

## **NEW PRODUCT DESIGN**

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### **Attributes and Attributes Levels**

We choose watches as our product with four attributes: watch type, size, the belt material, and price. We selected these attributes based on our observation and how major watch retailers categorize their products.

We further divide the watch type into smartwatches, electronic, and analog watches. Since our target customers are college students, most of whom wear watches in casual, less professional settings, we picked the above watch type attribute level to provide a more intuitive description of watch type to suit our potential customers. We provided four watch sizes: small (18mm - 29mm), medium (30mm - 36mm), large (37mm - 42mm), and extra large (Over 43mm). We offer a wide range of watch sizes to take into consideration both customers' wrist size and their personalities. In the questionnaire, we also offer four belt materials: nylon, plastic, metallic, and leather. These are four of the most commonly used materials for watch belts. To better suit the student's financial status and seek profit as a company, we decided on the price levels: \$100, \$300, and \$500.

The issues we met are focused on the combination of different types of watch and different belt material. For example, product 2 is the analog watch with a plastic belt, which results in a very low rating among respondents because the combination is rare among the market. In addition, analog watches tend to be more expensive on average, so we give most analog watches a higher price than electrical watches and smartwatches. Respondent 8 even rated product 4 very low because she thinks \$100 can only buy inferior analog watches.

## Questionnaire Design and Data Collection

We created a questionnaire with 15 products of different attribute levels. We asked our respondents to rate each product from 1 to 7, where 1 represents strong disliking, and 7 represents strong liking. The detailed questionnaire and the data are shown in *Appendix Table1: Questionnaire Data*.

In real life, watch types, sizes, belt material, and prices tend to correlate: Analog watches tend to be more expensive, a smartwatch's price is likely to be cheaper, and electrical watches tend to have plastic or nylon belts instead of leather ones, and so on. While designing the questionnaire, we took this reality into account. In hindsight, it may be better to consciously avoid such correlations. Otherwise, customers' preferences toward one attribute may be counted toward another due to the correlation between attribute levels. This will be discussed in later sections as well.

## Customer Analysis

Using regression in Excel, we estimated the part-worths for each of the ten respondents. The result is shown in *Appendix Table2: Regression Result*.

Using respondent 1 as an example, based on the regression result, we predict that the best possible product for respondent 1 is a *large-size smartwatch with a leather belt that costs \$500*. The worst product for this respondent is a *medium electrical watch with a metal belt that costs \$300*. Based on the range of the estimated coefficient for respondent 1, we can calculate the relative importance of each attribute for this respondent. The importance of type, price, the belt material, and size for respondent 1 is 0.11, 0.26, 0.40, and 0.23, respectively. In other words, for this respondent, belt material > price > size > type.

To better understand respondents' preference toward price, in *Appendix Table3: Price Sensitivity*, we visualized respondents 2 - 6's preference for different price levels. The plots are not perfectly consistent with our expectations, but they can be explained. Intuitively, customers should prefer a lower price to a higher one. However, in the watch industry, price is also proof of quality and an indication of brands. Since neither of these attributes is included in our questionnaire, respondents' preferences for them may be projected onto the different price levels. Further, as discussed earlier, our effort to mimic reality with our questionnaire results in a mild correlation between some attribute levels, which also affects the regression result on price.

### **Competitor Analysis**

We assume competitors X and Y are producing the products:

- Competitor X: Analog - \$100 - Small - Plastic Watch
- Competitor Y: Electrical - \$500 -Extra large - Leather Watch

Based on the regression result in *Appendix Table2: Regression Result*, our prediction of the respondents' utility and their preference over the competitors have presented in *Appendix Table4: Respondents' utility between X and Y*. As we can see from the table, five of the ten respondents prefer X to Y. Assume the watch market is divided between competitors X and Y. By the maximum utility rule, the market share for competitors X and Y is 50%.

### **Product Design**

Assume the product profiles developed by the firm's R&D department are:

- Product 1 - Analog watch, \$100, large, leather belt
- Product 2 - Smartwatch, \$100, large, leather belt

- Product 3 - Electrical watch, \$100, small, leather belt

We created three scenarios and launched each one of the three products in a scenario. The product attributes, the respondent's utility, and choice for products 1,2, and 3 are shown in *Appendix Table 5-7*. By comparing each product with the existing two competitors, we found that product 1 yielded the highest market share with the highest overall utilities across most respondents. Hence, we recommend that the firm adopt product 1.

If launching product 1: *Analog - \$100 - large - leather belt watches*, the estimated market share is 70% for our chosen product, 20% for competitor X, and 10% for competitor Y. Before introducing our product; the market share was equally split between the competitors, each having 50%.

The fortunes of our competitors have decreased in size as the number of customers buying their products switches over to buying our product. Further, we impact Competitor X much more than we impact Competitor Y. One reason for all the changes could be that a large proportion of the market prefers analog watches but have larger-sized hands and prefer to wear watches with large belts, which led to them switching from competitor X to our product. In addition, they may be price sensitive and prefer leather belts over plastic belts as they are more durable, which led to them switching from competitor Y to our product.

## Appendix

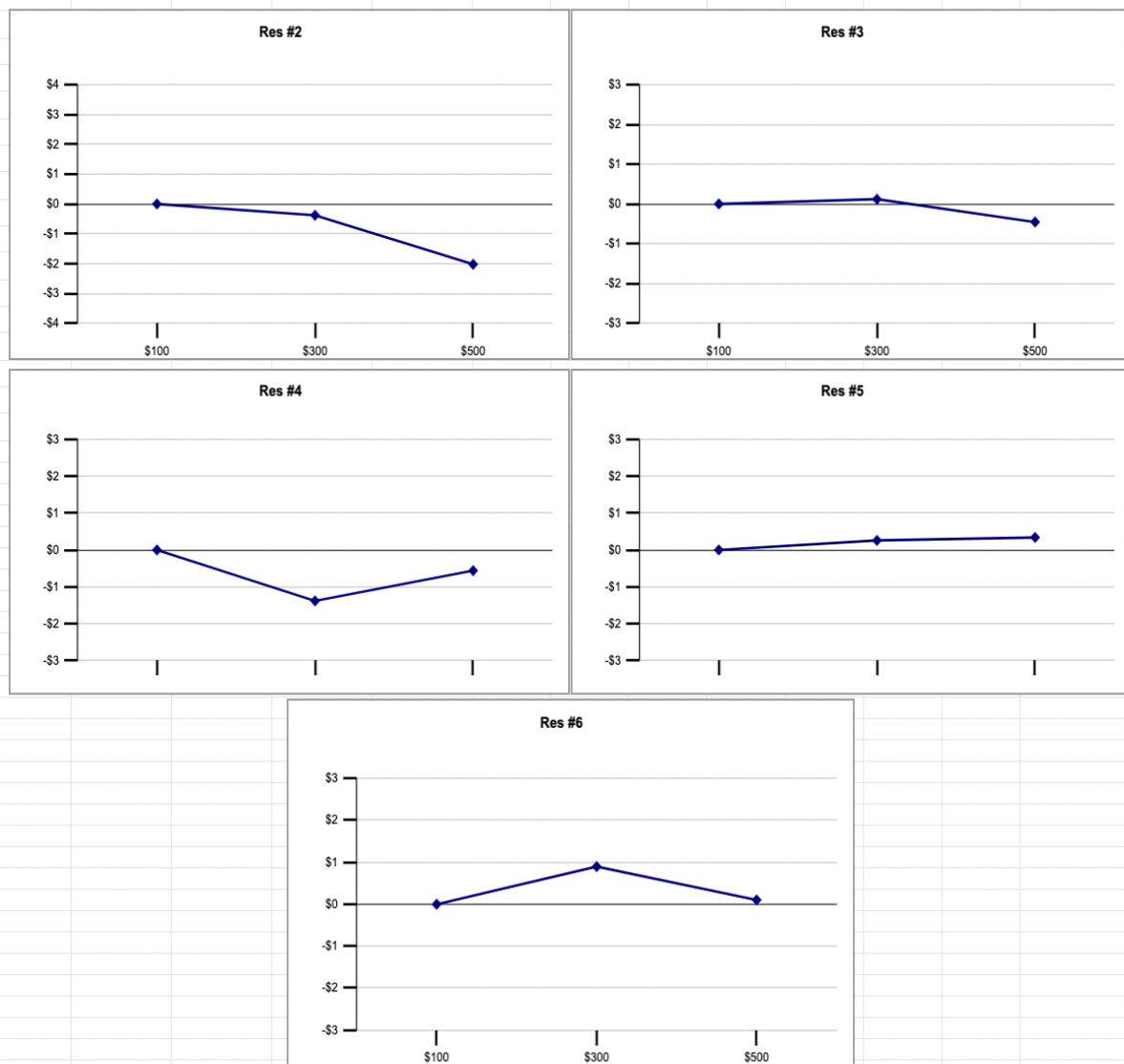
Please rate the following watches by choosing a number from 1 to 7.  
Use 1 to represent strong disliking and 7 to represent strong liking

#	features	Respondent 1	2	3	4	5	6	7	8	9	10
1	Electrical-\$300-nylon belt - small size	2	3	4	2	4	3	4	4	4	5
2	Analog - \$500 - plastic - middle size	6	2	4	1	2	4	2	3	2	3
3	Smart watch- \$300 - metal - large	4	1	5	5	5	4	5	6	5	7
4	Analog - \$100 - leather -middle size	5	4	5	7	5	5	5	3	5	5
5	Smart - \$100 - plastic - Extralarge	3	1	4	1	1	2	4	2	2	3
6	Electrical - \$100 - plastic - small size	2	6	4	2	2	2	4	4	2	3
7	Analog - \$500 - metal - large	5	1	5	6	6	4	2	6	7	6
8	Smart watch - \$100 - metal - large	5	1	4	6	4	3	7	4	5	7
9	Electrical - \$300 - leather - middle	4	3	4	5	5	4	5	4	7	6
10	Smart - \$500 - metal - small size	5	3	4	5	5	4	3	6	7	5
11	Analog - \$500 - Nylon - small size	6	2	5	2	3	3	3	5	6	5
12	Electrical - \$500 - Metal - middle size	3	3	3	5	4	5	3	2	4	4
13	Smart - \$300 - leather - small size	6	5	4	6	5	5	4	7	4	4
14	Analog - \$500 - metal - extralarge size	4	1	4	3	2	4	3	3	7	5
15	Electrical - \$300 - leather - small size	7	4	4	6	4	4	5	4	4	5

Appendix Table1: Questionnaire Data

	1	2	3	4	5	6	7	8	9	10	average	Preference
<b>Intercept</b>	2.628	5.578	3.874	2.211	1.955	2.108	4.103	3.368	1.368	2.942	3.013	
<b>smart</b>	1.265	-0.717	0.318	0.001	0.328	0.584	0.131	1.425	-0.147	-0.031	0.316	
<b>analog</b>	0.577	0.572	1.170	-0.215	0.061	1.140	-0.497	1.358	0.072	0.151	0.439	Analog > Smart > Electrical
<b>300</b>	-0.034	-0.379	0.121	-1.382	0.258	0.896	-1.135	1.431	-0.283	0.163	-0.034	
<b>500</b>	2.836	-2.020	-0.453	-0.561	0.338	0.102	-2.521	0.969	1.255	-0.532	-0.059	100 > 300 > 500
<b>medium</b>	-0.873	-1.734	-0.283	-0.347	0.113	0.671	0.411	-2.101	-0.244	0.333	-0.405	
<b>large</b>	1.627	-4.172	0.332	0.800	0.833	-1.142	0.513	-0.258	0.885	1.797	0.122	
<b>extra large</b>	-0.688	-3.836	-0.377	-1.511	-1.706	-0.820	0.167	-2.754	0.960	0.254	-1.031	large > small > medium > extra large
<b>leather</b>	2.874	-0.391	0.054	5.053	2.448	0.954	1.384	0.414	3.985	1.739	1.851	
<b>nylon</b>	-0.317	-2.165	0.206	0.868	1.217	-0.177	1.473	-0.747	3.110	2.167	0.564	
<b>metal</b>	-1.557	0.680	-0.031	3.374	1.775	1.598	1.347	0.020	3.163	2.021	1.239	leather > metal > nylon > plastic

Appendix Table2: Regression Result



Appendix Table3: Price Sensitivity

<b>Respondent's utility for X</b>	3.204	6.151	5.045	1.996	2.016	3.247	3.606	4.726	1.440	3.092
<b>Respondent's utility for Y</b>	7.650	-0.669	3.099	5.192	3.035	2.344	3.133	1.997	7.568	4.403
<b>Respondent's choice</b>	Y	X	X	Y	Y	X	X	X	Y	Y

Appendix Table4: Respondents' utility between X and Y

				Alternatives		
Attributes		Levels		Chosen product	Competitor A	Competitor B
Type		Electrical				X
		Analog		X	X	
		Smart				
Price		100		X	X	
		300				
		500				X
Size		Small			X	
		Medium				
		Large		X		
		Extra large				X
Belt material		Plastic			X	
		Leather		X		X
		Nylon				
		Metal				
Id	utility 1	utility 2	utility 3	Choice 1	Choice 2	Choice 3
1	7.70468	3.20436	7.64958	1	0	0
2	1.58808	6.15054	-0.6688	0	1	0
3	5.43049	5.04484	3.09865	1	0	0
4	7.84881	1.99616	5.19154	1	0	0
5	5.2966	2.01602	3.03523	1	0	0
6	3.05958	3.24728	2.34401	0	1	0
7	5.50352	3.60602	3.13325	1	0	0
8	4.88213	4.72582	1.9968	1	0	0
9	6.3107	1.4401	7.56823	0	0	1
10	6.62844	3.09225	4.40295	1	0	0

Appendix Table5: Scenario with Product 1

				Alternatives		
Attributes		Levels		Chosen product	Competitor A	Competitor B
Type	Electrical					X
	Analog				X	
	Smart			X		
Price	100			X	X	
	300					
	500					X
Size	Small				X	
	Medium					
	Large			X		
	Extra large					X
Belt material	Plastic				X	
	Leather			X		X
	Nylon					
	Metal					
Id	utility 1	utility 2	utility 3	Choice 1	Choice 2	Choice 3
1	8.39334	3.20436	7.64958	1	0	0
2	0.29917	6.15054	-0.6688	0	1	0
3	4.57848	5.04484	3.09865	0	1	0
4	8.0647	1.99616	5.19154	1	0	0
5	5.56374	2.01602	3.03523	1	0	0
6	2.50416	3.24728	2.34401	0	1	0
7	6.13197	3.60602	3.13325	1	0	0
8	4.94875	4.72582	1.9968	1	0	0
9	6.09161	1.4401	7.56823	0	0	1
10	6.44715	3.09225	4.40295	1	0	0

Appendix Table6: Scenario with Product 1



				Alternatives		
Attributes		Levels		Chosen product	Competitor A	Competitor B
Type	Electrical			X		X
	Analog				X	
	Smart					
Price	100			X	X	
	300					
	500					X
Size	Small			X	X	
	Medium					
	Large					
	Extra large					X
Belt material	Plastic				X	
	Leather			X		X
	Nylon					
	Metal					
Id	utility 1	utility 2	utility 3	Choice 1	Choice 2	Choice 3
1	5.5016	3.20436	7.64958	0	0	1
2	5.1877	6.15054	-0.6688	0	1	0
3	3.92825	5.04484	3.09865	0	1	0
4	7.26329	1.99616	5.19154	1	0	0
5	4.40295	2.01602	3.03523	1	0	0
6	3.0615	3.24728	2.34401	0	1	0
7	5.48751	3.60602	3.13325	1	0	0
8	3.78155	4.72582	1.9968	0	1	0
9	5.35298	1.4401	7.56823	0	0	1
10	4.68097	3.09225	4.40295	1	0	0

Appendix Table7: Scenario with Product 1