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# Assessing pricing for a new product concept: PDA + electronic health records + real-time monitoring

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## Abstract

This study is a subset of the broad stream of research dealing with the diffusion of innovation. We focus on pricing-related issues associated with the introduction of a 'new-to-the-world' product. We examine pricing as a pivotal component in the horizontal framework of the business model. After working with the group that developed a new-to-the-world product in the category of Personal Digital Assistants (PDA), we empirically tested a segmentation pricing model with 493 respondents. Results showed that different prices can be used for the same new-to-the-world product, targeted to different consumer segments. Prospective customers were willing to pay an additional amount for each feature that increases the usefulness of the product. An actual US dollar amount was identified for each feature, based on the consumer's rating of its monetary worth. Although the project study focused on new-to-the-world PDAs, the approach is appropriate for similar high-tech consumer products with unique health features.

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## Introduction

The relationship between innovation in products or processes and above-average returns is becoming increasingly interesting for a growing number of industries.<sup>1</sup> Innovation is most closely associated with the development of new products<sup>2</sup> and the driving of competitiveness, in both saturated and developing global markets. Innovation attempts to improve strategic competitiveness and financial performance.<sup>3</sup> Therefore, in many cases innovation is used to reverse trends in declining markets. Innovation as a strategy affects corporate activities surrounding many high-tech consumer products, such as electronic and medical devices.<sup>4,5</sup>

**Innovation is used to reverse trends in declining market**

The ability to develop and manage innovation is critical in corporate efforts to implement their strategies.<sup>2</sup> Innovation links the diverse, multi-silo activities in corporations, and at a specific level it links strategic and tactical levels of actions that the organization takes.<sup>6-9</sup> Large innovative companies have immense market power, as they have greater resources to invest in R&D. The more a company invests in R&D, the higher its reported performance.<sup>10</sup> However, no matter the size of the company, or the speed and rate of innovation, the quality of the product still affects the dynamic of competitiveness in the industry. Strategic implementation is infeasible when the product quality is poor.<sup>11,12</sup>

This study is a subset of the very broad stream of research dealing with the diffusion of innovation.<sup>13-25</sup> The study intersects with the body of work coming out of the organizational strategy field, especially in industries related to information and communications. In such industries, it is argued that the number of competitive forces that the firm faces has exploded, and that technological innovations have accelerated the rate of change.<sup>26</sup>

**We focus specifically on consumer-driven pricing**

This study focuses specifically on consumer-driven pricing issues associated with the introduction of a ‘new-to-the-world’ product, a Personal Digital Assistant (PDA) that can also be used as an electronic dietician, using a procedure that can be adapted to similar classes of problems worldwide. The paper applies conjoint analysis or experimental analysis of ideas, to evaluate both interest and pricing of a new-to-the-world product. We also used the data to segment consumers into ‘mind-sets’ for differential marketing, suggesting a segmentation-based pricing strategy for the product. In the study for the manufacturer entering the market with its core technology, we selected ideas from three different domains, medical equipment, information technology and electronic features of a PDA, to create the enhanced product concept — the ‘electronic dietician’. Respondents evaluated combinations of product features that came from the different domains, creating an innovative nutrition device that contains what consumers want and then goes beyond it.

Conjoint analysis provides the mechanism for identifying ‘what works’ in the product. At the same time, we identified the part-worth ‘dollar value’ of each particular element in this new electronic dietician. Managers have been reported to trust these conjoint part-worths more than subjective ratings of or intuitions about attribute part-worths because the conjoint task has been shown to predict actual market behaviour.<sup>27</sup> The approach provided the client with a system to create and then systematically update the offering.

**Creating value innovation**

The quest for quality flows from top management downward. Product quality means satisfying or exceeding customer expectations.<sup>28,29</sup> The particular form in which quality is described and manifested creates value of quality across an organization.<sup>30</sup> This value is embedded in strategies that embody and reflect the company’s long-term

commitment to its customers and share-holders.<sup>28</sup> In order to create value in the eyes of customers, the company must identify product features for which the customer is willing to pay. The greater the value provided to customers, the more customers will be willing to pay and the stronger the relationship between R&D and above-average returns.<sup>1</sup>

New-to-the-world products have become critical to maintaining revenue levels and market share in increasingly competitive markets. Kim and Mauborgne<sup>31</sup> discuss coupling innovation with value, arguing that value innovation makes competition irrelevant by presenting superior value that is new in existing markets, and creates new markets where competition cannot yet exist. By creating value innovation, a company may commercialize any invention, so that features of the new product will exceed customer expectations. In this effort, value, speed and quality, and most of all applied knowledge embedded in innovations, become pivotal.

This study evaluates a new-to-the-world product and presents a case study linking innovation and value. New-to-the-world innovation represents leapfrogging advancements in product design, often creating significant gains in consumer utility. Such new products are critical, not only because of their ability to become means for market share gain and revenue growth, but also because they change the competitive landscape of the markets in which they are launched.

New-to-the-world products have become critical to maintaining revenue levels and market share in increasingly competitive markets. Examples of new-to-the-world products include the Xerox photocopier introduced in 1952 and the Sony Walkman introduced in 1979. Ultimately, the value innovation strategy is defined as a strategy whereby companies that aim at profitable growth spend less energy on building advantages over their competitors and direct their efforts to providing buyers with a quantum leap in value.<sup>32</sup>

Our specific product is the PDA, the personal digital assistant. Developed almost 20 years ago, the PDA offers a platform for innovation consistent with today's mobile lifestyle. The ever-rapid merging of cell phone technology with computing capabilities makes the acceptance of new PDA ideas increasingly easier.

Today's PDA is often used for 'individual organization tasks', such as managing calendars and taking notes in the field. The typical PDA device is a flat, wirelessly connected computer that is portable, interactive and easy to use. It connects to a network via either a cable to a computer, or wirelessly via a mobile phone or router in a building or nearby area. Currently, connecting a PDA to a network is quite cumbersome. Therefore, most people use them for tasks that do not require constant network access. Many users process personal information on the PDA, for example to manage their address books and calendars. Shared information is most often updated asynchronously.

**New-to-the-world products have become critical to maintaining revenue levels and market share**

**The new-to-the-world type of PDA — an electronic recorder that may be also used as an electronic dietician**

For this study, we worked with a new-to-the-world type of PDA — an electronic recorder that can also be used as an electronic dietician. When going back and forth from one doctor's visit to another, the client can connect his/her PDA to a mobile phone and transfer information to the doctor's office, as well as control and process all nutrition data. In the next sections we describe the development of the PDA.

## **Relevant literature and research propositions**

### **Understanding drivers of acceptance, and the role of design**

Recent studies suggest that marketing and engineering design goals are driven by consumer preferences and engineering capabilities,<sup>31</sup> and that the interaction of business strategy and product design strategy can significantly drive the market performance of new products.<sup>33</sup> Product design is important. Ulrich and Pearson<sup>34</sup> argue that a superior product design, compared to other designs, strongly contributes to the profitability of a new product. Design is important for incrementally improved products, comprising the vast majority of so-called innovation. Recently, Alexander<sup>13</sup> reported that consumers follow through *less often* on positive purchase intentions to buy the newest products than on intentions to buy incrementally new products. Design, part of the incremental, therefore becomes more important.

Systematic experimentation with alternative designs can lead to increased product success.<sup>34</sup> Systematic experimentation calls into play the expansion of one's range of alternatives. When a company explores different options for a product's development, either at the design stages or at the actual prototype stage, the chances are higher of coming up with a winning product, simply because there are many more products or product combinations from which to select the final entry. This array increases the probability of success in creating value innovation. Furthermore, when the products or product ideas are systematically varied into different combinations by statistical design, one can quickly identify the specific feature that drives success (consumer acceptance) or the dual, namely failure.<sup>35</sup>

Experimental design of ideas, a so-called conjoint analysis, empowers the systematic approach to innovation. Experimental design presents respondents with different test combinations of product features, benefits or both. When a respondent sees combinations of ideas for a new product, she simply needs to respond to the specific combination, without having to articulate the reason why. Testing in this manner, with elements taken from different sources and perspectives, allows for rapid innovation, as the ideas from one domain are conjoined with the ideas from another, in order to form a new combination or new-to-the-world product.

### **Understanding price**

Beyond the combination of the features there is the issue of pricing, always a relevant issue when working in new areas. Appropriate pricing becomes a fundamental problem in developing new-to-the world products

**Experimental design of ideas, a conjoint analysis, empowers the systematic approach to innovation**

**Understanding the value that a product brings to different customer segments is essential in determining the price of new-to-the-world products**

after substantiating their unique attribute mix or their combination of technological features to bring customer value. Correct pricing on market introduction is a fundamental decision that may affect and even drive the success of a new-to-the-world product. As a novel product, a new-to-the-world product, by definition, has no clear substitute on the market at the time of its introduction. Therefore, one of the biggest marketing challenges is discovering an appropriate and effective launch price.

Pricing is not a cut and dried science. In one report, 70 per cent of managers indicated that their tendency is to either underestimate or overestimate the value of their products and services delivered to customers.<sup>36</sup> Failure to understand how to price properly can significantly affect the course of the business. Price affects profit. Hogan and Lucke<sup>37</sup> argue that there is less than a 50 per cent chance that new-to-the-world products will hit their volume and profits goals. Thus, understanding the value that a product brings to different customer segments is an essential ingredient in determining the price of new-to-the-world products. Price also affects customer acceptance. Haws and Bearden<sup>38</sup> stress the importance of customer-perceived 'fairness' as affecting product success. Whereas prices that are too low decrease profit margins, prices perceived to be too high create a perception of unfairness among customers, decreasing the demand for the product. Pricing research has attempted to cope with the issue using different methods. Bergstein and Estelami<sup>39</sup> identified four ways in which prices for new-to-the-world products have been set: intuition, direct questioning, conjoint analysis and market testing. In setting prices by intuition, while keeping in mind production costs, management simultaneously conducts internal discussions and determines price by the general consensus about the product price. Some methods use qualitative methods, such as focus groups or in-depth interviews. Other methods use more quantitative procedures. Conjoint analysis has often been used to determine shifts in consumer preferences at various proposed price points.<sup>39</sup> The systematic approach using conjoint analysis educates managers, allowing them to determine the optimal range for launching the new product.

### **Where to test prices and ideas**

The importance of pricing naturally leads to the discovery of the effect by which to test it, and not just to methods. Researchers are by now accustomed to testing reactions to price 'online', and have done so for almost two decades.<sup>40</sup> The speed of feedback using online research allows companies to modify their pricing strategy based on timely reactions of consumers. Online test marketing is most commonly done through company websites.<sup>41</sup> These sites can be stocked with actual new-to-the-world products and can ask consumers for their suggestions.

Online conjoint analysis is one of the newest, and most complex, areas of market research, with great potential for determining the price of new products. Consumers are presented with a series of product features, combined into test products, and are instructed to rate each screen, a test product, in terms of acceptance. Traditionally, price has

**Online conjoint analysis is one of the newest, and most complex, areas of market research, with great potential for determining the price of new products**

been one of these features. Until quite recently, the use of conjoint analysis provided information as to what feature respondents perceived as worth the additional costs.<sup>42</sup> This study considers price in a different way. Here price is the dependent variable. The goal is to identify, through conjoint analysis (experimental design), the part-worth price of each element in the new PDA product. Thus, the pricing is consumer driven, but the objective is to ferret out what the consumer is willing to pay for each PDA feature.

### **The two propositions tested in this project**

**Proposition A:** Customers will be willing to pay an additional amount above baseline for each feature that adds utility. Actual dollar amount can be identified for each feature based on relating the total amount a person would pay to a baseline amount and the incremental amount for the product feature.

**Proposition B:** Different prices can be used for the same product for different consumer segments.

These two propositions were explored in a case study of a specially designed electronic dietician PDA. The single product category (electronic health PDA/recorder) was evaluated for the purpose of understanding a larger class of similar categories representing new-to-the-world products.<sup>43</sup>

### **The contribution of this study**

This study demonstrates the use of experimental design, as part of a novel approach to pricing. This study goes beyond the measurement of estimated shifts in consumer preferences at various proposed price points. It expands the application of conjoint analysis by revealing a possible price strategy for each segment, as opposed to determining only a price threshold or a range. The strategy optimizes profitability by connecting the value of the offering, its price and the customer-perceived fairness. The knowledge extracted from this kind of an analysis enables the enterprise to gain a competitive edge through 'correct' consumer-oriented prices.

## **Research method**

### **Respondents' ideas, and the experimental design**

The study assessed the impact of 20 different elements (ideas/messages), divided into five separate silos, each silo comprising four separate elements. Table 1 presents the ideas. The five silos are:

- Silo A — What the PDA does with respect to health monitoring and health information;
- Silo B — How the PDA works with respect to electronic health records;

**We demonstrate the use of experimental design, as part of a novel approach to pricing**

**Table 1:** Coefficients for the interest and price model

		Interest	Price (US Dollars)
	<i>Additive constant</i>	20	153
A3	Organizes and displays your complete medical history...right at your fingertips to share with your doctor	9	20
A2	Monitors your heart rate and blood pressure	7	12
A1	Monitors your cholesterol and glucose levels	6	12
A4	Works with the new Electronic Health Record Dashboard. Helps you understand your health situation, based on what it monitors and your records	6	17
B1	Automatically notifies your doctor in case of an emergency	4	16
B4	Works all over the world, so you always have your records with you	3	12
B3	Linked to your hospital, so your electronic health records can be easily accessed while maintaining privacy	3	17
E1	Has all of the functions of a typical PDA	3	13
D1	Light weight, compact design...take it anywhere you go	3	6
D4	A medical monitor in your pocket	3	6
E2	Comes with a 1-year parts and labour warranty with Customer Care	2	11
E3	24-hour customer service	2	9
C1	Includes a privacy locking device	2	5
D3	Battery recharges in less than 2 hours	2	5
E4	Live help to assist with device setup	2	10
C3	Information presented in easy-to-read language	2	5
C2	Automatic web access to favourite medical sites like WebMD	1	5
C4	Backs up your information automatically via Microsoft ActivSync	1	9
D2	Comes in a titanium case	1	6
B2	Automatically linked to insurance claims for doctor visits	-1	10

- Silo C — How the PDA interacts with the user to present the information;
- Silo D — Physical features; and
- Silo E — Service features.

The division of elements into silos is a bookkeeping device set up so that any test concept contains, at most, one element from a silo, but often lacks all elements from the silo. In this way a silo can contain elements that are mutually contradictory or do not make sense together, and that, therefore, should not appear together in a test concept. By designing test concepts using silos, researchers guarantee that these elements never appear together. In the subsequent statistical analysis, however, the silos disappear and all the elements are treated separately, as individual ‘free agents’ in the modelling. Allowing incomplete concepts,

absent one to three silos, ensures that there is no multi-collinearity among the 20 predictor variables.

The experimental design is a main effects design, in that each concept element appears three times against different backgrounds provided by the other elements. Each respondent evaluated a unique permutation of the basic experimental design, comprising 25 combinations. Each combination or test concept, in turn, comprised two to five elements. The elements were arranged so that they were systematically independent, allowing for dummy variable modelling using ordinary least squares.<sup>44</sup>

Each respondent evaluated a relatively unique set of combinations, created by permuting the basic experimental design so that the design structure remained the same, but the specific combinations varied. This strategy ensures the ability to create an individual-level model because all respondents evaluate appropriate combinations. Individual-level models ensure that segmentation can be done by comparing the patterns of utility values across individuals.

The permutation strategy ensured that no particular combination could unduly affect the results.<sup>45</sup> This strategy differs dramatically from the more conventional approaches to experimental design, which create a limited set of combinations and then has many people test the limited set. The strategy of permuted design evaluates many more combinations across the entire spectrum of study participants, rather than relying, as traditional conjoint methods do, on a limited set of 25–50 combinations to represent all of the possible combinations.

## **Field implementation**

An e-mail invitation was sent to the i-Novation™ panel, a group of individuals who had previously agreed to participate. These respondents did not consider the invitation as spam. Respondents were motivated to participate by the chance to win a first prize of US\$100 and two second prizes of US\$50 each. Beyond the sweepstakes, however, the topic of the survey was introduced in a manner that tried to make the survey interesting, without giving away too much of the topic and contents.

## **The orientation page and concept screens**

Respondents who clicked on the link were then led to the orientation page for the new product. The orientation page presents the product in general terms while introducing the focus on nutrition. The page explains what the respondent will see, finishing with a discussion of how to answer the rating question (see Appendix A).

In the next phase respondents were introduced to concept screens. Each respondent evaluated 25 screens, comprising test concepts of two to five elements each. An example of a test concept appears in Appendices B, C, with the top screen showing the concept and the rating question for interest. The bottom screen shows the concept, but with the rating question for ‘price’ in US\$. The rating question always appeared before the price question. When the respondent finished rating



the concept on each question, the computer program automatically advanced, either to the next rating scale (price after interest) or to the next test concept.

The study invitation was mailed to 10,000 respondents. Altogether, 644 respondents logged in to participate, while 493 respondents completed the study. The sample size is consistent with that of similar studies.<sup>46</sup> The per cent response (about 4.9 per cent) is approximately what has been observed in other studies when the study was run (late 2007). The completion rate, 76 per cent, is also what has been observed in other studies with other food-related topics, and higher than what has been observed with financial topics, such as credit cards.

The panel comprised more women than men, since women tend to participate in these studies more frequently. Since this was an exploratory study, no effort was made to balance the sample. Rather, the effort was to gather as many interested respondents as possible. The classification portion of the questionnaire allowed the respondent to profile herself, and thus permits us to aggregate respondents by different criteria. These aggregated data will be presented for key subgroups.

The primary objective of the study was to identify how individual elements of the test concepts drive interest in the new product and price. To understand the impact of the different elements requires generation of a simple additive model relating the presence/absence of the elements to the response. This simplest of models, the additive relation, is expressed by the following equation:

$$\text{Rating} = k_0 + k_1(A_1) + k_2(A_2) \dots k_{20}(E_4)$$

In this model, the rating of elements (as defined below) is a weighted combination of the 20 elements, and an additive constant  $k_0$ . Therefore, knowing the ‘condition’ (presence/absence) of the 20 different elements  $A_1 \dots E_4$ , along with the additive constant and the individual weights, allows us to estimate the rating.

Three models were created for the analysis. Each model uses the full set of 20 elements as predictors, but the models contain different dependent variables. The experimental design was developed at the individual level, so that each person’s data could be separately analysed.<sup>47,48</sup> Ordinary least squares regression was used for the dummy variable model, making the outcome (additive constant and coefficients) easy to interpret.

1. Persuasion model — the 9-point rating scale serves as the dependent variable. This persuasion model generates coefficients or utility values to be used for the segmentation.
2. Interest model — the ratings of interest, originally on a 1–9 scale, were transformed into a binary scale, with ratings of 1–6 transformed to 0, and ratings of 7–9 transformed to 100. This transformation is done in the spirit of market research investigations, which trace their intellectual heritage to sociology. The focus of the market

research study is on the *proportion* of individuals in the population who exhibit a certain behaviour. In this case, we look at the proportion of individuals in the population who accept each concept element. The binary transformation changes the focus from metric information about interest (ie how strong is the feeling about the concept) to classification of the response (would the person be interested in the product described, yes or no). After the transformation, we related the presence/absence of the 20 elements to the binary response (0,100) for each individual respondent.

3. Price model — the respondents chose the appropriate price that they thought the manufacturer should charge. The ratings were recoded to the actual US dollars, rather than the original 1–9 rating. Again, ordinary least squares regression was used to create the dummy variable model relating the presence/absence of the elements to the dollar value estimated as the proper price. The modelling was done at the level of individual respondents.<sup>49</sup>

The coefficients for the interest and price models appear in Table 1 in descending order of interest.

The relationship between the coefficient value and T-value appears in Figure 1.

We present some of the observations from the total panel below:

1. The additive constant for interest shows the expected level of interest in the base PDA product, without the presence of elements. This is an inferred parameter, estimated from the pattern of the ratings. For this product, the additive constant is a low value of 20, meaning that only 20 per cent of the respondents would be interested, defined as rating the PDA as 7–9, if no additional information were to be presented. This low level is about the same as seen for credit cards. We conclude that the notion of a nutrition PDA by itself is not a topic of interest. It is the messages about the product features that will drive interest, and not the base idea itself.

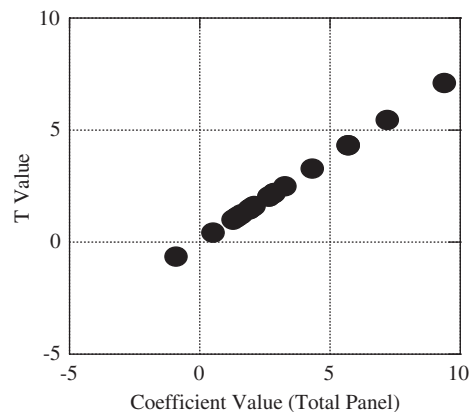


Figure 1: Relationship between the coefficient value and the T-value for the interest model

2. Most of the coefficients are low, around 0, meaning that the selection of features in general does not drive interest. Strategically, it is the few elements that produce a breakthrough that will be important. There are, in fact, a few strong performers, all in the first silo, about how the product works. The most important feature is A3, *Organizes and displays your complete medical history...right at your fingertips to share with your doctor*. The utility value is 9, meaning that we can interest an additional 9 per cent of the respondents in the product by this feature alone.
3. Many of the elements hover around 0. There is one negative element, and even that element hovers near 0 (utility of  $-1$ , *Automatically linked to insurance claims for doctor visits*).
4. With respect to price that a company should charge, the additive constant suggests a base price of US\$153, if no features are presented.
5. Those specific features that deal with the user's health are those that add the greatest value in terms of the price the product would command.
6. Furthermore, price is not a reflection of interest. Respondents have a sense of the 'fair price'. Just because a feature is not highly desired does not mean that its value is down-rated. For example, the feature *Linked to your hospital, so your electronic health records can be easily accessed while maintaining privacy* constitutes only a modest driver of interest to the general panel (utility = +3 for the interest model). Yet, the respondents recognize that this feature should drive up the cost, and think that a feature of this type should command an extra US\$17. We also find this differentiation between interest in the feature and expected price of the feature for the element *automatically linked to insurance claims for doctor visits*. This element is virtually irrelevant (interest utility =  $-1$ ) but yet is expected to drive up the price by US\$10. Interest and price questions, asked in this fashion, do not necessarily correlate. Price is therefore not a redundant attribute.

### **Interest in features among contrasting subgroups (gender, age, health condition)**

The database of 493 respondents allows us to look at the interest in the various features among different subgroups. The results from the total panel suggest that only a few elements score well, and that only two elements achieve utility values above 8. The utility value 8 is an arbitrary cut-off point used by the authors to identify elements that are fairly certain to be 'meaningful' in the marketplace, as observed from previous projects and client reports. In terms of statistics, the utility value 8 corresponds to a t-value greater than 5.0, a highly significant level (see Figure 1).

The results from some key subgroups appear in Table 2. The list of elements has been truncated to the higher performing elements. Elements not appearing did not score 8 or higher in their utility values

**Table 2:** Strongly performing elements among complementary subgroups

	Geo-demographics				Conditions actively being managed							
	Total	Male	Female	30–39 years	60–69 years	Heart disease	Osteoporosis	Gastrointestinal	Diabetes	Arthritis	High cholesterol	Hypertension
Organizes and displays your complete medical history...right at your fingertips to share with your doctor	9	8	10	11	8	12	12	11	17	11	11	13
Monitors your heart rate and blood pressure	7	7	7	3	8	11	14	11	9	9	13	13
Monitors your cholesterol and glucose levels	6	7	6	3	10	2	13	8	20	7	14	11
Works with the new Electronic Health Record Dashboard. Helps you understand your health situation, based on what it monitors and your records	6	8	5	11	2	5	11	6	13	6	8	10
Has all of the functions of a typical PDA	3	3	3	8	0	5	-1	7	1	5	3	3

in any subgroup presented. We show the elements that perform well, but in the interest of readability we simply show those elements achieving a utility of +8 by putting an X in the appropriate cell in the table.

1. Gender shows little difference. Men are slightly more receptive than are women to the notion of a dashboard for electronic health records (utility of 8 versus utility of 5, respectively).
2. Younger and older respondents (ages 30–39 versus ages 60–69) show higher additive constants than do respondents in the middle age ranges (not shown). Older respondents are interested in the product as a monitoring device, whereas younger respondents are more interested in the product as an information device, and react positively to the notion of electronic health records (utility of +11).
3. Condition being actively monitored makes a difference. Keep in mind that the product was positioned as a nutrition-oriented product (personal dietician). We see the highest basic interest from the respondents among those who are actively monitoring heart disease (additive constant=41), and the least among those who are actively monitoring hypertension (additive constant=28). These additive constants are substantially higher than the undifferentiated total panel (additive constant=20).
4. All respondents who actively monitor a condition respond strongly to the monitoring capabilities for heart rate and blood pressure, and to a lesser extent to monitoring cholesterol and glucose.
5. As might be expected, respondents with diabetes, followed by respondents with high cholesterol, are most strongly responsive to the ability to monitor cholesterol and glucose level.
6. Responses to electronic health records are mixed, although all positive. The strongest responses come from those actively monitoring diabetes, perhaps because they are aware of their conditions every day, and have to take steps in order to actively maintain their health.

One of the key foci of this paper was estimating the price an interested respondent would pay for this new technology, and whether a respondent who could actually use the product for medical conditions currently being monitored would be willing to pay more. We saw that each of the features commands a certain amount of willingness to pay, even if the respondent did not necessarily find that feature to be of particular interest. As such, Proposition A has been confirmed, confirming willingness to pay different prices by different segments for the same product.

We can explore three different groups that might be intuitively expected to have radically different demands for the electronic dietician. One group comprises those individuals who are not monitoring anything. The other groups are those who are monitoring diabetes and high cholesterol, respectively. The latter two subgroups

are presumably conscious of their diet because their condition can be controlled through proper diet.

These three groups show different patterns of attaching a dollar value to the features. We selected only those features for which the respondents would be willing to pay US\$15 or more, based on their response to the second question (which instructed the respondent to select the appropriate price).

Table 3 presents the price contribution of different features for three groups. We see that those not managing any medical condition would be willing to pay US\$160, and are really paying only for the ability to

**Table 3:** Price contribution of different features for three groups, monitoring nothing, monitoring high cholesterol, monitoring diabetes

	Not monitoring anything	Cholesterol	Diabetes
Additive constant (base price without price contributed by features)	160	142	150
<i>Not monitoring anything</i>			
Organizes and displays your complete medical history...right at your fingertips to share with your doctor	16	21	30
Linked to your hospital, so your electronic health records can be easily accessed while maintaining privacy	15	22	12
<i>Monitoring cholesterol</i>			
Linked to your hospital, so your electronic health records can be easily accessed while maintaining privacy	15	22	12
Organizes and displays your complete medical history...right at your fingertips to share with your doctor	16	21	30
Works with the new Electronic Health Record Dashboard. Helps you understand your health situation, based on what it monitors and your records	13	21	26
Automatically notifies your doctor in case of an emergency	12	21	13
Monitors your cholesterol and glucose levels	8	17	21
Has all of the functions of a typical PDA	12	15	10
Monitors your heart rate and blood pressure	7	15	17
<i>Monitoring diabetes</i>			
Organizes and displays your complete medical history...right at your fingertips to share with your doctor	16	21	30
Works with the new Electronic Health Record Dashboard helps you understand your health situation, based on what it monitors and your records	13	21	26
Monitors your cholesterol and glucose levels	8	17	21
Monitors your heart rate and blood pressure	7	15	17

organize their health records in an electronic form. Those actively monitoring a condition clearly linked with nutritional state (high cholesterol and diabetes) show a more complex pattern. Both groups want physiological monitoring of cholesterol, glucose, heart rate and blood pressure. However, the really important property for both groups is *information*. For those who monitor cholesterol, where the effect of overly high cholesterol may not be immediately obvious, it is important to link this product to the hospital and to the doctor. There appears to be a latent need here for the product's connectivity to medical help. In contrast, for those who monitor diabetes, the key is information and monitoring, but not necessarily connection with the doctor or hospital, perhaps because the respondent is already actively involved in controlling diabetes on a daily basis.

These results support Proposition B, and indicate that respondents are willing to pay an additional amount for each feature that is perceived to add utility.

### **Electronic health records (EHR) as a driver of price**

The current trend in medical informatics is moving towards the creation of electronic health records that can be accessed easily by any doctor or hospital, as well as by the patient herself. One of the objectives of this study was to determine how individuals differ in their interest in EHR (negative to strongly positive), and whether pricing would be affected.

To better understand user attitudes, the 493 respondents were divided into three groups, based on the coefficient for the EHR statement (A4). We created three separate groups: strong negatives, neutral-to-slight positives and high positives, respectively. These reflect three separate sets of feelings towards the EHR dashboard. This granular analysis is straightforward because we develop an individual-level model at the respondent level. Table 4 presents the coefficients for EHR for each attitude group, for the elements that deal with EHR.

These three groups differed dramatically in their interest coefficient for EHR, which makes sense, since it was the persuasion value for A4 that was used as the dividing criterion. In essence, we 'typed' the respondent by their response to A4. The important finding is that, among those respondents who are highly positive (strongly interested), the EHR dashboard can command US\$36, whereas among those who are not interested it commands a mere US\$1.

### **Mind-set segmentation at the granular, topic level**

A recurring theme in these results is that individual differences exist. Some of these differences make intuitive sense. Older respondents are more interested than are younger respondents in the monitoring function of the product. Individuals who are selected on the basis of their response to electronic health records are willing to pay more for this type of information feature.

On a more basic level, however, the question remains as to whether there exist in the respondent population different mind-sets of individuals,

**Individuals differ in their interest in Electronic Health Records (EHR), and whether pricing would be affected**

**Both propositions were supported**

**Table 4:** Three attitude groups about EHR specifically, and the price each is willing to pay

		Attitude to EHR (A4)				Dollars willing to pay for feature		
		Interest	Strong negative	Neutral-to-slight positive	High positive	Strong negative	Neutral-to-slight positive	High positive
A4	<i>Additive constant</i> Works with the new Electronic Health Record Dashboard. Helps you understand your health situation, based on what it monitors and your records	20 <b>6</b>	31 <b>-11</b>	27 <b>3</b>	0 <b>24</b>	168 <b>1</b>	158 <b>14</b>	131 <b>36</b>
A3	Organizes and displays your complete medical history...right at your fingertips to share with your doctor	6	-2	6	25	6	17	35
B3	Linked to your hospital, so your electronic health records can be easily accessed while maintaining privacy	3	1	0	10	16	15	22
B4	Works all over the world so you always have your records with you	3	0	2	9	6	13	17

based on the pattern of their responses to the entire set of elements, and perhaps transcending the geo-demographic and psychographic differences that we capture in the classification questionnaire. The notion of such underlying, latent segments, based on responses to the concept elements, is not new. Other researchers have recognized the importance of such segments for product design.<sup>50</sup> Segments have been shown to be useful both for conventional packaged goods and for fast-moving electronics, where innovation is key.<sup>34</sup>

Procedures for segmenting responses typically use cluster analysis,<sup>51</sup> which divides the respondents by the pattern of their responses, according to a well-defined statistical algorithm. The individuals in a cluster are ‘similar’ to each other, whereas the individuals in different clusters ‘differ’. In this study we are interested in differences defined by the pattern of responses to the specific features of the product. In these data, the respondents were clustered by k-means clustering, based on the utilities of the 20 elements in the persuasion model.<sup>52</sup> The criterion for segmentation was the interpretability of the different segments. That is, the statistical assumptions of clustering were valid numerically, but a cluster had to make intuitive sense.

With 493 respondents, it is possible to create a number of different cluster solutions. We created two, three, four and five cluster solutions for the same respondents. For each cluster solution, for example putting the respondents into two groups to create a two-cluster solution, we looked at the elements that performed well, to determine whether the solution differentiated the groups in a way that made intuitive sense. That is, were the strong performers in a cluster all qualitatively similar, or was there a seeming mix of two or more types of strong elements?

The outcome of this intuitive analysis of the segments indicates that a minimum of three clusters or segments is required to produce an intuitive ‘story’ that could be easily conveyed in a vignette. Higher



**Table 5:** Winning elements for interest for the three segments and the feature price

	Feature interest			Feature price		
	S1	S2	S3	S1	S2	S3
Additive constant	17	28	19	152	149	164
<i>Segment 1 — Ordinary health maintenance</i>						
A2 Monitors your heart rate and blood pressure	<b>12</b>	-2	6	<b>15</b>	7	8
A3 Organizes and displays your complete medical history...right at your fingertips to share with your doctor	<b>11</b>	-8	7	<b>16</b>	3	10
A1 Monitors your cholesterol and glucose levels	<b>11</b>	7	8	<b>20</b>	19	20
A4 Works with the new Electronic Health Record Dashboard. Helps you understand your health situation, based on what it monitors and your records	<b>9</b>	0	2	<b>18</b>	17	15
<i>Segment 2 — Wants to be 'medically connected'</i>						
B1 Automatically notifies your doctor in case of an emergency	1	<b>11</b>	6	11	<b>29</b>	14
B3 Linked to your hospital, so your electronic health records can be easily accessed while maintaining privacy	0	<b>11</b>	3	12	<b>27</b>	21
E1 Has all of the functions of a typical PDA	2	<b>8</b>	2	9	<b>19</b>	16
<i>Segment 3 — Wants the PDA to be an 'information processor'</i>						
C2 Automatic web access to favourite medical sites like WebMD	1	2	<b>12</b>	13	9	<b>19</b>
C4 Backs up your information automatically via Microsoft ActiveSync	1	1	<b>10</b>	10	8	<b>15</b>
A1 Monitors your cholesterol and glucose levels	11	7	<b>8</b>	20	19	<b>20</b>
B2 Automatically linked to insurance claims for doctor visits	1	-1	<b>8</b>	11	5	<b>10</b>
D2 Comes in a titanium case	1	0	<b>8</b>	9	6	<b>12</b>

numbers of segments in a solution were even more focused, but failed the test of being parsimonious, since there were more clusters than needed. Winning elements for interest for the three clusters, price of these elements and definition of the clusters appear in Table 5.

The following patterns emerge:

1. The three segments are ordinary health maintenance (basic monitoring and information), medical connection (being connected to doctors and hospitals is important), and want information and PDA functions (but not monitoring).
2. All groups are fairly low on their basic interest in this product. It is the elements that play the critical role.
3. The segments feel that the basic price is approximately US\$150–165, but the features may command substantial additional premiums.
4. The segments differ in what features drive acceptance, as well as in the prices for features that must do the work to convince the respondents.
  - a. The top feature price for Segments 1 and 3 is approximately US\$20.
  - b. Those in Segment 1, who want ordinary health maintenance, are willing to pay an additional US\$20 for monitoring glucose level.

- c. Those in Segment 3, who want the informational features, are also willing to pay an additional US\$20 for glucose level.
- d. Neither segment wants to pay very much for blood pressure monitoring.
- e. Respondents in Segment 2, who are 'connection-oriented', are willing to pay an additional US\$29 in order to have the device connect them automatically to the hospital. The connection is worth a lot more money.

Electronic health records, *per se*, appear directly as the 'hot buttons' for Segment 1 (ordinary health) and Segment 2 (connection), and somewhat indirectly for Segment 3 (additional features for information processing). Segment 3 wants their medical information linked to the insurance company for doctor visits. Understanding these segments can articulate the optimum product positioning statement for each segment, based on perceived value and benefits as related to price.

## Discussion

Effective innovation creates greater value when compared to the accretion of gradual additional changes to existing products. Effective innovative processes produce organizational learning that often serves as a basis for the development of new competencies. The 'pricing process' is one example, and the key topic of this study. Historically, maximizing profits has been one goal for companies, and a goal whereby optimization is desirable. Today, pricing processes are becoming even more important because the shopping reality is that prospective customers have all the pricing information they need at their fingertips. Customers regularly turn to the web to gather intelligence on a product, its price and the accompanying services before actively considering a purchase. Pricing can become a survival issue in light of this superior knowledge by customers.

A great deal of literature for many decades has dealt with pricing under various competitive conditions.<sup>53-55</sup> Such expositions often assume perfect information, which companies rarely possess.<sup>53</sup> When firms develop new-to-the-world products, they lack information regarding the pricing environment. To avoid cost-based pricing, which may result in loss of potential profits,<sup>56</sup> companies need to understand what the customer will pay for the different parts of the product, and then incorporate that information into their prices, always being ready to fall back on a more defensive pricing when need be, or to exploit momentary opportunities to increase their price when they can. Knowing the 'algebra of customer wants' at the granular level, for a particular product at a particular time, is one strategy that can help the corporation.

In this case study, we incorporated these types of information about customer preference and pricing, creating a new-to-the-world novel product that was shaped by features that customers chose as enhancing their utility. The results of this study suggest that the nutritional device, that is, the PDA dietician, has promise. Customers generated the

**Companies need to understand what the customer will pay for the different parts of the product**

**Results show the specific features that allow value pricing**

perceived value of each feature in the PDA dietician, providing a basis for value pricing. They did so in a non-confrontational way, by evaluating alternative vignettes of the product, in terms of acceptance and fair price. The results show the specific features that allow value pricing because customers are in a needs state where these features are relevant. Ingenbleek<sup>57</sup> reported that value pricing is the most effective pricing method when the product has a significant advantage over competing products. However, when companies fail to create real value, this leads to disappointing pricing, resulting in a smaller market share and profits. Experimental design of ideas in the manner presented here can help to ensure that the features are perceived to have real value, and only those features that generate these value perceptions are included or at least promoted in advertising communications.

**Using different price points for the same product for different consumer segments can optimize profitability**

We demonstrated how using different price points for the same product for different consumer segments can optimize profitability. We estimated the dollar value of every feature, and identified the actual dollar amount by which a price should be increased or decreased per feature. We showed how conjoint analysis can be used to determine the additional expenditure customers are willing to make for each feature providing differentiated utility for each segment.

The results of our study show that even features that were not highly desired drove up the cost and commanded an extra US dollar amount. The perceived value of features varied among age groups. For instance, younger respondents desire the electronic dietician as an information device, whereas older people desire the electronic dietician as a health-monitoring device.

Interest in a feature is not the same as cost willing to pay. Respondents differentiated between their interest in the product and what they thought the feature should additionally cost. Contrary to expectation, interest and price do not necessarily correlate. Depending on the value attributed to a certain identified feature, customers were willing to pay US\$36 more than the price that was determined as the base price for the product. A recent study evaluating product versions that will maximize profits suggests in a similar vein that companies can treat different product features individually, allowing customers to create the product version or bundle that suits their needs best.<sup>57</sup> Companies should, and now can, carefully assess the effect of product combinations on their marginal costs. However, low marginal cost is not enough. Evans and Webster remark that the incremental costs in adding features might be very low,<sup>58</sup> but adding those features may do little to increase product acceptance.

Discrimination pricing by segment may be a good strategy. The approach presented here makes the pricing strategy actionable, while at the same time providing the enterprise with knowledge about the product. A focus on the value from the customer's perspective provides a sustainable and efficient way to achieve profitable pricing. The knowledge gained from systematic experiments of the type presented here leads to the enhancement of profits and market demand, while enabling customers to value innovation, at what they perceive to be fair

prices. Activity-based costing is particularly appropriate for this type of study, especially when the firm evaluates trade-off in the costs of changing the number of features or the bundle and price elasticity.<sup>58,59</sup>

### Direction for future studies

This study revealed that, despite management and engineering's best efforts, only a few elements did very well for the total panel. Therefore, profitability must lie in appealing to different mind-sets. What attracts one group may not attract another. To sell a new-to-the-world product that has features with different appeal to at least three different groups, companies may use new approaches that merit further study from the business community, and that are based on the notion of conjoint measurement and experimental design.

**Newly revealed needs and expectations are to be monitored**

One approach to selling the new product may involve the direct engagement of the prospective customer in an interaction, such as a web-based interaction in order to 'type' the customer. This interactive-typing approach, really a short 'intervention test', has proved successful for the Success Built to Last website<sup>60</sup>. In two other client studies, one on customer experience and one on jury selection, the same typing approach was used, first to optimize the experience, and second to identify what to say.<sup>61-64</sup> The results are currently undergoing in-market validation. Such validation, in turn, provides a new dimension for understanding the customer mind.

To sum up, in today's competitive marketplace, where customer segments are changing rapidly, and are defined by constantly changing customer experience and newly revealed needs and expectations, understanding and monitoring these expectations is critical to sustained profits and the competitive edge. This paper presents a new, sustainable approach. The approach presents an opportunity to take another look at the way features of products drive the perception of the 'right price'.

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## Appendix A

See Figure A1.

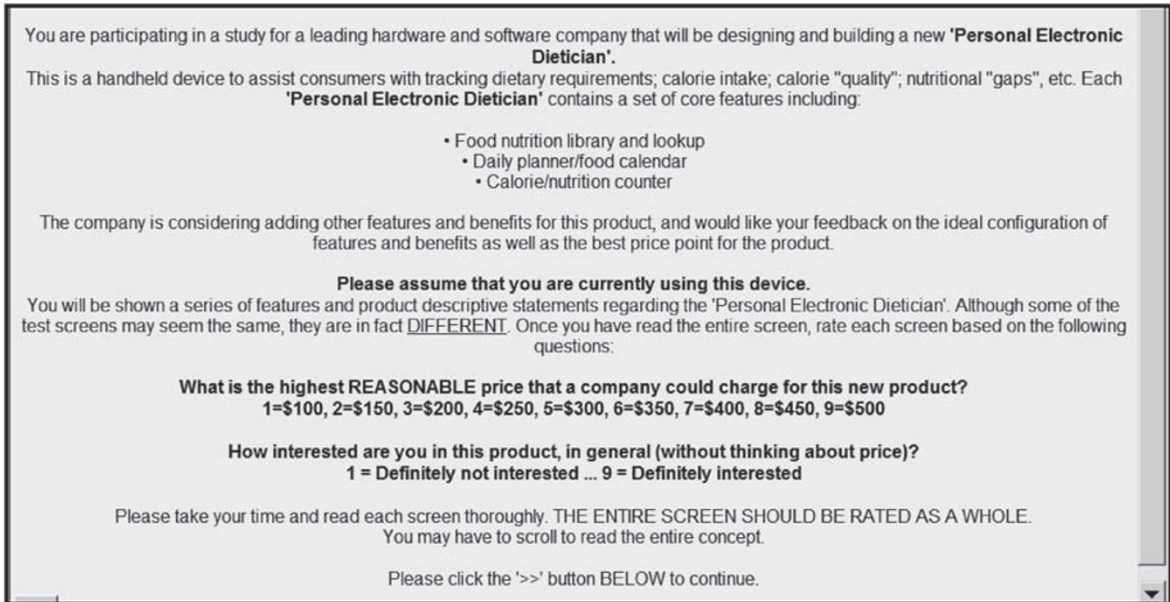


Figure A1: The orientation page presenting the products and pricing in US dollar

## Appendix B

See Figure B1.

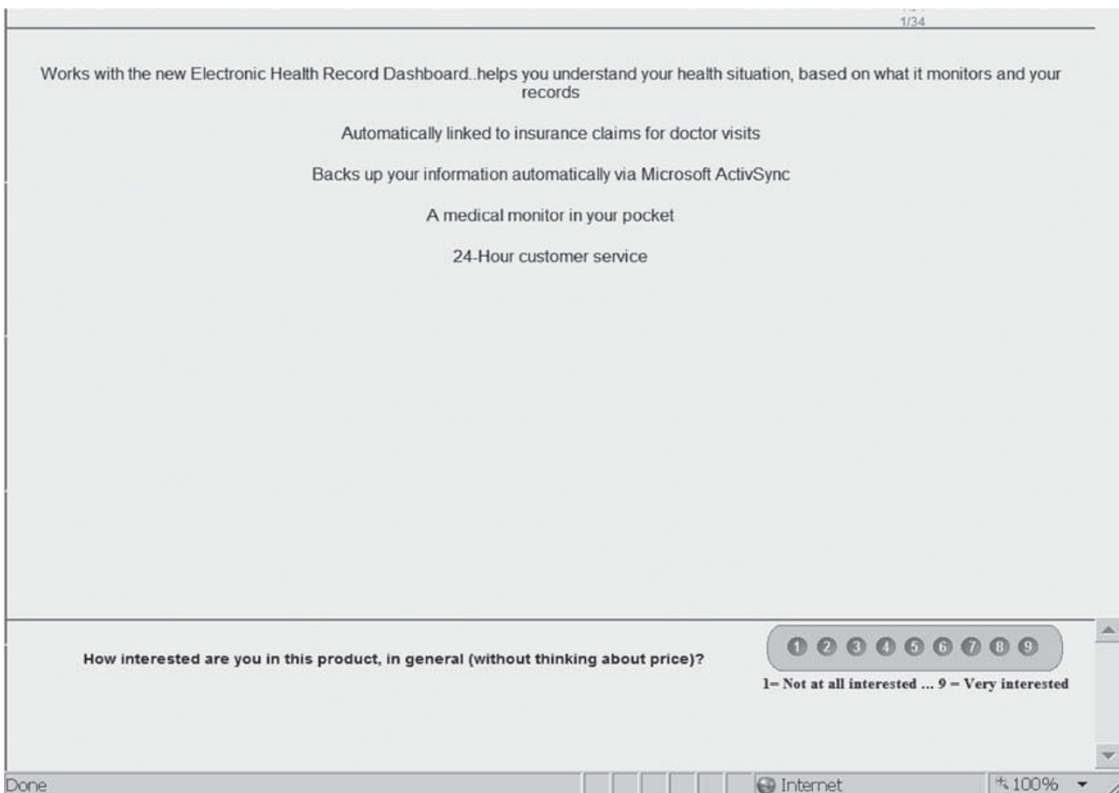


Figure B1: Example of a product concept and the rating scale for interest



## Appendix C

See Figure C1.

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Works with the new Electronic Health Record Dashboard..helps you understand your health situation, based on what it monitors and your records

Automatically linked to insurance claims for doctor visits

Backs up your information automatically via Microsoft ActivSync

A medical monitor in your pocket

24-Hour customer service

What is the highest REASONABLE price that a company could charge for this new product?

1 2 3 4 5 6 7 8 9

1-\$100, 2-\$150, 3-\$200, 4-\$250, 5-\$300  
6-\$350, 7-\$400, 8-\$450, 9-\$500

Done Internet 100%

Figure C1: Pricing questions for the same concept