Using Early Concept Narratives to Collect Valid Customer Input about Breakthrough Technologies: The Effect of Application Visualization on Transportation

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Abstract

The value of early customer input has long been recognized by companies. However, especially when breakthrough technologies are involved, more insight in valuable methods for collecting early customer input is needed. In this paper, we propose a method to evaluate a breakthrough technology with customers. First, a creative process should point out applications of the breakthrough technology. Applications allow customers to imagine the benefits of the technology behind it. By using early concept narratives, typically scenarios of somebody using and interacting with the application, this imagination process is enhanced. When no prototypes are available yet, it appears that narratives and visuals allow customers to really "see" the new world of the application, a process called transportation, which is a mix of imagery, feelings, and attention. In an experiment in which we make use of a case of an application of a breakthrough technology, we provide empirical support for our claim that early concept narratives could be a valuable tool to get valid customer reactions. Furthermore, we show which kind of visual format the applications should have in order to optimize transportation. The results of this study will support decision making about how to pursue breakthrough application evaluations early in the product development process.

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1 Introduction

Early customer input contributes to successful new product development [for a review of often-used customer research method, see 1; 2], as well as technology forecasting does [3]. In fact, customer input plays a central role in established market research methods for forecasting the success of incremental innovations. When technological breakthroughs are involved, however, technological forecasting based on customer input is problematic [4]. In line with Veryzer [4], a breakthrough technology, also termed radical or high-tech innovation here, is defined as a product which involves dramatic leaps in terms of (1) the product benefits it offers; (2) the technological capabilities it provides; and (3) customers' consumption patterns. That is, a product can be regarded as a technological breakthrough when it satisfies needs that were not satisfied before, when it performs functions in ways that did not yet exist, and when it requires customers to radically change their way of thinking about the product and using it. The key problem is that collecting valid customer input about technological breakthroughs is practically impossible. This is due to the fact that customers are generally unable to accurately understand the functionality and benefits such radical innovations provide. Without a thorough understanding of the innovation and its potential benefits, customers are likely to evaluate it too negatively. That is, more negatively than they would do when they understood the innovation. When this happens, innovation is frustrated [5], because potentially great technological innovations are not recognized as such by customers, which often leads to premature and unwise termination of their development. For example, if customers are asked to evaluate a technological breakthrough like spray-on solar-power cells [6], most of them will not have a clear picture what they are evaluating. They are unable to tell what the potential benefits and risks of this breakthrough are. As a result, they will probably discard this breakthrough technology as science fiction that is not interesting for them.

Customers' inability to understand technological breakthroughs is directly related to the novelty of such innovations and their supporting technologies, and to the lack of reference to existing products. Customers simply cannot imagine what the innovation is all about [7]. Two obvious solutions to this problem come to mind immediately. If customers do not understand what the innovation is about, one could either explain it to them, or one could look for customers that do understand the innovation. To start with the latter, product developers and market researchers have often turned to expert users, or so-called lead users [8] to collect early customer input. The rationale behind this approach is that lead users, in contrast to the average customer, are believed to be able to evaluate technological breakthroughs and to imagine their potential benefits. They are able to do this, because they are well ahead of market trends and have needs that go far beyond those of the average user. Lead users often come up with their own solutions to their hitherto unsatisfied needs. Unfortunately for the problem at hand, there are three major problems with using the input of lead users to forecast the success of technological breakthroughs. First, expert users tend to be over-optimistic about the market chances of innovations [9]. Second, lead users might not be representative for the average customer; their needs might never become the needs of the majority of the customers. Third, lead users are generally hard to find.

Thus, although the lead-user approach has proven to be valuable on occasions (e.g., see [10]), on other occasions market researchers have had no other option than collecting early customer input regarding high-tech innovations by simply explaining to customers what the innovation is first, and then ask them to evaluate it. In order to do so, it is necessary to explain to customers not only what the technological breakthrough is, but also what new functionality and benefits it offers. But as our example of the spray-on solar-power cells has illustrated, customers cannot evaluate a breakthrough technology as such; they can only evaluate the breakthrough technology if it is first translated into a concrete application. In the case of spray-on solar-power cells, such a concrete application would be a sweater coated in the material that could power a cell phone or other wireless devices. Customers would be able to evaluate the solar-power sweater, because it is much easier for them to see what its potential benefits and risks are.

In short, we propose in this paper that a focus on the applications of breakthrough technologies rather than on the breakthrough technologies themselves can close the gap between technology foresight and market research. An application of a technological breakthrough is defined as a fulfillment of a potential need of customers (e.g., powering their mobile devices with their apparel). Applications are seen as important elements of the future

of technological forecasting: “The applications of new technology, rather than invention per se, is the payoff for technology foresight, and this requires understanding of many organizational, market and social factors” [3, p.4]. Furthermore, we propose that the best way to explain applications of breakthrough technologies to customers is through the use of early concept narratives. In this paper we will explain what early concept narratives are, how they can be used to explain high-technology applications to customers, and why they are effective to collect early customer input regarding high-tech innovations. We will present an experiment that was carried out in cooperation with an electronics company in which the effectiveness of three different visual presentation formats of an early concept narrative was examined. The results from this experiment have several practical implications for market research into technological breakthroughs which we will discuss in the final section of this paper.

2 Theoretical Background

2.1 Presenting high-technology applications to customers: the early concept narrative

Once an application has been defined, it needs to be presented to customers. In the case of our solar-power sweater, one straightforward and relatively simple way of presenting it to customers is to describe it in terms of appearance, functionality, and benefits. It will not be that simple for customers, however, to actually imagine the benefits of the sweater on the basis of a description only. For example, how will they know if the sweater is comfortable and not too warm? A second, much more sophisticated way of presenting the sweater to customers is to have them try on a prototype. Obviously, this requires that the sweater prototype has already been developed. This is typically not the case, though. In the early development phase of a breakthrough technology innovation, the new technology either does not exist yet, because it is not (yet) fully operational, or it would be too costly to develop a prototype. Nevertheless, companies need the early input regarding the possible value of an application and regarding the direction into which an application should be developed. In order to be able to provide valid input, Klink and Athaide [11] argue that customers should receive as much stimulus material as possible that reflects the kind of information that would be available in the market place. All of this means that a presentation method is needed in which applications of technological breakthroughs can be presented to customers before they have been developed in detail.

An important characteristic of such a presentation method should be that it stimulates customers' imagination. That is, the method should incite customers to imagine the future value of the high-tech innovation. Early concept narratives, a specific type of future product scenarios, are particularly promising in this respect. Specifically, an early concept narrative is a description and/or depiction in which someone uses a new product(concept) in a specific setting. It includes the usage situation of the product, its benefits, and its attributes. It often takes the form of a story in which a customer uses the new product in a future setting, following a classic storyline with an introduction and an ending. The story can also be accompanied by visual material that shows various design aspects of the product and its anticipated environment. In doing so, narratives evoke imagery [12]; customers can imagine a technology and its potential benefits by seeing it applied in a product, which use is made explicit. In our example, such a narrative would describe/depict a day from the life of the main character of the narrative (for instance, Helen), who uses the solar-power sweater to charge her cell phone while cycling to work, to charge her PDA during a meeting, and to power her MP3 player while jogging through the park after work.

The strength of the early concept narrative method is that it helps customers to look ahead and imagine how the new product could be beneficial to them, even when there is no actual product or prototype available, when customers are lacking knowledge about the innovation, and when they are experiencing great uncertainty about the breakthrough technology and its applications. Some companies have understood the potential of early concept narratives and are using them to explain their new products. Vodafone (www.vodafone.com), for instance, has a future section on its website, telling a story and animating several possibilities of their future technology. This enables their customers to look ahead, to visualize concrete contexts in which the new technology can be used, and to think about potential consequences of the new technology for daily life. Early concept narratives are proposed to be effective because they stimulate customers to visualize the situation described in the narrative, which enables them to give valid product judgments. Indeed, previous research supports the claim that the use of visual imagery in market research causes customers' responses to be more valid in the face of uncertainty. Several studies have shown that the evoked visual imagery can support a customer's product evaluation and make it less negative [5; 13; 14; 15]. For example, Hoeffler [5] showed that when customers lack experience and knowledge about a new product's attributes and benefits, they often use mental simulation (i.e., imagination) to make inferences about these uncertain attributes and benefits in order to predict the innovation's utility. He also found that the preference for a

really new product that was based on mental simulation was consistent with the preference for the new product that was based on actual product trial [5]. This final finding suggests that it is possible to obtain valid customer responses about high-tech innovations early in the product development process by using imagery that is evoked by early concept narratives in market research.

2.2 Transportation in early concept narratives

From the previous section it can be concluded that the effectiveness of early concept narratives depends on the degree of imagination that is elicited by the narrative. If customers are more absorbed by the narrative, imagining more elaborately what the high-tech innovation could mean to them, they will provide more valid product evaluation's afterwards. The degree of absorption into the narrative world is coined transportation. This term is conceptualized by Green and Brock [16] as "a distinct mental process, an integrative melding of attention, imagery and feelings". Transportation was originally described by using the metaphor of a traveler, going some distance from the world of origin, making some aspects of that original world inaccessible and returning to the world of origin somewhat changed by the journey [12].

When transportation occurs, people become fascinated by the story outlined in the narrative, pay less attention to their surroundings, and are less distracted. So, if customers get transported when reading an early concept narrative, they might be better able to shrug off the uncertainties connected with the innovation described in the narrative because the possibilities of the new product show themselves in an ordinary way. As argued earlier, this should result in evaluations of high-tech innovations with high predictive validity; these evaluations should not be very different from those that people would have made if they had been able to evaluate (a prototype of) the actual innovation. In other words, if transportation takes place, early concept narratives can be used to accurately picture the value of an application of a breakthrough technology.

Transportation is more likely to take place when the early concept narrative clearly explains the high-tech innovation, because people need to understand what they are reading [17]. The degree of clarity of an early concept narrative explaining an innovation can be referred to as the degree of realism of the early concept narrative. Realism in the context of customer research refers to the portrayal of objects as they are in actual purchase and usage situations [18]. So, the better the early concept narrative is able to present a real-life picture of

a high-tech innovation, the greater the likelihood is that customers get transported into the narrative, and the better they will be able to provide valid product evaluations.

From a practical perspective, then, it is important to create early concept narratives that are as realistic as possible. In practice, all imaginable types of formats of early concept narratives are being used, from text to full-fledged films. As explained above, the most realistic early concept narrative would be one that presents a picture of how the radical innovation can be used that is as similar as possible to the situation in which the customer would use the innovation in real life. It is posited here that an early concept narrative in the form of a movie is best able to capture real-life usage. The basis for this claim is that film is the most suitable medium to capture the real-life human-product interactions that are particularly relevant when the narrative concerns an application of a breakthrough technology that (per definition) offers new ways of product usage. So, whereas film would be the preferred format type for early concept narratives in terms of realism, the development of such narratives is not always feasible in terms of time, money and effort. When this is the case, alternative visualizations such as animation, pictures, or drawings can be used. People who are confronted with static rather than moving images are generally capable of imagining a story line and filling out the gaps in it. For instance, people appear to have no problems at all with reading comics about virtual worlds. If static visualization formats are used, earlier research of Loosschilder and Ortt [18] suggests that they too should be maximally realistic. They showed that higher degrees of realism of static visualization formats lead to more valid research results; photo quality concept evaluations possessed higher validity than evaluations of CAD representations of the same concept.

To examine the question about presentation format type in early concept narratives more substantially and to study both the effect of static versus dynamic formats, the study that will presented next tested the effect of three different types of application visualizations in an early concept narrative on transportation. The different format types that were examined are a drawn visualization, a photorealistic visualization, and an animated sequence of the story line. In each narrative the same description of the high-tech application and its potential use was given. The three narratives differed only with respect to the way the application is depicted. Based on the argumentation presented above, we predicted that transportation would be strongest for the animated sequence and weakest for the drawn visualization. More formally, the following hypotheses were tested:

H1a Transportation will be stronger when customers evaluate an early concept narrative in the form of a photorealistic visualization than in the form of a drawn visualization.

H1b Transportation will be stronger when customers evaluate an early concept narrative in the form of an animated sequence than in the form of a photorealistic visualization.

3 Methodology

The experiment was conducted in close cooperation with a pre-development department that often uses early concept narratives for breakthrough technologies. For the breakthrough technology concerned here, around twenty applications were ideated, as is common with the early concept narrative method. Some of these applications were quite similar, some were more futuristic, and some required additional technologies to be developed. All applications were carefully ideated, although not (yet) in full detail. The experiment reported here concerned the test of three different types of format of the same early concept narrative about one high-tech application selected from the larger pool of ideated applications. Participants to the experiment were presented with an early concept narrative that consisted of a description combined with pictorial information. The early concept narrative describes the behavior of Jack, a customer who is shopping for an MP3-player in an electronics store. He is comparing different products. During this process, Jack is using a totally new application of a breakthrough technology. The application is an interactive display in a cabinet that assists customers in shops to obtain information on products they are considering. It can also provide product comparisons based on their specifications. This application is innovative because when the display is switched off, it becomes completely transparent, comparable to an ordinary window. In the narrative, we see Jack switching on the interactive screen that consequently provides him with all kinds of information about different MP3 players that are displayed in the store. Out of the set of ideated applications we chose this particular application because its benefits were believed to be clear for most customers. This was important because we wanted participants to our experiment to have at least some expertise about the product category [19].

As noted earlier, three different types of visual presentations were created as stimulus material for the experiment: drawn visualizations, photorealistic visualizations, and an

animated sequence of the story line. The different visual presentations were created as follows. First, from photographs of a user in a shopping situation, drawings were made by tracing the lines and adding color to the surfaces. Next, the elements of the interactive display (lights and interface) were inserted into the pictures and drawings. Finally, on the basis of the photos, an animated version of the storyline was created, in which the interactive elements, such as the lights and interface, were animated. In short, we used a 3x1 between-subjects design. Every participant received only one type of visualization. We refer to these three conditions as drawing, photo, and animation. To get an impression of how these different visualizations looked like, appendix A shows them, but for a different early concept narrative than the one used in the current study[1].

3.1 Participants

A total of 173 members from a non-student customer household panel were approached to participate in the experiment of which 109 (57 female, 52 male) actually participated (response rate of 63%). To represent potential users of interactive displays, participants were selected based on age and education (25-50 years old, middle and high level of education). Participation was voluntary and rewarded with a small financial compensation of about US $2.50 which could be donated to charity or received in the form of stamps.

3.2 Procedure

Data were collected through an internet questionnaire survey. Invitation e-mails with a personal hyperlink were sent to each participant. The questionnaire started with questions assessing gender, prior knowledge of the featured technology (i.e., interactive displays) and of the product domain (shopping behavior). These questions were included as control variables. Next, the narrative was presented in one of the three presentation formats. Participants read and watched the narrative at their own pace after which they filled out a set of questions on evaluation and transportation that were obtained from Green & Brock [16]. The questionnaire took approximately 30 minutes to complete. After having completed the questionnaire, participants were thanked and debriefed and received their financial compensation in the form they chose (i.e., donation to charity or stamps).

3.3 Measures

All variables were measured by means of 7-point Likert-type scales. For an overview of all items, see appendix B and C.

Transportation. The main dependent variable was measured using the three different subscales that were suggested by Green and Brock [16]. They describe transportation as "an integrative melding of attention, imagery, and feelings". The imagery subscale consists of four items and refers to the degree to which people are actually imagining the things that are happening in the early concept narrative. The transportation subscale consists of seven items and refers to the degree to which people feel that they are being absorbed in the story. Finally, the lack of attention subscale consists of three items and refers to the extent to which people either where or where not distracted while reading the early concept narrative. Cronbach's alphas for the three subscales were .76, .70, and .71 respectively (see Appendix B).

Product comprehension. To assess whether the different presentation format types had an effect on participants' levels of comprehension of the high-tech application featured in the narrative, participants filled out 24 true/false items. Some examples are "According to the narrative, using the interactive cabinet helps to get you a discount" (false), "According to the narrative, the interactive cabinet allows you to read your email" (false), or "The interactive cabinet allows you to compare product specifications" (true). Participants could score minimally zero and maximally 24 on this measure.

Narrative informativeness. Participants were asked to indicate on a 5-items scale (Cronbach's alpha = .88) to what extent the narrative was informative about the interactive display and its benefits: e.g., "Knowing what you know now from the narrative, to what extent are you able to evaluate the interactive display?" (1 = not at all; 7 = very much).

Narrative realism. Participants indicated whether they believed that the early concept narrative was realistic on a single item: "Please indicate how certain you are that the interactive display will perform the same in real life as in the narrative" (1 = very uncertain; 7 = very certain).

Covariates. Two covariates were included in the questionnaire. Knowledge of displays was measured by 2 items, after a short clarification about interactive displays that are currently present in public places (Cronbach's alpha = .88): e.g., "In general, how much do you know of all kinds of different interactive displays" (1 = nothing; 7 = very much). Shopping behavior was assessed by means of a 4-items scale (Cronbach's alpha = .67) of

which a typical item was: “I usually compare electronics before I buy it?” (1 = strongly disagree; 7 = strongly agree).

4 Results

The two covariates were included in all analyses reported below, hence we report ANCOVAs. Unless noted otherwise, no significant effects were found for the covariates. To test our hypotheses we conducted three separate ANCOVAs with presentation format type as the independent variable and imagery, transportation and attention as dependent variables. The means are given in Table 1.

- Insert Table 1 around here -

For imagery, no significant effects were found. For transportation the effect of presentation format was significant ($F(2, 103) = 4.49$, $p < .05$). Pairwise comparison tests showed that both the difference between the drawing and animation conditions and between the photo and animation conditions were significant (drawing vs. animation: mean difference = .53, $p < .05$; photo vs. animation: mean difference = .45, $p < .05$). In other words, transportation was equally strong for the drawing ($M = 4.43$) and photo format ($M = 4.35$), but stronger for both of these format types than for the animation format ($M = 3.90$). Thus, based on the results on the transportation subscale, both H1a and H1b need to be rejected. Regarding H1b, the results showed the opposite effect. The effect of the knowledge of displays covariate was also significant ($F(1, 103) = 4.56$, $p < .05$). Correlation analysis shows that there is a positive correlation ($r = .29$, $p < .01$) between participants’ knowledge of displays and transportation. This means that the more knowledge of interactive displays participants possessed, the more strongly they were absorbed in the narrative.

For attention the effect of presentation format type was significant ($F(2, 103) = 3.88$, $p < .05$). In this case, pairwise comparison test revealed a significant difference between the drawing and animation conditions only (drawing vs. animation: mean difference = .84, $p < .01$). Again, these results are exactly the opposite of what we expected, namely that transportation would be strongest for the more realistic animation format. Thus, based on the results for the attention subscale, H1a and H1b are rejected. The effect of the shopping behavior covariate was significant ($F(1, 103) = 5.28$, $p < .05$). This means that participants

whose shopping behavior more closely resembled that of Jack in the narrative (r = .25, p < .01) tended to be less easily distracted from the narrative.

Next to the level of transportation, the degree to which participants comprehended the interactive display was measured. The mean scores for this variable are also presented in Table 1. These numbers show that comprehension was high in all conditions. The overall mean correctness of the 24 true/false items was 22.64, with a minimum score of 19. Comprehension was highest in the drawing condition (M = 23.00), lower in the photo condition (M = 22.54), and lowest in the animation condition (M = 22.38). These differences did not reach significance (F (2, 103) = 2.09, p = .13). Thus, irrespective of the type of presentation format of the narrative, participants understood the interactive display very well. The significant effect found for the shopping behavior covariate (F (1, 103) = 3.93, p < .05) indicates that participants' comprehension of the interactive display was affected by their shopping behavior (r = .22, p < .05). Those participants whose shopping behavior resembled that of Jack in the narrative comprehended the interactive display better.

Additional ANCOVA analyses showed that the visual format of the early concept narrative application had no significant effect on the perceived realism of the narrative (F(2,103) = .34, p = .71). Overall, participants were pretty certain (M = 4.2) that the interactive display would work in reality as it was described in the narrative. The informativeness of the narrative did not differ significantly across presentation format types (F(2,103) = .485, p = .62). The mean was 5.2 on a 7 point scale, which suggests that the narrative communicated the benefits of the interactive display well.

In short, contrary to expectation, our results show that transportation was strongest for the drawn visualisations and weakest for the animated sequence of the story line. The results for comprehension, narrative realism, and narrative informativeness show that all tested early concept narratives, regardless of the visual format of the applications, were capable of making participants understand the possibilities of the application. Moreover, participants evaluated all three narratives as realistic and indicated that they communicated the innovation's benefits clearly.

5 Discussion and managerial implications

We started this paper with the observation that collecting valid early customer input about technological breakthroughs is problematic, because customers are generally unable to

truly comprehend the functionality and potential benefits of such radical innovations. We proposed that this problem could be successfully tackled by presenting customers with early concept narratives in which a particular application of the breakthrough technology is explained. Early concept narratives stimulate customers' imagination and incite them to think about potential benefits of the high-tech application by presenting a possible scenario in which the innovation is used. The outcome of this process is believed to be that customers get a more realistic image of the breakthrough technology and its potential benefits as a result of which they will be able to make more accurate (i.e., valid) evaluations. We further proposed that in order for an early concept narrative to be effective, customers need to be absorbed in it to a certain extent, that is, transportation needs to take place. In other words, the narrative needs to strike the experience of the subjects [17]. The results of our experiment show that transportation into the early concept narrative did indeed take place. Levels of imagery, transportation, and attention were all above the midpoint of the scale. Furthermore, our participants found the narrative realistic; they believed that the interactive display as it was described in the narrative could work in reality.

A key aspect of early concept narratives, and an important point we want to stress here, is that they describe a concrete application of the breakthrough technology rather than the technology itself. This is important because it will stimulate customers transportation and ít will help them to imagine potential benefits of the breakthrough technology. Thus, to create an early concept narrative, the breakthrough technology should be 'translated' into a concrete application and usage situation. More generally, we believe that the use of concrete applications in customer research could be highly effective to close the gap between technological breakthroughs and customers. Indeed, we found that participants' comprehension of the interactive display that was featured in the narrative was high. Participants also indicated that the narrative clearly communicated the potential benefits of the interactive display. These results were of course affected by the specific application that was used in the experiment. One of the main characteristics of the interactive display is that it relates quite well to the shopping experiences of many customers. Nevertheless, differences in shopping behavior of our participants had a significant effect on their comprehension of the interactive display. This finding suggests that during the development of applications companies should focus on customer behavior that is not so completely new that customers cannot relate to it. In this respect, Martin [20] suggests that the customer's background is important for a better understanding of the evoked imagery, as imaginary situations are often formed based on past memories. If, in the creative process of developing an application, it is

not possible to connect to the existing behavior of customers, it will be difficult to define applications that can be used in customer research.

As noted before, it is of the utmost importance that transportation occurs before customers evaluate an application of a breakthrough technology that is described in an early concept narrative. If transportation is too low, the validity of the customers' evaluations will suffer. Therefore, companies that consider using early concept narratives should pay a lot of attention to the development of the narrative. The narrative should describe a person using a specific application in a particular context in such a way that customers in a research setting can imagine themselves actually using the application. In this respect, the importance of pre-testing the transportation levels for a particular early concept narrative before it is used in market research cannot be emphasized enough.

Nowadays, early concept narratives usually consist of a combination of a verbal description and a visual presentation of the innovative application and its use. As far as we are aware, companies use all sorts of different visual presentations, from simple drawings to flashy movies. In this experiment, we examined the effect of three different visual presentation formats (drawing, photo, and animation) on customers' reactions towards the high-tech innovation featured in an early concept narrative. We expected that the narrative format with the highest level of realism, the animation, would elicit the highest transportation and comprehension levels. The results, however, showed exactly the opposite; transportation and comprehension were highest in the drawing condition. How can this result be explained? A first explanation could be that customers can more easily process information with respect to the application featured in the narrative if they are able to define their own pace of studying the narrative and are not forced to follow the pacing of an animated concept. A second explanation has to do with the level of detail found in the drawing format versus the photo and animation formats. Highly-detailed visuals may increase the level of realism of a narrative, but at the same time, they may also draw customers' attention away from the main benefits of the application. The purpose of the kind of customer research that is central to this paper is to gain insight into potentially interesting applications of a breakthrough technology. We believe that too much attention for detail in this kind of customer research should be avoided as the details of the application are less relevant than the more global ideas behind the application. Therefore, we advise companies that wish to include visuals into their early concept narratives for radical innovations to use relatively low-detailed visuals such as simple drawings. Functionality details can be mentioned in the narrative, instead of being depicted. An

additional advantage of such a strategy is that the narrative can be developed quite easily, fast, and at lower costs.

The breakthrough technology that was studied in our experiment concerned an innovation for the relatively short term, say 3-5 years. One could wonder whether the use of early concept narratives would also work for breakthrough technologies that will enter the market in 10 to 20 years, for example. In principle, we do not see any reasons why early concept narratives could not be developed for such future innovations. As a matter of fact, many science-fiction movies contain examples of such futuristic early concept narratives where they deal with new technologies such as space ships, laser guns, and human transportation by means of beams. As the host of science-fiction related Web sites indicate, people seem to have little difficulty with getting transported into these stories and articulating themselves about these technologies (e.g., www.startrek.com, www.starwars.com). The problem from the perspective of market researchers and companies is of course how realistic these futuristic narratives will turn out to be.

This study has given a first indication of the potential value of early concept narratives describing an application as a method in closing the gap between breakthrough technologies and the market. Although various methods for collecting customer input exist (for a review of often-used customer research method, see [21]), only concept testing with expert-users is a serious alternative for the early concept narrative approach. The starting point for both methods is a concept of a breakthrough technology application, and not a blank sheet as is the case for other early customer research methods, such as the Delphi-method [22], emphatic design [23], customer idealized design [24], laddering [25], and ZMET [26]. These methods have all been developed for the purpose of revealing customer needs, not for testing new product concepts. Thus, having customers evaluate early concept narratives constitutes a form of concept testing rather than idea generation. As such, the use of early concept narratives as a means to collect early customer input about technological breakthroughs appears to be a valuable alternative to concept testing with experts, such as lead users, The big advantage, of course, is that in contrast to expert customers, ‘standard’ customers are much easier to find.

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Appendix A - Example of the three different visual formats used in this study

Please note that these pictures represent a different early concept narrative than the one used in the study.

Drawing

Picture

Animation

Appendix B – Transportation items and subscales

	Green & Brock (2000) Transportation scale items 7-point Likert scale (1 = strongly disagree; 7 = strongly agree)	Subscales *		
		Imagery Cronbach's Alpha =.76	Transportation Cronbach's Alpha =.70	Attention Cronbach's Alpha =.71
1.	While reading I had a vivid image of Susan.	X		
2.	While reading I had a vivid image of the interaction between Susan and the cabinet.	X		
3.	I had a vivid image of the described shopping situation.	X		
4.	While reading, I had a vivid image of how the cabinet was performing	X		
5.	While I was reading the text, I could easily picture the events in it taking place.		X	
6.	I could picture myself in the scene of the events described in the text.		X	
7.	After the text ended, I found it difficult to put it out of my mind.		X	
8.	While I was reading, I wanted to learn how the text ended.		X	
9.	I was enjoying reading the text		X	
10.	I found myself thinking of ways the text could have turned out differently.		X	
11.	The events in the narrative are relevant to my everyday life.		X	
12.	While I was reading the narrative, I was distracted by activity going on in the room around me (reversed).			X
13.	I was completely involved in the text while reading it.			X
14.	I found my mind wandering while reading the text (reversed).			X

Appendix C – Dependent variable items (translated from Dutch)

Transportation See appendix B.
Product comprehension 24 true/false items, some examples are: According to the narrative, using the interactive cabinet helps to get you a discount. (false) According to the narrative, the interactive cabinet allows you to read your email. (false) The interactive cabinet allows you to compare product specifications. (true)
Narrative informativeness Knowing what you know now from the narrative, to what extent are you able to evaluate the interactive display? The narrative is clear, it enables me to estimate if the product saves me time while shopping. The narrative is clear, it enables me to evaluate if the product allows me to make choices easier. The narrative is clear, it enables me to estimate if the product provides me with information that is more relevant. The narrative is clear, it enables me to estimate if the product is useful while shopping.
Narrative realism Please indicate how certain you are that the interactive display will perform the same in real life as in the narrative.
Covariates *Knowledge of displays* In general, how much do you know of all kinds of different interactive displays? Compared to your friends, how much do you know of interactive displays? *Shopping behavior* I usually compare electronics before I buy it. Usually I buy the first product that meets my needs. Usually I know which product characteristics are important for me before I go to the store. I often visit electronics related websites before I go to the store.

Footnote 1

[1] Due to reasons of confidentiality, the visuals that were used for the early concept narrative examined in the study cannot be shown.

Table 1 Means and F-Values for Value of customer input and Transportation

	Visual format of application					
	DRAWING N=22	PHOTO N=40	ANIMATION N=47	Overall mean	F-Value	Sign.
Value of customer input						
Comprehension	23.000 (.254)	22,544 (.190)	22.378 (.173)	22.641 (.120)	2,087	.134
Narrative informativeness	5.207 (.238)	4.914 (.178)	5.009 (.162)	5.043 (.113)	0.485	.617
Narrative realism	4.012 (.329)	4.181 (.247)	4.334 (.224)	4.175 (.156)	0,341	.712
Transportation						
Imagery	5.541 (.177)	5.481 (.133)	5.407 (.121)	5.476 (.084)	0.213	.809
Transportation*	4.429 (.176)	4.350 (.132)	3.904 (.120)	4.228 (.083)	4.491	.013*
(High) Attention *	5.554 (.251)	5.061 (.189)	4.711 (.172)	5.109 (.119)	3.882	.024*

*p<.05
Standard errors are in parentheses

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