

CUSTOMER VALUE IS NOT A NUMBER - INVESTIGATING THE VALUE CONCEPT IN LEAN PRODUCT DEVELOPMENT

Martin Gudem*, Martin Steinert, Torgeir Welø, Larry Leifer

ABSTRACT

Lean Product Development (LPD) is an operational philosophy aimed at maximizing customer value while minimizing non-value-added-activities, known as waste. Originating from manufacturing, the value-concept in Lean is still strongly tied to product features despite evidence that perceived value concerns more than just the physical product. This paper presents different views on customer value, as provided by the employees at a Norwegian boat manufacturer, customers, and the competition. Our research suggests that a less-than-perfect match between customer needs and product offerings may prove beneficial. Furthermore, how customers perceive product value depends on previous experience. It is also suggested that deep understanding of customer-defined value does not imply an ability to satisfy that value. A purchasing decision often relies on emotional and utilitarian value, and product developers must target both. Yet, the value-concepts used in LPD tend to revolve around utilitarian value alone. An extension of LPD towards 'Lean Innovation' is suggested.

Keywords: Case study, Engineering design, Innovation, Product development, Customer value, Lean

1 INTRODUCTION

In this paper, we suggest to redefine the functional product value calculation in Lean Product Development by integrating emotional customer value into the traditional model concerned with minimizing production costs and reducing time-to-market. Our findings are based on empirical insights gained at the Norwegian boat manufacturer Hydrolift. We questioned and observed how employees, customers and competitors define customer value, and compared our findings with present models for promoting customer value and minimizing waste in Lean Product Development (LPD). Six findings emerged, which have an impact on how companies seek to maximize customer value using techniques from the LPD approach: 1) Our findings suggest that a less-than-perfect match between customers needs and product offerings may prove beneficial under specific circumstances. 2) Customers tend to evaluate products with which they have little experience in relation to other objects that they are more familiar with. 3) Although often a prerequisite for satisfying customers, understanding customer value does not imply improved ability to satisfy that value. 4) Competitors' de facto and implicit statements of intended and actual value tend to overshadow the voice of the customer in developing new products. 5) A purchasing decision often relies on emotional and utilitarian value, and product developers must target both. 6) Whereas the value concept in LPD appears to be solely linked to product attributes, the majority of marketing material and customer feedback suggested that value relies on the overall customer experience. These findings imply that existing Lean tools are not necessarily effective at maximizing customer value in product development.

2 CUSTOMER VALUE AS A DRIVER IN LEAN PRODUCT DEVELOPMENT

Lean is an operational process management strategy derived mainly from the Toyota Production System in the 1980s [1][2][3], focusing on waste reduction in the factory. The term Lean Production was introduced in the early 1990s, and the concept was later extended to the Lean Factory in the mid 1990s, changing focus from waste reduction to cost, quality, and delivery. The next expansion of the concept includes the Lean Enterprise in the late 1990s, before taking the Lean notion into areas such as product innovation, product development [4][5][6][7][8], engineering, design, software development (agile), accounting, etc. Over a 20-year period, the focus of lean has drifted from elimination of waste to cost, quality and delivery and then further into customer value at the turn of the century. It is well known that Lean Manufacturing no longer represents such an exclusive competitive advantage. Lean

principles applied in other areas such as product development however, may still to some extent influence the rules of competition. Basic definitions used to separate waste from value must be changed as the Lean approach is extended from production to product development. Product development is a much more complex ‘process’, since it – rather than physical parts or objects – concerns the generation and use of information that collectively is applied for reducing the risk of manufacturing a product. Unlike physical objects, information can reside simultaneously in multiple locations and be stored in a number of forms (thoughts, sketches, writing, CAD, prototypes, etc.). In product development, waste is typically associated with doing activities with the wrong input rather than doing unnecessary activities, as is the case in manufacturing. Moreover, waste removed at micro process level may create waste at system level [9]. The lack of common tools and techniques available, along with the complexity of implementing a sustainable LPD strategy, means that the concept does represent a competitive factor.

The Lean approach is traditionally associated with the desire to improve predictability and reduce time-to-market as well as the costs of developing, launching, producing, and distributing new products. It has been shown that companies repeatedly developing new articles with a strong basis in existing products and capabilities have had more success with LPD compared to those targeting more novel products [10]. The legacy from manufacturing optimization is still clearly present in today’s LPD-framework, which concerns streamlining an operational value stream where value is defined by product features. However, as observed by Redström [11], Mitchell [12], and Verganti [13] among others, industries are experiencing a need towards expanding the design space, paying increased attention towards designing the user experience, not just the product as a technical artifact. As businesses seek to expand the design space beyond product features, their process management strategies must too be expanded. Lean Innovation (LI) is therefore suggested as an extension of LPD, taking into account alternative methods for providing customer value, for example through services, brand, and customer experience. Part of the motivation towards expanding the design space comes from the idea that people tend to buy products for emotional, psychological, and sociocultural reasons, not just utilitarian ones. The user’s interpretation of a given artifact cannot be fully predicted, but as Crilly et al. [14] note, some interpretations are more likely than others. Incorrect or unintended interpretations may be the result of differences between the designers’ and the users’ knowledge and experience related to using a product, as well as different perceptions about the context in which the product is being used [15]. The ability to introduce innovations concerning a product’s emotional properties, or meanings [13], is thus dependent on extensive knowledge about the user’s needs, desires, and experiences [11]. Consequentially, innovations related to meanings are more difficult to develop but also more difficult to imitate or copy, and they may therefore provide the basis for long-term competitive advantage [13].

3 INVESTIGATING CUSTOMER VALUE – THE HYDROLIFT PROJECT

Perspectives on customer-defined value were explored following a case study approach, as described by Yin [16] and Eisenhardt [17]. Evidence was gathered through an employee ideation event, semi-structured customer interviews¹, photo exercises, marketing material reviews, and interviews with sales personnel and branch experts. Triangulation involves the use of multiple sources of evidence, and is recognized as valuable in improving construct validity. That is, “establishing correct operational measures for the concepts being studied” [16]. In this study, investigating the perspectives among different groups of stakeholders, not only improves construct validity, but also provides a framework that explains how perceptions of emotional (and utilitarian) value evolve through the development and sales process. The study was framed as a front-end activity intended to support a ‘leanification’ process of Hydrolift’s product development methodology. Understanding customer value is crucial in order to separate value-added activities from waste, and the study was therefore focused on gaining deep insight in customer-defined value, as well as internal and external perceptions concerning the nature of customer value in the Scandinavian boat industry. The research team received assistance from an external design anthropology consultant in organizing the internal ideation exercise, conducting customer and branch specialist interviews, as well as in analyzing competitors’ marketing strategies.

¹ Interview guide available upon request

The study was initiated by an internal ideation exercise where employees were asked to write down on post-it notes their views concerning the 'ideal customer', what the company had to offer these customers, and who their competitors were. Responses were collected and summarized in a table for further analysis. The ideation exercise was followed up by a series of interviews involving existing customers from Norwegian and Swedish markets. The interviews followed a semi-structured approach, using an interview-guide based on the themes of the internal ideation exercise. A total of nine in-depth interviews were conducted. The internal ideation event and customer interviews would mainly concern absolute customer value. That is; to what extent the attributes of a product or service address customer needs [9]. Further insight in Hydrolift's value relative to the competition was sought through interviews with branch specialists, observations at boat fairs, and by reviewing marketing material and web sites of competitors. Branch specialists included four CEOs at Norwegian and Swedish boat dealerships, and the editor of a Scandinavian boat magazine.

Customer interviews and the internal ideation event indicated that a purchasing decision, as well as customer satisfaction by large was influenced by the product's ability to satisfy unspoken requirements. The research team did for this reason set up a photo exercise, trying to capture the value characteristics of a potential customer, and identify product attributes that could satisfy this value. Existing customers proved reluctant towards participating in this exercise, but two NTNU professors, which held some of the same characteristics similar to those seen in actual customers, agreed to serve as test subjects. Not dealing with actual customers meant that the outcome would be less accurate in terms of describing customer value, but the exercise would nevertheless provide useful experience in seeking to relate product requirements to customer characteristics. Visits were made to both participants' homes, where they were asked to introduce and comment on objects and situations, representing their personality, values, and life situation. The resulting photos and comments were organized in a value chart (Figure 1), according three different levels: 1) User characteristics, 2) Product characteristics, and 3) Product features. User characteristics relate to a person's personality, values, and life situation, in other words terms that could be applied when trying to express what kind of person the user is. User characteristics are ultimately influenced by the environment, which includes the surroundings and circumstances for past and present experiences. Product characteristics relate to the user's interpretation of a given artifact. The category goes beyond the mere sum of product features, and concerns the qualities or benefits sought in a product. Personal impressions are influenced by company image, market rumors, and previous experience, and although the user's interpretation of a given artifact cannot be fully predicted, some interpretations are more likely than others [14]. The lack of an absolute answer means product developers should be prepared to update the value chart as they learn more about the user. The product feature level describes actual product features, which can be pointed out in an object, and such features have traditionally been viewed as the primary means for providing customer value in LPD [8]. Drawing clear distinctions between the three levels is difficult, since a product can represent a certain characteristic at the same time as it exhibits a desirable feature. User characteristics also tend to influence what kind of product qualities are being sought. The distinctions are nevertheless helpful in organizing what would otherwise be an unstructured set of pictures.

Figure 2 illustrates how stakeholders' perceptions of value associated with an innovation interact and develop over time. Stakeholder perceptions of product characteristics evolve through the development- and sales process. Product development is guided by internal views on customer value and what type of solution is needed to satisfy that value (company perception of intended value). The extent at which the development team succeeds in aligning their own perception of customer value (intended vs. actual value) determines how well the product lives up to initial expectations. Users will in most cases base their purchasing decision on how well the communication of actual value, as reflected by the sales teams, corresponds to their own assessment of needs and wants (Figure 2, striped arrow: company perception of actual value affects user understanding of intended value). Alternatively, if the product has yet to be developed, the purchasing decision will be guided by how well the understanding and communication of *intended* value, as reflected by marketing, corresponds to the user's assessment of his or her needs and wants (Figure 2, striped arrow: company understanding of intended value affects user understanding of intended value). Customers can only experience actual value once the product has been delivered and taken into use. The user is likely to be satisfied if the experienced actual value

corresponds to or overshoots his or her initial understanding of intended value. Competing products serve as a benchmark, both in the sense of guiding product development as well as in affecting customer satisfaction. In other words, the customer will use his or her knowledge in assessing relative value while making the purchasing decision, as well as in the use-phase.

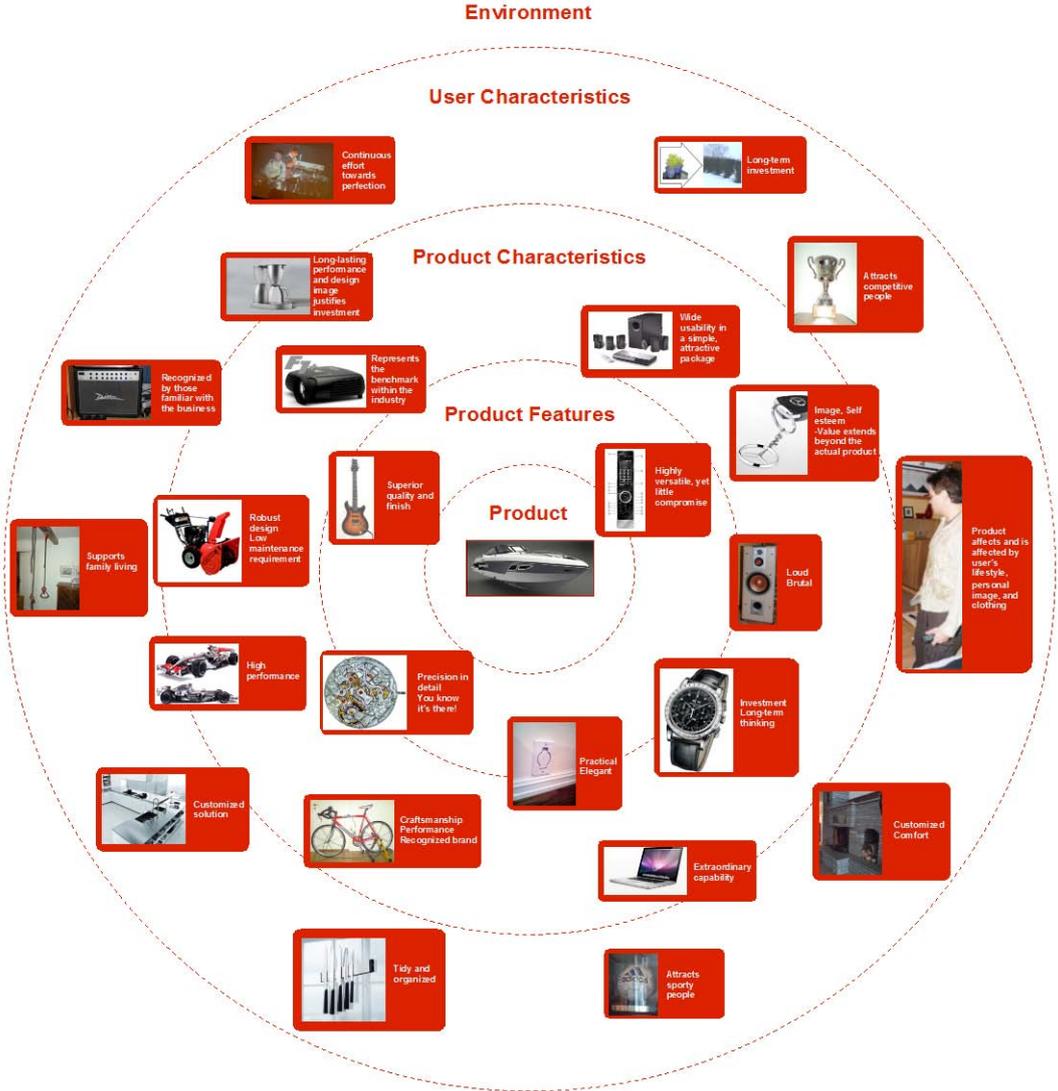


Figure 1 – Value chart

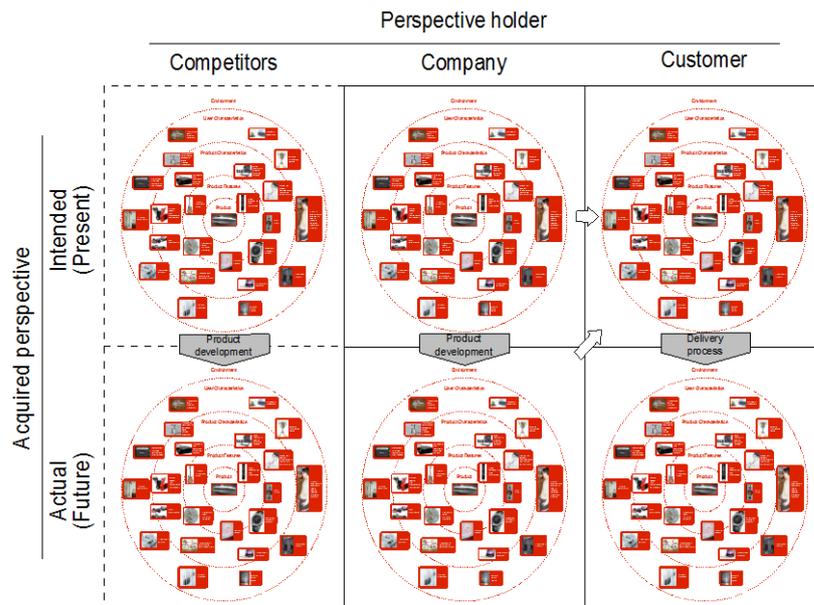


Figure 2 – Perspectives on customer value

Considering Figure 2 in light of data and experiences gained from the Hydrolift project, six phenomena that are contrary to the classical customer value definition of LPD become apparent. While traditional LPD methodology sees value as universal, rational and quantitative, our findings suggest that value is subjective, includes emotional as well as utilitarian aspects, and concerns quantitative, measurable characteristics as well as qualitative characteristics that cannot be attributed to certain product functions or features.

4 SIX CUSTOMER VALUE PHENOMENA

Findings from the interview sessions supported the impression put forward by Hydrolift representatives, that most their customers were either business entrepreneurs or craftsmen, or both. The ‘typical customer’ is a male, 37 to 60 years of age, with a preference for high-quality, solid craftsmanship, racing features and good design. The customer, owner, and user is here assumed to be the same person, as this is common in the Norwegian leisure boat market. Further insights regarding customer profiles and their relationship to Hydrolift will not be disclosed, but it is worth noting that a purchasing decision by large is affected by how well the Hydrolift brand supports someone’s personal values. Furthermore, customer satisfaction tends to be governed by the extent to which the user experience is in line with customer expectations. The following six phenomena observed during the project challenge the traditional LPD approach of customer value definition. Figure 3 illustrates how they relate to the different evolving perspectives the customer value.

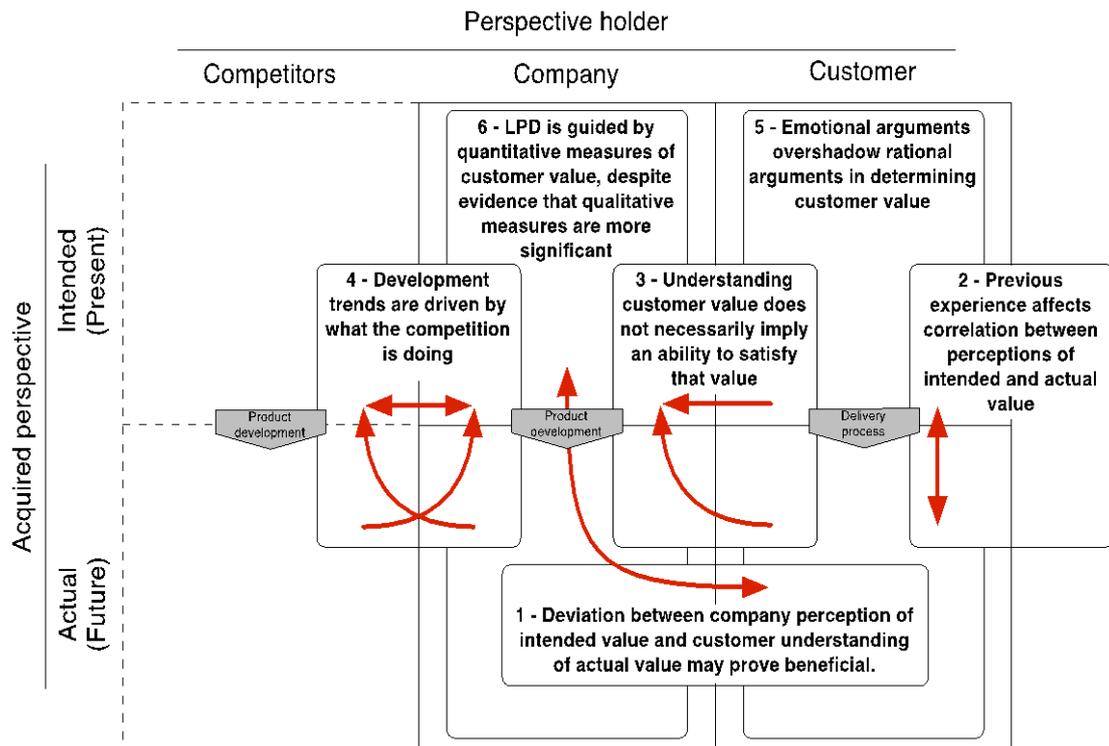


Figure 3 - Observed phenomena in relation to the evolving perspectives of customer value

4.1 Deviation between company perception of intended value and customer understanding of actual value be prove beneficial

There may not be an exact match between company perception of intended value and customer understanding of actual value. That is; the company may develop a successful product in spite of, or even because of, a slightly skewed impression of user characteristics. Rather than describing the customer as he or she actually is, the product may be developed based on who the intended customer would like to be. For example, dealing with a customer group of 37 to 60-year olds, a large fraction of customers do not qualify as athletes. Yet, the Hydrolift marketing material features mostly young, sporty people. Furthermore, some of their smaller models are anything but 'family friendly' in that they offer comfortable seating for two persons only when going at high speeds. Yet, men with families are often attracted to these models. To them, Hydrolift offers a 'time-out' from the ordinary life, providing an experience of speed and adrenalin that they otherwise do not have in their well-established lives. In fact, a number of customers informed that they found the experience of going at full throttle in rough sea relaxing. Focusing entirely on handling the boat tends to take their minds away from the problems of everyday life. Redström [11] supports the idea that there always will be a varying degree of the intended use that governs the design process, and the eventual use of the resulting design. Yet, he does not appear to appreciate the potential benefits associated with developing and marketing products using a glamorized customer image.

4.2 Customer understanding of intended value depends on previous experience

Customer understanding of intended value depends on previous experience. It was found that those with previous boating experience would have a more realistic view of what the ownership experience would be like. Those with less boating experience tended to draw parallels between the experience of owning a car versus that of owning a boat. Most cars are produced in high volumes and large companies put great resources into testing and tooling as part of their development. Boats on the other hand, tend to be manufactured by small companies with less development resources, placing greater emphasis on artisanship. Furthermore, components such as motors, gears, and electronics, are often

developed and supplied by third-party companies. As a result, boats tend to have lower reliability as compared to cars, and handling warranty issues often becomes a complex process where the boat manufacturer ends up as a negotiator between the parts supplier and the end-customer. Experienced boat owners are aware of this situation, but most new customers are not. As a result, the understanding of intended value is closer to the understanding of actual value for those with previous experience, and their satisfaction levels tend to be higher compared to those for new customers. This finding; that the user’s understanding of a product is affected by prior knowledge about similar artifacts, is in line with previous research by Kahmann and Henze [18], Plowman [19], and Chamorro-Koc and Popovic [15].

4.3 Understanding customer value does not necessarily imply an ability to satisfy that value

The ability to understand customer value does not necessarily imply an ability to satisfy that value. Customer interviews revealed insights concerning the users’ characteristics as well as feedback on where improvements could be made. While the latter provided a basis for a great number of incremental improvements, a company concerned solely with this type of development would maintain too much of a focus on low-hanging fruit. Maintaining the same technical base while relying solely on incremental improvements will undoubtedly lead to a steady rise in technical performance. However, the introduction of more significant innovations by competitors will make the current technological base obsolete, no matter how refined it may be. Overall value as perceived by the customer will consequentially drop despite continued product development efforts. Presenting a brand new highly compelling value proposition to customers is about more than merely improving details. As suggested by Verganti [13], being able to interpret how people assign meanings to objects, and understand how the evolving environment affects people’s lives is a prerequisite for introducing radical innovation in meanings. Put in another way; user characteristics change along with the environment, and a company must be able to foresee the effects and the opportunities that lie in that change. Understanding user characteristics is one piece of the puzzle, whereas being able to foresee and satisfy the arising unspoken needs or wants is another.

4.4 Development trends are driven by what the competition is doing

The actors in the Norwegian leisure boat market appear to be very concerned about what the competition is doing, perhaps at the expense of gaining deeper insights into customer needs. Reviewing marketing catalogs and web sites of Hydrolift and its competitors revealed a high degree of similarity in sales arguments. All companies highlighted design, sportiness, exclusiveness, value for money, comfort, and craftsmanship as their strengths. Yet, the impressions from talking with customers and branch specialists, and experiencing the different products first-hand clearly provided a more differentiated view (ref. Figure 4). As can be seen in other markets, no brand is the leader with regards to all aspects of customer value, although the marketing material in this case seemed to suggest so. This finding implies that the Norwegian boat industry is less developed compared to other markets, in terms of defining niches for the different actors. This situation is very different from the car industry for example, where major actors use marketing as a means of associating their brands with specific, often unique, sets of qualities.

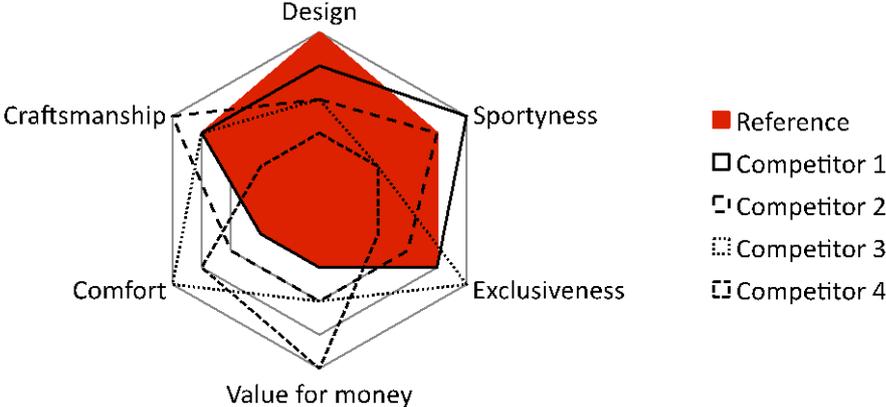


Figure 4 – Spider chart for benchmarking against competitors

The internal ideation event revealed a high degree of consensus among participants in terms of describing customer characteristics, and what the Hydrolift brand represents. A majority of employees recognized the same two brands as main competitors. White-collar workers appeared to maintain a broader view in terms of identifying competition. However, no participant seemed to consider the idea that a potential customer may prioritize investing in something other than a boat, for example a summerhouse or a sports car. This is striking, since a number of ‘hot leads’ have been lost as the potential customer has decided to spend his or her money on something other than a high-end boat. Paying attention to the competition is necessary to ensure that new products offer competitive performance with regards to attributes that are marketed by the competition (e.g. top-speed or range). Relying solely on other companies for setting the scales and benchmarks for product development however, limits the ability to deliver new value to customers. The strategy may work for fast followers, but is not an option for those seeking to become market leaders.

4.5 Emotional arguments overshadow rational arguments in determining customer value

A majority of factors describing customer and product characteristics refer to qualities that are difficult to express as explicit requirements or through ‘hard’ data. However, the tools most frequently used among engineers, such as requirements lists, product standards, and testing protocols, are only applicable for ‘hard’, quantifiable data. Figure 4 shows a spider chart illustrating how Hydrolift and its competitors emphasize different attributes in marketing their products. Marketing brochures and feedback from sales personnel and branch specialists provided the input for this illustration. The categories were identified based on the sales arguments most frequently presented from these sources. Brands were ranged relative to the best performer (benchmark) within each category.

The ranging process was based on subjective impressions among research team members, meaning that the answers are not absolute. The diagram is nevertheless useful in pointing out the scales in which companies are competing, as well as in providing an overview of the market situation. It is worth noting that none of the top six product attributes identified in this exercise can be expressed through quantitative data alone. They are all made up from a number of factors, some of which can be broken down into quantifiable parameters. Figure 5 illustrates how the notion of value for money can be broken down into qualitative and quantitative attributes.

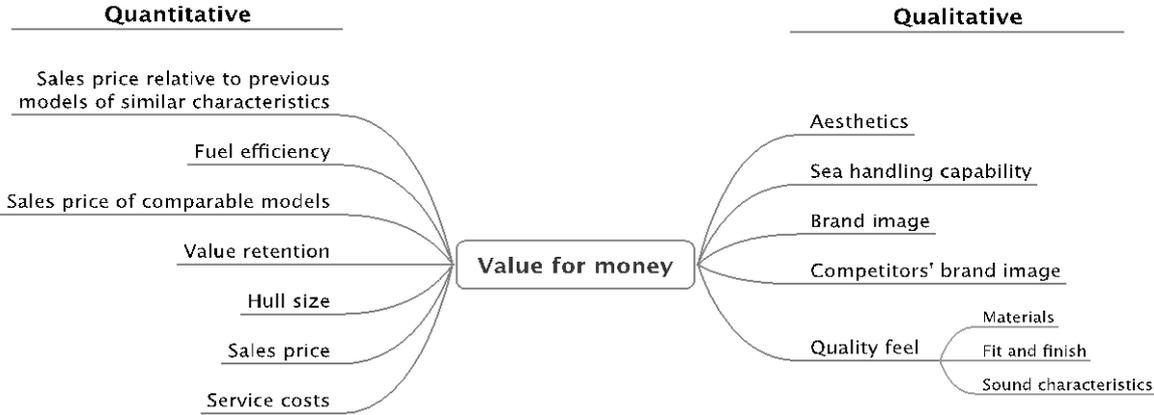


Figure 5 – How the customer impression of value for money depends on qualitative and quantitative attributes

Considering that a purchasing decision much relies on qualitative properties and user experience, it is a paradox that traditional engineering approaches are rooted in targeting quantitative attributes. Company culture, personal impressions of what constitutes customer value, existing technologies, and

earlier products are some of the factors that affect decisions concerning qualitative properties; that is, few guidelines tell people how to act when making decisions that will have an effect on qualitative product attributes. Product development, particularly in the detail design phase, involves frequent decision-making by team members. Most decisions are trivial, and employees may use their own skill, knowledge, and judgment in reaching a conclusion. Considered individually, the effect of each minor decision may be small, but the sum of all decisions can have considerable impact on final product attractiveness. Relying on company culture and replication of qualitative attributes seen in earlier products without any formal means of communicating 'soft' targets in a development program involves risk, since:

1. Company culture changes over time and as people come and go
2. Different departments and groups of people (designers, engineers, managers, operators, etc.) tend to hold different opinions of what the company brand is, and what their products represent, leading to a lack of design strategy deployment
3. Less-than-optimal solutions are unconsciously transferred from previous products through incremental innovation

The lack of robustness in current techniques for acquiring, documenting, and sharing knowledge on 'soft' attributes emphasizes the importance of understanding context-of-use first-hand. As suggested by Chamorro-Koc and Popovic [15], a lack of experience in using the product in its context-of-use, produces incomplete designer and user concepts of a product's intended use and physical features. Building on the idea that the vast number of small decisions in a product development process has a significant effect on the qualitative attributes, understanding the context-of-use becomes a priority for all members of the organization, not just designers. As a consequence, a company is likely to benefit from having product developers that share the same culture as its end-customers.

4.6 LPD is guided by quantitative measures of customer value despite evidence that qualitative measures are more significant

Whereas the value concept in LPD appears to be solely linked to product attributes (ref. Ward [8], and Reinertsen [20]), the majority of marketing material and customer feedback suggested that value relies on the overall customer experience. Regardless of source, this experience was always expressed through a set of qualitative characteristics. Qualitative characteristics cannot be measured directly, as they are dependent on subjective impressions. They tend to go beyond the actual product, being influenced by company image, market rumors, and personal experience. As a consequence, a company should seek to improve the ownership experience by addressing different innovation types, for example by offering improved services or by exploring alternative delivery channels (ref. Doblin, a member of Monitor Group [21]). The bottom line is that there is no one-to-one relationship between customer value and product attributes.

Pine and Gilmore [22] defend the idea that using a product is part of a wider experience, while Jordan [23] and Verganti [13] argue that products are more than tools designed to fulfill a task. "Products are *living-objects* with which *people* have *relationships*. Products are objects which can make people happy or angry, proud or ashamed, secure or anxious" [23]. Consequentially, product developers need to develop an understanding of the experiences evoked by or associated with products [18]. The problem however, is that traditional marketing is utilitarian-based. That is; it concerns what kind of people will buy a product based on its functionality.

Considering findings from the Hydrolift-project as well as the supporting material presented here, a more holistic approach is needed. A true LPD-system must be capable of maximizing emotional value as well as utilitarian value, since a purchasing decision ultimately is guided by how the customer perceives the product relative to both of these value dimensions.

5 CONCLUSIONS

Based on data from the Norwegian leisure boat industry, this study has exposed insights in how employees, customers, and the competition perceive customer value. Our findings suggest that value is subjective, includes emotional as well as utilitarian aspects, and concerns quantitative, measurable

characteristics as well as qualitative characteristics. A value chart (Figure 1) has been developed to communicate the links between environment, user characteristics, product characteristics, and product features. The realization that customer value is subjective and evolves over time has motivated the development of a model (Figure 2) of how different stakeholders' perceptions of customer value relate to each other, and how they develop as experience is gained from using the product. This model explains the six key findings from the Hydrolift-project accompanied by the researchers.

Considering the above findings, we suggest developing the LPD concept into dealing with emotional value as well as utilitarian value. Furthermore, our research indicates that customer value can be delivered through a number of innovation areas, and is not just dependent on product features [24]. We would therefore like to suggest 'Lean Innovation' as a working title for the philosophy of using Lean principles in targeting emotional as well as utilitarian value through a variety of innovation areas. While this study points out the importance of targeting both functional and emotional value in product development, the relative importance of the two will depend on the industry and the specific product development project. Innovations seeking to target and alter the meaning dimension require deep insights in customer value and especially its emotional aspects. This is not necessarily the case for technology-driven innovation, which aims to create functional value. Understanding the position of meaning-driven and technology-driven innovation in different types of industry represents a challenge for further research. The issue of whether these two are the only dimensions driving a sustainable innovation strategy should also be explored. Further insights in *how* emotional value can be maximized are also needed.

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