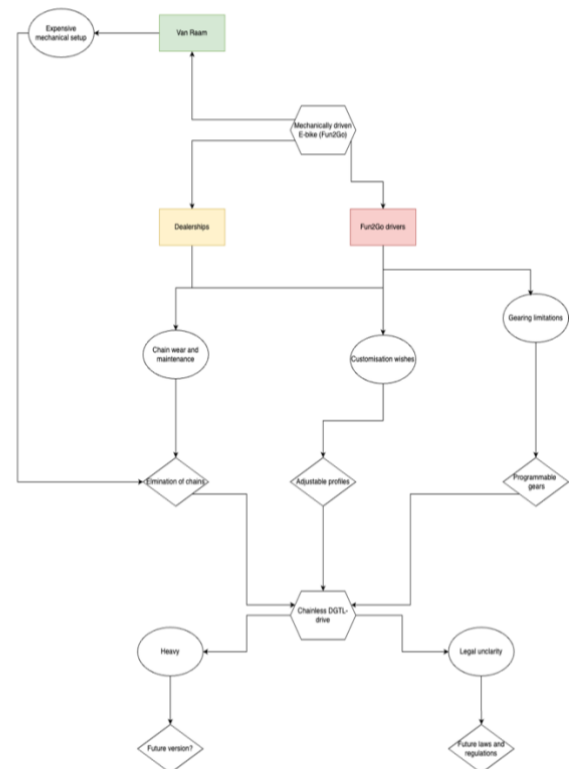
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9. APPENDIX

Original SCOT diagram



SCOT diagram of the chainless DGTL-drive based on the premise of this research



Visualisation of the frequency of coded statements per social group

