A TOOL FOR ASSESSING CUSTOMERS' BARRIERS FOR CONSUMING REMANUFACTURED PRODUCTS

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Abstract

One opportunity to address our world's environmental challenges is to change our patterns of consumption towards more sustainable ones, e.g. buying used products, renting products, and joining pools for co-consumption. All of these patterns share at least one point of departure: They imply that people use products that other people have used before. In this context, remanufacturing is a particular opportunity. In principle, remanufacturing means that a used product is industrially renovated in order to assure quality. However, remanufacturing is still just a niche, and the established pattern of consumption and production - involving new products - is very dominant. Reflecting this, there is a need to better understand how to gain acceptance for remanufactured products, and in particular to understand customers' barriers and drivers for consuming used and remanufactured products. Reflecting this background, the tool presented in this paper is aiming to support remanufacturing organisations to get a better understanding about the customers and their possible ways of reasoning when they approach an offer based on a remanufactured product.

Keywords: Sustainability, Circular economy, User centred design, Remanufacturing, Evaluation

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1   INTRODUCTION

"The major cause of the continued deterioration of the global environment is the unsustainable pattern of consumption and production" (Agenda 21, United Nations, 1993). But, what can we do about it? Actually, there are many means and opportunities. Some of them are based on societal norms or are about forming new norms; such as legislation, certifications, ecolabelling, education, persuasion, and lobbying. Along with this, technology development is often seen as an enabler. Furthermore, there is an opportunity to change the patterns of the consumption itself; including buying used products, renting products, and joining pools for co-consumption. All of these patterns share at least one point of departure: They imply that people use products that other people have used before. This can, however, act as a barrier. For instance, a lot of people are reluctant towards wearing clothes that others have worn before. On the other hand, some people have no trouble with this at all, or may even consider reuse as a driver. Moreover, the customers' perceptions may differ depending on the type of product in question. For instance, most people would accept a used car or used tools. However, in most cases the potential customer will be concerned about the condition of a certain used item offered.

In this context, *remanufacturing* (Lund, 1984) is a particular opportunity. In principle, remanufacturing means that a used product is industrially renovated in order to assure quality. Sometimes the remanufacturing process involves upgrading as well. However, remanufacturing is still just a niche, and the established pattern of consumption and production – involving new products – is very dominant. Reflecting this, there is a need to better understand how to gain acceptance for remanufactured products (cf. Hazen et al., 2012), and in particular to understand customers' barriers and drivers for consuming used and remanufactured products (cf. Gaur et al., 2015). This understanding and knowledge is key for the remanufacturing organisation: By increasing the understanding about the customers' reasoning and associated factors, the organisation will be enabled to adapt their processes and products in favour of increased competitiveness. At the same time, this will imply a contribution to a sustainable society.

Reflecting this background, the aim of the tool presented in this paper is to support remanufacturing organisations to get a better understanding about the customers and their possible ways of reasoning when they approach an offer based on a remanufactured product. Specifically, the driving ideas behind the tool are:

- A generally applicable method that can be used by all remanufacturing organisations.
- The method constitutes support for self-diagnosis of the operations, while having the goal of addressing typical barriers for the (potential) customers in their adoption process. In turn the aim is to propose changes in the processes or products.
- The typical barriers found in the method are based on empirical findings.
- The typical barriers are complemented with descriptions of essential mechanisms of the customers' adoption process as well as proposals for action.
- The method is implemented on an e-learning format, and is carried out step-by-step, to make it easy to use.

2   RESEARCH APPROACH

The development of the assessment tool has been done as a sub-project of a larger research project on remanufacturing, funded by Vinnova (the Swedish Governmental Agency for Innovation Systems). The project in full has involved two universities and four industrial companies established in remanufacturing, and the general agenda has been driven by the potential of sharing and utilising knowledge of involved parties. A specific ambition has been to provide methods that are useful in the partner companies' operations. Over time, it turned out that two of the companies had particular interest in the customer domain, and therefore, the development of the tool presented here has been done in collaboration with these two companies in particular. Overall, the development process comprised of:

1. Empirical study to understand the partner companies' operations and needs as well as to explore customers' attitudes and reasoning about remanufactured products.
2. Synthesis of method and implementation in an on-line tool while both considering empirical findings and aiming for applicability in the partner companies' operations.
3. Pilot implementation at two dedicated partner companies and evaluation regarding validity of content, ease of use, and usefulness in the organisation.

Figure 1 summarises the information sources of the empirical study, and their respective purpose. Initially, a pre-study including visits at all of the four involved companies was done. Thus, observations along with unstructured interviews were done, and notes were made in a log book. Next followed a customer- and user-oriented study involving multiple information sources (cf. Yin, 2014), where a survey using on-line questionnaires was the most central. The questionnaire was designed and managed using standard software; SurveyMonkey (www.surveymonkey.com). The distribution of the questionnaires was done via Facebook and email, encouraging forwarding to further recipients, thus aiming for a heterogeneous sampling strategy (cf. Robson, 1998). In the questionnaire, the respondents were asked to indicate their acceptance of different product types as remanufactured. They were also asked to explain *why* – in their own wording in order to minimise researcher bias. These explanations were later categorised by the researchers using KJ-analysis (originated by Jiro Kawakita), and sub-categorised as barriers and drivers for consuming remanufactured products. All in all, the questionnaire was filled out by 135 individuals and the KJ-analysis included 735 statements.

The next step of the project was synthesis of the assessment tool. The associated method framework was brought about by essentially reflecting the customer's adoption process (cf. Rogers, 1995), all the way from being aware of the existence of, through considering, to using a remanufactured product. The content, in particular the barriers and drivers for consuming remanufactured products, was derived from the preceding empirical study, but also generated by logical reasoning. The actual on-line tool was implemented using the software Quizworks Online Assessment Tool (www.onlineassessmenttool.com). Finally, the assessment tool was introduced to the two dedicated partner companies and evaluated. This was done through a two-hour session on-site at respective company, and involved both observation of the tool in action and a semi-structured interview. In both cases, the respondents were sales managers, thus representing key informants (cf. "purposive sampling strategy", Robson, 1998).
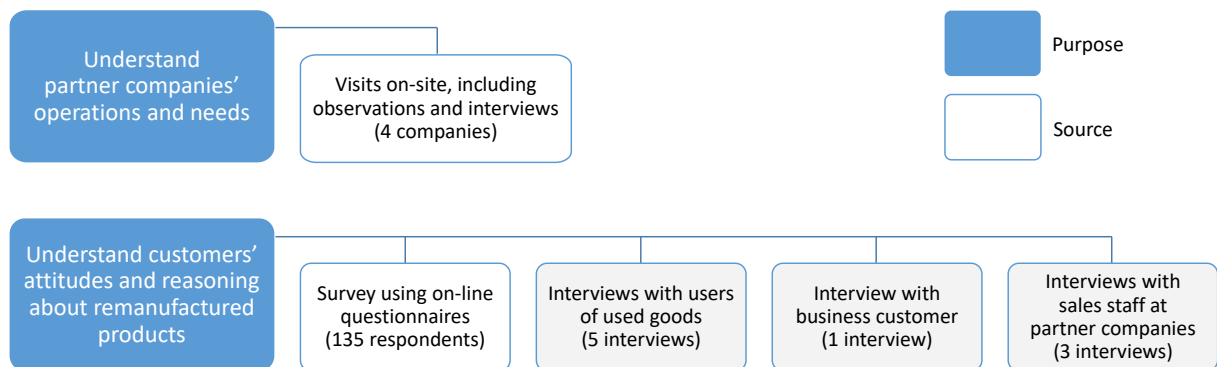

Figure 1. Information sources of the empirical study and their respective purpose

3 PROPOSITION: A TOOL FOR ASSESSING CUSTOMERS' BARRIERS FOR CONSUMING REMANUFACTURED PRODUCTS

This chapter presents the central contribution of the paper: A tool for assessing possible barriers for customers acquiring and using remanufactured products, intended to be used for self-assessment in a team within a remanufacturing company. While the method is based on internal self-assessment, a precondition for use is that the team adopts a customer-empathetic attitude.

In the tool, the team will initially encounter a number of statements representing barriers for consuming remanufactured products, and are prompted to rank how relevant they are. When the team has finished this questionnaire, a summary will indicate a number of areas with potential for improvement. Each of these areas is also complemented with descriptions of some of its mechanisms, as a food for thoughts.

In the overall sense, the output of the assessment constitutes input to the company's processes for communication, marketing, remanufacturing, customer support, and possible R&D.

The assessment tool is designed to address one product category only (e.g. smartphones, printers, etc.). If the company provides more than one category of products, the team needs to decide on which of these that is in focus for a particular session before proceeding.

The assessment tool as accessed and used at:

https://www.onlineassessmenttool.com/remanufacturing-assessment-addressing-the-customer-in-acquiring-and-using-remanufactured-products/assessment-36641 (Rexfelt and Almefelt, 2017).

Below, the full content of the tool will be presented. Thus doing, the aim is to provide an authentic representation of the content as well as to provide *transferability* (cf. Guba and Lincoln, 1989), i.e. allow readers to possibly apply the concepts in their own contexts. Furthermore, the linguistic style is kept as presented in the tool, thus reflecting the envisaged user, i.e. a team within a remanufacturing company.

3.1 Statements representing barriers

The statements representing barriers are organised in the form of a questionnaire. The team will encounter in total 22 statements and is prompted to indicate the importance of each. Five examples of the 22 statements are:

- "The potential customers are not aware that this product category (e.g. system cameras, smartphones, printers, etc.) can be acquired as remanufactured on the market."
- "The potential customers need to change their habits in order to acquire, use and dispose remanufactured products of this category."
- "The potential customers are aware that this product category can be acquired as remanufactured, but generally undervalue it in relation to new and/or used products."
- "The potential customers are worried that the remanufactured products we offer might suddenly fail or break down."
- "The potential customers have difficulties understanding our remanufacturing process and the benefits it conveys."

Along with each statement there are four assessment options given, and you are prompted to select the one that best reflects the opinion of the team (while envisioning the customer's perception). The four assessment options are identical for all 22 statements, and are:

- "A significant problem".
- "A minor problem".
- "Not a problem/Not applicable".
- "Don't know".

3.2 Result of assessment of the statements

When the team has assessed all 22 statements in the questionnaire, a result page will appear, see example in Figure 2. The result page is organised according to ten different areas, with possible potential for improvement. A high percentage represents a great potential for improvement and vice versa. For each area, there is also a "Learn more" link that leads to "food for thoughts" on the topic.

Figure 2. Example of a result page after assessing the statements (2 of 10 areas shown)

3.3 "Food for thoughts" addressing the ten areas for potential improvement

The "Food for thoughts" (accessed by clicking on the "Learn more" links) are compiled from empirical findings (observations, interviews and external questionnaires) as well as theoretical mind-sets. They are intended to stimulate further discussion and reflection in the team. The following ten areas are addressed (same areas as on the result page):

1. Visibility
2. General practicality
3. General perception of value
4. Assortment
5. Perception of the offered products
6. Initial impression of company/organisation
7. Initial impression of the offered deals
8. Transparency of the offered products
9. Customers' experience of acquired products
10. Customers' experience of the company, after sales

Referring to these ten areas, the following sub-sections will present the contents of "Food for thoughts".

3.3.1 Visibility

"Visibility" is about awareness, i.e. are the potential customers aware that your remanufactured products are available to them? This can basically be considered a marketing challenge. The purpose of marketing is thus to increase visibility. One can also reason in terms of "critical mass" – if the market volume of a certain product category (e.g. a remanufactured IPhone) increases, then the visibility will automatically increase, and finally the opportunity will be commonly known. Tips to increase visibility include:

- Be visible in market channels typically used by customers when they are about to acquire a product of a certain category. Examples: Market places (global or local) on the internet (e.g. eBay), in stores (e.g. Best Buy), through the company's sales staff and homepage, fairs, lectures, etc.
- Take inspiration from good examples in sectors and companies that are well-established within remanufacturing. Example: Marketing of remanufactured IT-products; Inrego (www.inrego.se).
- Utilise the environmental benefits of remanufacturing for boosting marketing. In addition, environmentally conscious individuals and companies are potential "early adopters". There are also consumers that are willing to act as "ambassadors" for more sustainable consumption.

Along with this, some aspects to reflect on are:

- Can the remanufactured product be found in the same market channels as new products of the same category? Should it?
- Can it be found in the same channels as used (but not remanufactured) products of the same category? Should it?
- If the remanufactured product has unique channels, why aren't these noticed?
- Which mechanisms for "visibility" exist, and which of these could be used?

3.3.2 General practicality

General practicality is about the ease or the difficulty that a customer/user experiences when acquiring, using and disposing a product. Consider for instance someone who gives up ownership of their car, and joins a carpool instead. The cars may still be very similar, but practicalities of these two use-patterns are very different. Important aspects in the context of practicality are:

- *Habits*: If the customers need to change their habits in order to acquire, use and dispose remanufactured products this process of changing habits may reduce the practicality. This may apply even if the new way of doing things (after the change process) is more hassle-free.
- *Visibility*: If the remanufactured products are less visible to the customers, it can be less practical to acquire them.
- *Technical compatibility*: A remanufactured product may be of an older model that no longer has the same support or compatibility as a newer one.
- *Trialability* (cf. Rogers, 1995) and *testability*: Customers' negative perceptions may be overcome through a risk-free trial with suitable support from the organisation behind the product offer.

Some questions to reflect on are:

- How do our potential customers 'live their lives'?
- Will acquiring/using/disposing a remanufactured product from our organisation make their lives easier/more difficult? How?
- Do the potential customers need to go through a process of change in order to acquire/use/dispose remanufactured products? How can we help them get through it?

3.3.3 General perception of value

General perception of value is about a remanufactured product's attractiveness to the potential customer, i.e. the customer's perception of the product's performance and cost. Note that perception of value may apply both to an attitude towards remanufactured products in general, or towards remanufactured products of a certain category (see Figure 3, left). Here the focus is on the latter.

The most important aspect of value perception is relative advantage, i.e. how the customers' rate the value of a remanufactured product in relation to other offers (cf. Michaud and Llerena, 2011). Note that customers can have different points of reference when thinking in terms of relative advantage. For remanufactured products the point of reference could be both new products and used (but not remanufactured) ones. Figure 3, right, describes schematically how a customer compares the performance of a product offered as either new, used or remanufactured. Note that the 'length' of the arrows is highly dependent on the customer's perceived effectiveness of the remanufacturing process (cf. Hazen et al., 2012). This perception, along with price and the general practicality of buying the remanufactured product, are central aspects when discussing the customers' general perception of value. Some aspects to reflect on are:

- Which are the potential customers' points of reference when assessing relative advantages?
- Do they perceive your offers as being better? If not, are they right or are your offers not transparent?
- Remember that relative advantages is not only about performance and cost! Positive aspects that remanufacturing may convey are e.g. sustainability, an increased practicality (e.g. immediate delivery), products with history, or products that have proven themselves effective in use.
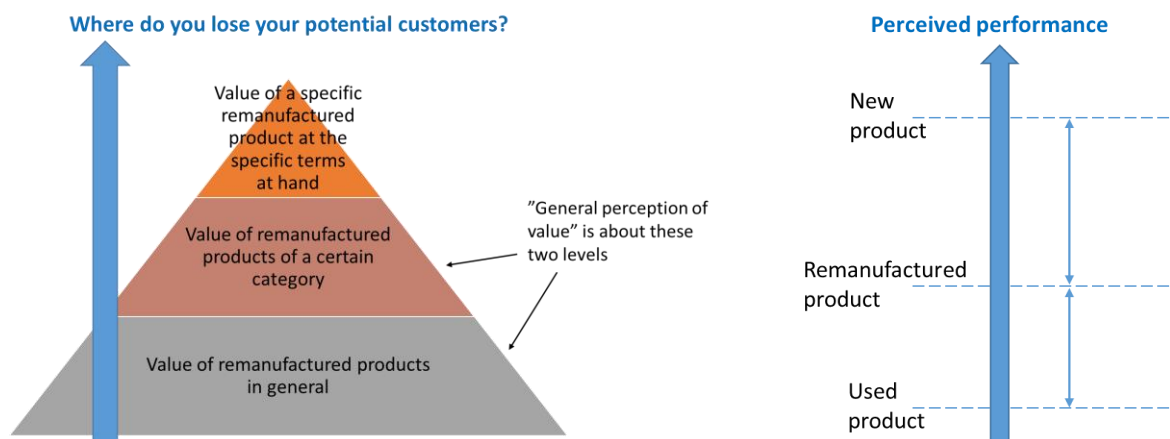

Figure 3. General perception of value (left), and the points of reference in comparing the performance of a product offered as either new, used or remanufactured (right)

3.3.4 Assortment

Assortment is about the products you offer, and how they match the customers' demands. The major challenge is "supply vs. demand": Alignment of available product assortment (regarding e.g. brand, model, # units) versus demand may be particularly challenging in a remanufacturing organization, since the incoming flow of goods is often irregular and difficult to control. In this context, it is highly valuable to have knowledge about both customers' demand of certain products and how these products can be sourced. An inherent conflict is that popular products are more difficult to source and acquire. Here, a possible strategy is to work with different market segments, but also to deploy a remanufacturing process that assures that also older products are good enough or even comparable with the most demanded products. Another way of reasoning is to "sell by having a better understanding of the customer's needs than what the customer itself has"; "For you a three-year old PC is fully adequate, but with a new OS installed. Thus, it will also be less expensive for you". Some aspects to reflect on are:

- Are there any possible means to alleviate the effects of irregular inflow of used products?
- Is a stock of goods a possible solution, and if so, what are the consequences?
- What products (e.g. brand, models, and #units) are demanded by the customers? Why these?
- What alternative ways are there to source these products?
- In what ways can one compensate for poor availability of a certain product, and how can one argue for and suggest an alternative product to the customer?

- Does the remanufactured product assortment imply any "unique selling points", and is it even superior in addressing the customers' needs, compared to the corresponding brand-new assortment?

3.3.5 Perception of the offered products

Potential customers may have a passive opposition against acquiring a remanufactured product. This may spring from the concern that the product will have poor performance, low reliability, or soon become outdated. On the other hand, there are potential customers that are attracted to acquire a remanufactured product, and examples of reasons do not only include "value for money", but also, e.g., "the perception of making a more personal choice". The graph in Figure 4 shows aspects that potential customers may consider when approaching a purchase of a remanufactured product. It is based on the results from a 2015 survey (see Chapter 2) with ordinary people. They were asked to choose which 3 out of 9 product types that they would be most likely to accept buying as remanufactured, and which 3 they would prefer not to. The 9 products types were everyday products such as mobile phones, suitcases, clothes and hand tools. When stating what product types they would (or would not) be likely to accept as remanufactured, they were asked to explain **why**. The topics of these explanations were then clustered into the 21 categories seen in Figure 4, and the number of statements were counted.

Some of these topics are typical **barriers**, i.e. things that could make a customer negative towards a remanufactured product. These are mostly related to the life length and function of the products, but also hygiene (see "Barriers" in Figure 4). These worries can however be **alleviated**, if for instance the product's condition is easy to inspect (see "Alleviators" in Figure 4). Then there are **drivers** that can make a customer interested in acquiring a remanufactured product. Some of these are straightforward (such as "value for money") while others are more veiled, such as the thought of increasing consumption without spending more money or deteriorating the environment more (see "Drivers" in Figure 4).

This knowledge about the customers' perception of the remanufactured products, and in particular about perceived barriers for consuming them, constitute valuable input to the company's processes for communication, marketing, and remanufacturing. By actively addressing these aspects in the company's processes, the remanufactured products will (in the long run) be perceived more attractive by more customers. Some aspects to reflect on:

- Is the customers' concern that our remanufactured products are inferior (in relation to new products) justified? If "No", is our communication effective? If "Yes", is our remanufacturing effective?
- A remanufacturing company must have full understanding about why used products of their product category are rejected, and spend effort on restoring and improving corresponding product properties via remanufacturing. Do our processes address this?
- If one has development and manufacturing in-house, one has further opportunities to influence, e.g. enhancing the remanufacturing process by designing the product for remanufacturing. What possibilities do we have to affect the design?

3.3.6 Initial impression of company/organisation

The impression of the company; the perception of the company's "image", greatly affects how prone a potential customer is to go further in the process of acquiring a product. This way of reasoning is probably applicable to any company, but can be seen as particularly relevant for companies whose product offers are more unknown to the customers. Since customers in general are more used to consume brand-new products rather than remanufactured, it is particularly important for a remanufacturing company to actively work on building trust. The issue of trust can be tackled from at least two different perspectives – the company's *competence* and *motives* respectively:

- A concrete way of building trust in the company's competence is to let the customer try a product (cf. "Trialability", Rogers, 1995), for instance for free during a limited period of time. Alternatively, the customer gets the money back if the product did not meet expectations. Thus, the customer's scepticism is alleviated. At the same, the customer will get used to consume the product in question, including contacts with the company's support function.
- A complementary way of building trust is to clarify the company's motives, e.g. the ambition to be "a good player in society" by contributing to a sustainable development. Thus, the company can concretely communicate environmental benefits or that it cares about many different customers in society (see e.g. Inrego, www.inrego.se).
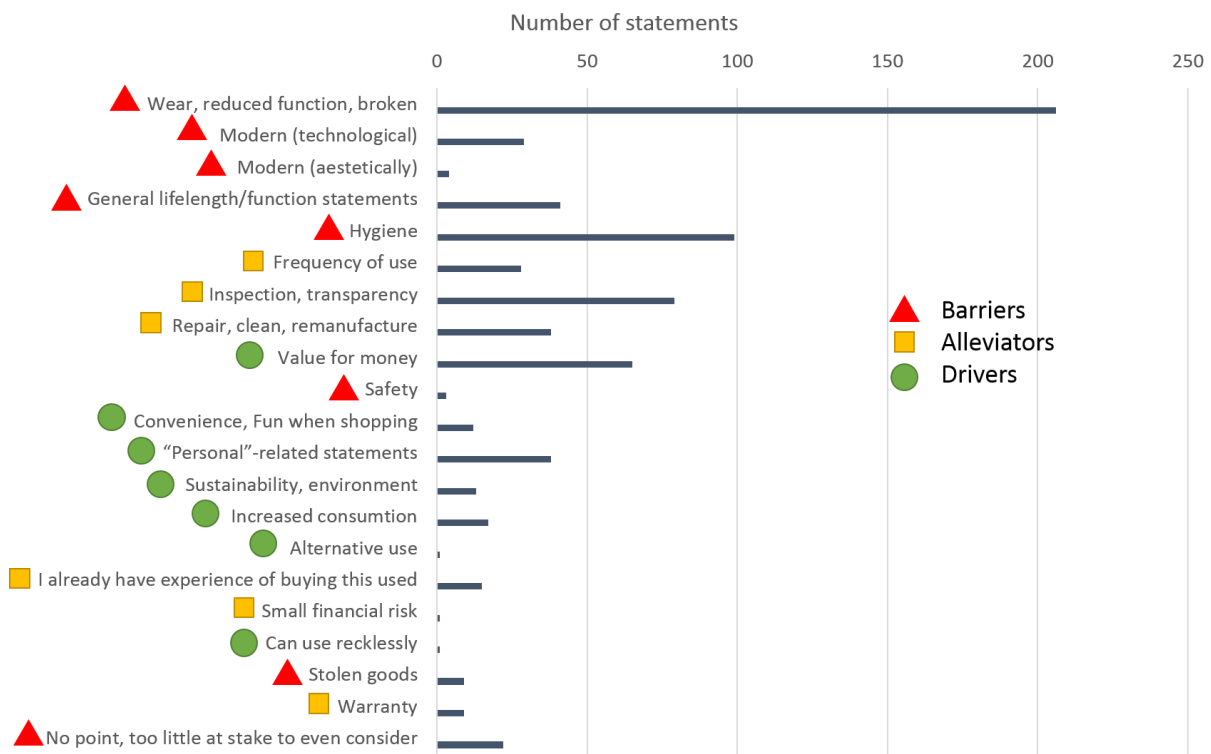
Figure 4. Perception of the offered products: What is on the customers' minds?

3.3.7 Initial impression of the offered deals

"Value for money" and "risk" are central aspects when a potential customer is approaching a particular product offer. "Value for money" is indeed an opportunity in the case of a remanufactured product, and that opportunity should of course be highlighted in marketing. At the same time, the company needs to actively address the customer's possible concerns about taking a greater risk. Here, warranties and customer support play important roles, but it is also important to describe how the remanufacturing process assures product quality. Figure 5 illustrates some essential mind-sets on the topic:

- The variation in terms of performance, reliability and price is inherently larger for used products than for new ones. Therefore, the potential variation in terms of "value for money" is also larger.
- The customers should be given the perception that they can make a bargain (right dark area).
- At the same time they must not fear ending up in the dark area to the left. This can be cared for through good remanufacturing, warranties, customer support, etc.
- Reasonably, the remanufacturing must assure quality of the product in order to at least end up in the light area ("Rational").
- The dark areas may be related to more "irrational" perceptions. The excitement of a possible bargain, or the fear of getting scammed, may be disproportionally high in the customers' minds.
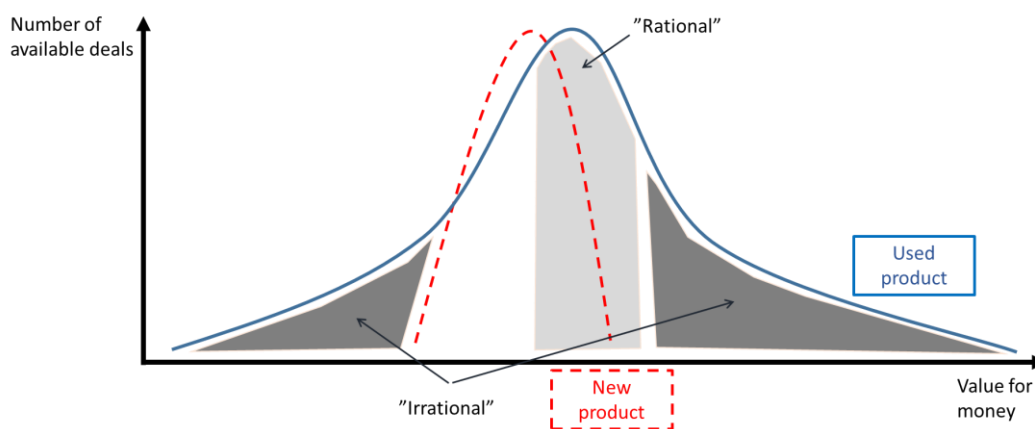

Figure 5. The increased range of perceived value for money

3.3.8 Transparency of the offered products

Generally speaking, "transparency" is about describing things in a way that makes it possible to see through them. Here we focus on the transparency of the actual product offer, since good transparency alleviates anxiety and passive opposition against acquiring a product. This is particularly relevant in the context of remanufacturing, since it is reasonable to assume that used products, and probably remanufactured as well, have larger variation than new ones, in terms of both performance and condition. At the same time, it is important to point out that the purpose of the remanufacturing is to assure product quality regarding performance and condition, and thus minimize the variation among units. Some communication strategies in order to increase transparency of the product offer are:

- A detailed description of the model's performance and "track record".
- A detailed description of the unit's condition.
- A detailed presentation of the remanufacturing process assuring that all units are in good condition.

3.3.9 Customers' experience of acquired products & experience of the company, after sales

The customers acquire products for a reason, and that reason is using them. The basis for a positive experience of an acquired product is that it meets (or exceeds) one's needs and expectations. Here, again, transparency of the product offer plays a central role, since the description of the model's performance and the unit's condition constitute the starting point for the expectations on the product. Nevertheless, a customer may accept quite a lot of hassle as long as the tale ends happily. If a certain product or a certain unit appears to be unreliable or defective in some respect, the company needs to correct this. In the long run, of course, satisfied customers are the key for growth, and satisfied customers automatically become the company's ambassadors, and may serve as references. Some strategies to favour the experience are:

- Marketing and customer support that help the customer selecting an appropriate product.
- Transparent description of the unit's performance and condition.
- Effective customer support for correcting mistakes or defects on products.
- Continual customer support in order to maintain a good relation with the customer in the long run.

4 EVALUATION AND DISCUSSION OF THE TOOL

The assessment tool has been validated and evaluated on site at two companies that have been part of the project. Below, the researchers' observations as well as the respondents' thoughts are summarised.

4.1 Validity of content

In general, the content of the assessment tool seems to correspond well to reality and the experience of the respondents. Consider the two responses from respective company representatives below:

"The content does very well!"; "Most of it feels right!"

However, some individual contents have limited validity. For instance, this applies to the graph "Perception of the offered products: What is on the customers' minds?" (Figure 4). While the graph indeed stimulates discussion, and the aspects as such seem valid, the *magnitude* of the aspects are probably not true for all product categories. Consider for instance expensive products, such as a car. Then, the importance of "Warranty" should reasonably be more significant in the graph. Moreover, some missing details were identified in the "Food for thoughts", and these was subsequently added to the tool. For instance, regarding "General perception of value" as well as "General practicality" it was found that "immediate delivery" is a particular opportunity for remanufactured products (since they already exist).

4.2 Format of the tool

As stated by the respondents, the tool's "e-learning format" fits well in a team working in a conference room equipped with a large screen. In particular, it is easy to use and overview. However, it was found that some images are not visible in full, which forces scrolling. In addition, it would be good to have a "comment box" along with the assessment of the 22 "statements representing barriers". The structure of the actual method implemented in the tool seems appropriate. The respondents appreciate the way of putting and assessing the initial 22 barrier statements, the assessment result's clustering into ten problem areas, and the subsequent opportunity for "Food for thoughts". In particular, the bullet points with "aspects/questions for reflection" in the end of each "Food for thought" were appreciated. Nevertheless, potential for more method steps was identified; e.g. support for compiling an action list.

4.3 Usefulness of the tool

The tool was found very useful in driving discussion and capturing reflections. In addition, the questions were found understandable and possible to answer. Overall, the company representatives are positive about using the tool (cf. "verification by acceptance", Buur, 1990), as seen in the following statements:

> *"I will take it to the management team, actually. I have sent the link already. It makes one reflect. Possibly one should take it to the sales team as well. Then one will reflect."*

> *"Provides input to discussion, creates discussion. Really exciting, this is exactly what we were interested in within the project, and that you presented something that we actually can use."*

However, also limitations were stated:

> *"Bringing this tool to the sales team, it could happen that there will not be any concrete output, because everything does not apply to their everyday lives. It wouldn't work in the production."*

Finally, the respondents were asked about the necessity of having a method coach (cf. Norell, 1992). They don't think this is necessary, provided that the tool has been introduced to someone in the team.

5 CONCLUSIONS AND FUTURE WORK

Reflecting needs of society in general and remanufacturing firms in particular, this paper has presented a tool for assessing customers' barriers for consuming remanufactured products. The framework behind the tool has a step-by-step logic and the content is driven by empirical findings. The implementation is done in e-learning format. By systematic exploration, the tool supports the firm in gaining understanding about different customer aspects and their importance. In addition, enhanced learning is obtained by taking e-lectures. The format as such drives the process ahead and is perceived self-explanatory. Overall, the tool stimulates discussion and reflection, in turn providing input to the remanufacturing firm's processes. In the long run, this favours both attractiveness of remanufactured products and profitability. The tool has been introduced at two remanufacturing firms and its applicability has been tested with promising results. However, it needs to be tested in more organisations for further refinement and validation. Moreover, potential for more method steps was identified: For each aspect/question in the e-lectures there should be answer options in order to support the team in making concrete decisions.

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