Abstract
In this paper a holistic customer value approach is suggested that deals with the "how", "why", "when", "where" questions from a customer’s point of view. Moreover a cluster and correspondence analysis is performed using 200 innovations selected from various industries. It illustrates the relevance of the three dimensions that characterize the current innovation landscape: contextual relevance (why, when and where), personal/ environmental relevance (who) and behavioral change (how).

Different types of dependencies may be created between these dimensions to create new value to the customer. Making one move along one of these dimensions, may induce opportunities to make new moves along other dimensions. Therefore trade-offs and synergies between the "what", "who", "why", "how", "when" and "where" context should be analyzed in depth.

Several examples are given in this paper.

Keywords
customer value, ideation, innovation, dependencies

Customer Value and Ideation
New, market-driven product ideas are often inferred from customer needs and environmental changes. Many ideation and product development tools based on customer needs have been discussed in the literature. For instance, the house of quality in the Quality Function Deployment approach lists customer needs, which are translated into design attributes. A matrix indicates how needs and attributes interrelate. An additional roof matrix deals with possible contradictory or reinforcing attributes that are needed to fulfill all customer needs (Hauser and Clausing, 1988); Griffin and Hauser, 1993).

Goldenberg and Mazursky (1999a) state that, instead of analyzing customer needs, analyzing the product itself allows future demands to be predicted. Analogous to Darwin’s theory of natural selection, it can be argued that given the changing needs of the marketplace over time, the products that will survive are those that adapt to the changing environment through alterations in their own attributes. The characteristics of a product can be divided into components (objects such as the legs of a chair) and attributes (variables of the product, such as colour and height). A distinction can be made between internal attributes and components, controlled by the manufacturer, and external attributes and components, characterized by the customer context (for instance the weight of the person sitting on the chair).

Goldenberg et al. (1999a and b) define templates characterizing intrinsic changes in product configurations. One of their templates operates in the context of attributes. An attribute dependency matrix can be defined in which the columns consist of external components/attributes and the rows of a mixture of internal and external components/attributes. The confrontation of rows and columns may lead to new ideas which are based on interdependencies between previously unrelated components/ attributes (for instance the presence of urine and the appearance of a colour on a diaper). A step (level-related) function may characterize a dependency as in this example (the appearance of colour depends on the level of urine).

The other four templates in the Goldenberg et al. study operate in the context of components. Components can be removed, replaced, divided, etc. This may induce changes in the product’s functionality (maintaining, changing, removing functions, etc.). Goldenberg et al. (2001) observe that “successful” products tend to fit one of their dependency templates and involve a clear solution to a customer problem (offering functionality).

There is a clear difference between attributes and functions. Attributes can be described using adjectives (transparent, big, etc.), while functions can be described using verbs (it allows customers to “do” things) (Christensen, 2005).

Increased functionality may be created by various kinds of changes to product attributes. For instance (Kotler and Trias de Bes, 2003):

- Improvement of existing attributes
- Reduction of existing attributes
- Elimination of existing attributes
- Creation of new attributes.

Creation and elimination may be combined in case of replacement (Foster and Kaplan, 2001). Refinement of existing attributes may be another option (Horowitz, 2001).

Lastly, increased functionality may be created by “combining/bundling” multifunctional attributes (creating
dependencies). This can be achieved in several ways:

- Various complementary attributes, previously incorporated into different products, may be bundled into one new product. Cristol and Sealey discuss various integration levels (see Cristol & Sealey, 2000 and Sawhney, 2004).
- The other option is “nesting”, in which one attribute or function (previously independent) is incorporated or covered by another, is also a bundling option.

Sometimes a product may need to serve a double purpose, creating contradictions (attributes or functions that cannot be combined). The consumer may expect different functions from the product at various places or moments. Altshuller defined inventive principles, called TRIZ principles, to deal with these kinds of contradictions (from a technical point of view) (Altshuller, 1988; Hipple, 2005).

Towards a New Customer Value Ideation Approach

The ideation approaches discussed in the previous section mainly focus on dependencies between and across components, attributes and functions (see figure 1, below). The key question answered in these approaches is: “What” is offered to the customer?

The real value of an innovation is determined by the experiences and actions customers face in using or buying products and complementary products at a certain moment, place and time (Cooper, 2000; Prahalad & Ramaswamy, 2003; Sawhney et al., 2006; Forsyth et al., 2006; Woodhead, 2007). It involves various external aspects of the customer context: “what” the new product can do for the customer, “why” they can use it (new applications), “when” and “where” it can be used or bought, “who” is involved and what actions have to be performed by the customer (“how”) (see figure 2, next page).

Kim and Mauborgne (2000) use an ideation approach in which utility levers such as simplicity, convenience, ... are contrasted with different stages of the experience cycle. It may be perceived as a matrix combining a “what” and a “when” dimension of customer value.

The stages in the experience cycle are:

- Production: e.g., creation of T-shirts by customer
- Pre-purchase (knowledge): e.g., CD box with button that allows listening to part of the music
- Purchase: e.g., order and pay for food through text messaging
- Delivery: e.g., language course by phone
- Use: e.g., ergonomic pan
- Supplements: e.g., car coating against dust
- Maintenance: e.g., public loaders for mobile phones
- Storing: e.g., folding carton toys
- Disposal: e.g., reused expansion barrel (of burner) in design (as a seat).

In today’s rapidly changing environment the customers’ reference framework becomes more holistic as they are facing substitute offerings from various industries dealing with similar customer problems (Dahl and Moreau, 2002; Kim and Mauborgne, 2000; Flint, 2002). Customer also experience many influences from their social context (for instance, government implementing regulations for increasing environmental friendliness).

Within this reference framework the customer will evaluate the gains and losses of new products (Logman 2004, 2007; Haksever et al., 2004 and Braet and Verhaert, 2007).

Benefit drivers (gains) may be:
1. Simplicity/usability
2. Performance/capability (due to increased performance of existing functions or the creation of new ones)
3. Fun
4. Customization/segment adaptation
5. Environmental friendliness (positive influence on society)
Cost drivers (losses) may be:
6. Customer costs of adoption (monetary and nonmonetary such as search as search efforts)
7. Customer disadvantages (unwanted or undesired functions in all contexts)
8. Customers costs of use (monetary and nonmonetary such as behavioral change/tasks to be performed)
9. Customer productivity/time
10. Customer risks (unwanted or undesired functions in some contexts)

Three dimensions seem to characterize today’s customer value in particular.

**Loss and Risk Dimension**

Losses customers will incur in switching to new products often outweigh the gains from using them. This has been extensively studied in the literature on framing effects and loss aversion (Kahnemann and Tversky, 2000, p. 45-46).

Contrary to many studies on losses, a clear distinction is made in this study between reduction of losses (unwanted properties or functions), which are relevant in all circumstances/contexts (indicated as disadvantages) and those that are relevant in some circumstances/contexts (indicated as risks).

Several risk categories can be distinguished:
- Personal health: for instance, ergonomic products that diminish physical risks
- Personal safety: for instance, bicycle that decreases the risk of lurching
- Financial security: for instance, option to try out new product before buying (decreasing the risk of a wrong buy)
- Environmental comfort: high contrast projector usable in overlit rooms, etc.

The risk exposure will be the result of the probability of the context and the customer impact. For instance, a person driving a car may experience increased risks in situations of fatigue (Mueller et al., 2002).

Therefore risk is related to the “where”, “when” and “why” dimensions of the customer context.

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**Figure 2. Holistic reference framework of customers.**
**Behavioral change dimension**

Verryzer (1998) finds that changes in consumption patterns (being highly correlated with familiarity and risk accordance) are key factors in affecting the customer's evaluation of new products.

Resistance may occur in particular when characteristics of the new product imply a change in behavior (more actions or more complicated actions to be performed by the customer) (Gourville, 2006; Calantone et al., 2006).

Innovations may imply shifts in the functions/tasks between company, customer, product and complimentary products in various ways (see figure 3).

(c) Shift between customer and company:
- From customer to company: for instance, the company performing actions/jobs previously accomplished by customer (e.g., in B2B handling customer storage, etc.) (Sawhney and Balasubramanian, 2004).
- From company to customer: for instance, in the context of customizability (providing increased customization options to customer).

The other arrows in figure 3 indicate possible shifts between products/services of complementary players in the value chain and the interaction between these complementary offerings and the customer.

All these shifts are related to the “how” dimension of the customer context. It would be expected that task shifts from the firm/product to the customer induce the highest customer resistance. Von Hippel (2006) however observes that there also seems to be an increased interest in customizability (customers creating their own tailor-made solutions and hence not being resistant to extra tasks if they add personal value).

**Environmental Dimension**

Finally there is growing pressure to deliver products and services that are environmentally compatible (Gupta, 1995). Pollution prevention, waste management, etc., are examples of these hot topics. Trends such as social responsibility, environmental friendliness, etc., involve various stakeholders (government, NGOs, companies pursuing corporate social responsibility, etc.).

The individual in relation to society refers to the “who” dimension of the customer context (Michell et al., 1995 and Bessant et al., 2005).

Based on these insights the following hypothesis is defined:
Today’s value innovations (from a firm’s perspective) are probably driven by three consumer related dimensions:
- the contextual relevance
- the type of behavioral change
- the personal versus environmental impact.

Empirical Study

Two hundred innovations (sample size) were used to analyze which value drivers are relevant in distinguishing various types of innovations.

The contribution of the “contextual”, “behavioral” and “social” dimension (as discussed above) to this categorization was analyzed in more depth.

The innovations were selected:
- Partly from a business magazine that makes a selection of worldwide innovations each week (period selection: 2005-2007)
- Partly from the Creax innovation database (see www.moreinspiration.com).

Innovations were selected from various industries:
- Communication
- Mobility
- Lifestyle
- Food and beverage
- Wellness
- Home living
- Entertainment

An additional set of observations related to B2B (industrial) innovations was also included.

The first objective in the sampling procedure was to have a proportional distribution across all industries (as indicated in Table 1). The second objective was to have a proportional distribution between the class of benefit and the class of cost drivers. In our sample 142 observations of innovations were detected that focused on at least one benefit driver. On the other hand, 118 observations were detected that focused on at least one cost driver.

Initially a cluster analysis was performed. Two categories of customer impact dimensions were included in the analysis, respectively dealing with:
- Value locus (cost and/or benefit drivers)
- Behavioral changes related to the innovation (shifts of functions/tasks)

Five variables were included within the category of benefit drivers/gains and five within the category of cost drivers/losses (see previous section for the description of the ten variables).

Moreover three moves in task shifts were included to deal with the changes in functions/roles between the company, the product and the customer: no or limited change in tasks, more tasks and fewer or less complicated tasks.

A binary scale was used for all variables (showing the characteristic: yes or no). Coding of each of these variables is based on trade press information in which the advantages and directions for use of the new product are described. Of course, in reality the benefit drivers and cost drivers make sense only from the subjective experience of the customer. E.g., what is “fun” to one customer might actually be scary or aversive to another.

Table 1. Frequency table across all industries

<table>
<thead>
<tr>
<th>Industries</th>
<th>Number of Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication</td>
<td>22</td>
</tr>
<tr>
<td>Mobility</td>
<td>23</td>
</tr>
<tr>
<td>Lifestyle</td>
<td>24</td>
</tr>
<tr>
<td>Food and beverage</td>
<td>25</td>
</tr>
<tr>
<td>Wellness</td>
<td>24</td>
</tr>
<tr>
<td>Home living</td>
<td>31</td>
</tr>
<tr>
<td>Entertainment</td>
<td>24</td>
</tr>
<tr>
<td>Industrial (B2B)</td>
<td>27</td>
</tr>
</tbody>
</table>

A hierarchical cluster algorithm was run. The five cluster solution yielded the best results in terms of significance and meaning of the various clusters. Table 2 summarizes the distribution of number of observations across clusters.

These clusters were then used in a correspondence analysis. Looking at “the principal inertia information”, it was found that three dimensions explained 86.2% of the total variance (dim 1= 34.4%, dim 2= 29.4% and dim 3=22.8%).

The principal inertia is the weighted average of the Chi-squared distances from the centroid to the projections of the row profiles on the respective principal axis. It is an absolute measure of the dispersion of the row profiles in the direction of that axis. Each principal inertia can be decomposed into components due to each row profile (or column profile). Rows, which contribute highly to a principal axis, largely determine the orientation and the identity of the corresponding principal axis.

Analyzing the contribution of all clusters and attri-
Figure 4a. Biplot of correspondence analysis.

Dimensions 1 and 2

Symmetrical Normalization

Attributes:

Increase in:
1. Simplicity/usability
2. Performance/capability (due to increased performance of existing functions or the creation of new ones)
3. Fun
4. Customization/segment adaptation
5. Environmental friendliness (positive influence on society)

Decrease in:
6. Customer costs of adoption
7. Customer disadvantages (unwanted or undesired functions in all contexts)
8. Customers costs of use
9. Customer productivity/time
10. Customer risks (unwanted or undesired functions in some contexts)

Change in customer tasks:
11. More customer tasks
12. Fewer or less complicated tasks
13. No change in customer tasks
Figure 4b. Biplot 2 of corresponding analysis.

Dimensions 1 and 3

Symmetrical Normalization

Attributes:
Improved:
1. Simplicity/usability
2. Performance/capability (due to increased performance of existing functions or the creation of new ones)
3. Fun
4. Customization/segment adaptation
5. Environmental friendliness (positive influence on society)

Reduced:
6. Customer adoption costs
7. Customer disadvantages (unwanted or undesired functions in all contexts)
8. Customers user costs
9. Customer productivity/time
10. Customer risks (unwanted or undesired functions in some contexts)

Change in customer tasks:
11. More customer tasks
12. Fewer or less complicated tasks
13. No change in customer tasks
butes to the inertia of these dimensions, the following ob-

- Dimension 1 was mainly influenced by the task-re-
  related attributes and the benefits “customization”
  and “fun” (cluster 2 and 4 explained 89.8% of this
dimension).
- Dimension 2 was mainly influenced by the “envi-

- Dimension 3 was mainly explained by the risk at-
  tribute (covered in cluster 5 and explaining 78.7%
of this dimension).

The biplots visualize the five clusters and attributes re-
lated to these dimensions (see figures 4a and 4b, next
two pages).

In table 3 (next page) the five clusters are discussed in
detail.

These empirical insights seem to confirm our theoreti-
cal findings that contextual relevance (in some versus all
circumstances), behavioral changes and personal/environ-
mental influence characterize to a large extent today’s in-
novation landscape.

These dimensions may be related to the 5W/1H ques-
tion oriented ideation approach (see figure 5, below).

“Who” refers to the people involved as a result of the

value proposition: individual persons, different family
members, the society, etc.

“What” refers to the advantage itself (benefit and/or
cost drivers).

“When” refers to a specific stage of the customer ex-
perience cycle (purchase, delivery, use, etc.) or a moment
within that stage (for example new moment of use).

“Where” refers to the location where the experience
stage takes place.

“Why” refers to the scope of application (reasons for
buying the new product).

“How” refers to the tasks to be performed by the people
involved.

Interesting product ideas may result from a combina-
tion of all these dimensions. For instance, in case of the
“Phone Languages” example, removing displacement for
the customer (how?) not only provides simplicity/more
productivity to the customer (what?), but also allows in-
creased customization (what?). Moreover, the customer
can decide “when” and “where” he wants the course by
phone. Some innovations may induce changes in the people
involved (who?). For instance, a bicycle with a back wheel
that doubles, when the bicycle almost stops may be safe for
children learning to ride a bike (removing the task of run-
ning for mom or dad).

Several dependencies between all these customer value
dimensions may be created to induce new products. For in-
stance, two types of dependencies may be created between
the change of customer tasks (how dimension) and the
benefits in terms of productivity/time (what dimension).

(a) A change of customer tasks may lead both to more
simplicity and a time/productivity gain (two aspects of the
what dimension). The following examples illustrate this:

- GoMobo is a firm dedicated to improving ev-
everyday life for on-the-go consumers through
the innovative use of mobile technology. It
develops new products allowing customers to
pre-order food online or via text message.

- Degussa has developed a unique surface refine-
ment technology called Top on Top. Surfaces
treated with Top on Top are easy to clean and
remain clean for months. The new technology
significantly decreases the effort required to
keep surfaces clean and reduces the amount of
cleaning agent needed. It also makes surfaces
highly dirt- and water-repellent. As a result,
dirt no longer sticks stubbornly to the surface,
while water and oil bead into droplets that can
easily be wiped away. This reduces the time
that has to be spent on cleaning.

- Mobile Notetaker is a device to capture natural

Figure 5. A customer value ideation approach.
handwriting from any surface, and store it for future use. Based on a revolutionary electronic pen that uses ordinary ink refill and writes on any paper, the PC NoteTaker stores handwritten notes, memos or drawings for easy upload to any computer at your convenience. Additionally, if Mobile Notetaker is connected to a computer, handwritten text and drawings are displayed directly on the computer screen. This saves time for the customer.

- The Mac & Cool Quick Cooling Dish begins cooling instantly without diluting the food. No more blowing on hot food is needed by the parent (saving time and people involved)

(b) Sometimes a change of customer tasks may lead to more simplicity for the customer, but not to a time/productivity gain.
- The Swedish company Bokilur allows you to listen to audiobooks on your cell phone. No more reading is necessary. It is simple, but not necessarily saves time.
- The N300 is a simple product that can assist to combat ear discomfort associated with flying in an otherwise normal ear.

It also should be noted that a change in tasks not necessarily has to be behavioral, but also may be cognitive in nature. The MD.2 pillbox, which is about the size of a coffee-maker, not only dispenses medications, but also has an audio feature that reminds patients when it’s time to take their medication.

Lastly, the empirical study shows that attribute/function dependencies (as in the Goldenberg et al. studies) may have entirely different customer value implications.

For instance Design Barcode turns standard barcodes into appealing and engaging brand elements, using a shape for the barcode that corresponds to the product content. In this example a dependency is created between two attributes of the product: the packaging barcode and the con-

<table>
<thead>
<tr>
<th>Clusters</th>
<th>Value Focus</th>
<th>Behavioral Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cost advantage to society (environmental friendliness) and customer (adoption costs and costs of use)</td>
<td>No or limited change in number of customer tasks. E.g., eco-friendly diapers, energy-friendly window, washer using ozone (less water), water-saving showers, etc.</td>
</tr>
<tr>
<td>2</td>
<td>Fun or customization</td>
<td>Additional customer tasks. E.g., products customized by customer (T-shirts, jeans, etc.); small laboratory-box for doctors enabling them to perform tests on their own, etc.</td>
</tr>
<tr>
<td>3</td>
<td>Increased performance or reduction of disadvantages</td>
<td>No or limited change in number of customer tasks. E.g., navigation system integrated into mobile phone, washer that allows shoe washing as well, search engine allowing Chinese text interpretation using English key words, ear plugs for construction workers filtering traffic noise but not other noises, etc.</td>
</tr>
<tr>
<td>4</td>
<td>Increased customer productivity/simplicity</td>
<td>Fewer tasks or less complicated tasks. E.g., phone languages (language course by phone → no travel needed); smart pill box (warning when to take a pill → not necessary to remember); WashDryIron (washer/dryer/iron in one); color changing ink on egg (indicating when it is ready—not necessary to check time), etc.</td>
</tr>
<tr>
<td>5</td>
<td>Reduction of risks (unwanted properties/functions in specific customer contexts, etc.)</td>
<td>No or limited change in customer tasks. Steering or correcting bicycle (relevant in case of risky bicycle riding), water resistant mobile phone (relevant in some environments such as bathroom), mobile phone option allowing unsending of text message sent, car seat detecting when you fall asleep, etc.</td>
</tr>
</tbody>
</table>
tent. The customer value is fun (what dimension).

Another example is Quooker that allows you to get boiling water straight from the tap (e.g. to drink your tea). It creates a dependency between the temperature of the water and the function (purposed). The customer value is a behavioral change in the way water is boiled (how dimension).

All these examples show that important customer value information may be lost if a product focused ideation approach (focusing on attributes and functions) is used.

Moreover product focused ideation approaches also have important limitations as they do not deal with the complementary product context of the customer. For instance, a touchbook enables a reader to touch the surface of a printed page and retrieve digital content on a computer. This idea could not have been generated if ideation was limited to creating attribute dependencies within the existing product (attributes of a printed page).

Conclusions

The cluster and correspondence analysis shows that value creation and innovating is no longer only about “what” you are offering to the customer (improvements of attributes and functions), but also about changes in the customer context (“when”, “where” and “why”) and the customer process (“how”).

Many studies on context effects deal with the relational properties of “attributes” across and within different alternatives. The insights in this paper indicate that a context is not only about attributes, but also about tasks and risks (relevance) experienced by the customer and about environmental implications.

Our findings are confirmed by the strategies of successful companies. A company such as Apple combines the three customer context related dimensions and operates along the continuum of each of these dimensions.

One hand tasks are removed or made less complicated when new products are introduced (e.g. iPhone with multi-touch display and no other buttons). On the other hand more customizability options (inducing more tasks) are offered. In both cases, value is created. Moreover, different contexts in which a new product may be relevant are identified (e.g. context of phoning, gaming, etc.). Finally, environmental issues are dealt with, such as the needs for more connectivity and convergence of different products, environmental friendliness, etc.

An interesting question related to our insights is: “what is the value growth margin of a product or offering?”.

Studying the flexibility of the product to move further along each of the three contextual dimensions identified in this study, may answer this question to a large extent.

As it is quite obvious that all contextual value dimensions are interrelated, making one move along one of these dimensions, may induce opportunities to make new moves along other dimensions. Therefore trade-offs and synergies between the “what”, “who”, “why”, “how”, “when” and “where” context should be analyzed in depth.

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