Columbia Business School
AT THE VERY CENTER OF BUSINESS™

Columbia CaseWorks

ID# CU137

PUBLISHED ON
OCTOBER 20, 2014

Apple vs. Samsung: The $2 Billion Case

BY ODED NETZER* AND RAJAN SAMBANDAM†

Background

Apple Inc. sued Samsung Electronics for approximately $2 billion, contending that Samsung violated some of its patents (e.g., patents '915, '163 and '381), each of which covers a specific user interface software feature. (See References for court document citation.) These patents covered a wide range of enhanced touchscreen features, including the following: "pinch-to-zoom," "double-tap-to-zoom," and "rubber-band" or "snap back," which refer to the ability to scroll just past the border of the document, with the document then snapping back to the edge of the display window.

While the lawsuit was comprised of multiple components, a critical issue was the magnitude of the revenue loss experienced by Apple as a result of the patents that were allegedly copied by Samsung. Was Apple's $2 billion valuation a reasonable one? This was not a simple calculation, as it required multiple inputs. Believing that market research could lay the foundation for a credible valuation, Apple hired a team of expert witnesses (led by John Hauser, Professor of Marketing at the Sloan School of Management at the Massachusetts Institute of Technology) to estimate the value consumers placed on these specific patented product features.[1]

Apple's expert witness team decided to conduct a survey of Samsung users to better understand the value they placed on these touchscreen capabilities. Rather than use the conventional approach of directly asking consumers about the value of the features, they decided to use a more sophisticated marketing tool known as *conjoint analysis*.

[1] The need to evaluate consumers' willingness to pay for product features is very common in litigation cases involving damages due to patent infringement (e.g., Continental Airlines vs. American Airlines and Tivo vs. EchoStar).

Author affiliation
**Associate Professor of Business, Columbia Business School*
†Adjunct Associate Professor, Columbia Business School

Acknowledgements
Shiri Melumad, PhD '15, Columbia Business School

Conjoint Analysis in Brief

A simple way to assess how much consumers value a product feature would be to directly ask the question. However, there are a few problems with this direct elicitation method. First, as there is no trade-off involved, consumers tend to say that every attribute is important. Second, consumers in the marketplace generally evaluate and choose a product as a whole, noting the features it includes rather than evaluating each attribute separately. Thus, directly asking consumers to separately evaluate attributes is likely to yield unrealistic—and perhaps biased—results.

The idea behind conjoint analysis is to consider *jointly* the set of attributes that comprise a product as a template for understanding consumer preferences. By providing a complete product for evaluation (rather than individual features one at a time), conjoint analysis encourages consumers to make trade-offs between various product features. In a variation known as *discrete choice conjoint analysis*, multiple products are provided and consumers are asked to choose among them making a more complex (and realistic) trade-off between the products. By setting up the products appropriately, the researcher is able to understand the value placed by consumers on individual features.

For example, when two products that differ on a single feature (and price) are presented, the choice made by the survey respondent provides clear information on the trade-off made between that feature and price. Those who choose the more expensive product (which includes that feature) reveal that they are willing to pay more for it, while the opposite is true for those who choose the cheaper option. By presenting a sequence of such options, the researcher is able to identify the preferences of the market. Conjoint analysis is a robust approach that has been widely used in practice for more than three decades.

The Conjoint Study in the Apple-Samsung Case

The main litigation in the Apple-Samsung case revolved around the price premium that consumers were willing to pay for touchscreen capabilities such as "pinch-to-zoom" and "rubber-banding," which Apple alleged were copied by Samsung. The expert witnesses brought in by Apple developed two separate, but similar, online surveys—one for smartphones and another for tablets. Each one included a discrete choice conjoint model, comprised of six features.

If the primary issue was related to touchscreen capabilities, why did the conjoint analysis include four other features (not including price)? Because by including other features, the products were more fully formed and hence more realistic. Further, the other features were helpful in masking the true focus of the study and thus providing reliable results.

How did Apple choose these seven features chosen from a much larger subset? These were among the features highlighted on Samsung's own website, and were also those used in other technology websites for smartphone and tablet comparisons.

Once the features were selected, each feature needed to be assigned at least two levels (otherwise it would be a constant and not useful for analysis). Based on qualitative research with 20 consumers, Apple narrowed down the levels of the features that were both most relevant to consumers and were at issue in the case. Each of the six features were described by four levels. For example, the levels of the Storage feature were: 8 GB, 16 GB, 32 GB, and 64 GB.

Thus, products could be formed by selecting a combination that used one level of each feature. Every choice task comprised four product "profiles." Respondents were asked to imagine they were in the market for a smartphone (tablet) and asked to choose one, if these were the only four options available.

The listed features used in each conjoint model were exactly the same (see Table 1).

TABLE 1. CONJOINT MODEL FEATURES.

Features	Level 1	Level 2	Level 3	Level 4
Camera	12 MP Rear Camera, HD Video Recording, Autofocus, 2MP Front Camera, Zoom	8 MP Rear Camera, HD Video Recording, Autofocus, 2 MP Front Camera	8 MP Rear Camera, HD Video Recording, Autofocus	3 MP Rear Camera, Standard Video Recording, Autofocus
Size & Weight	4.5 inches, 6 oz.	4.3 inches, 5.3 oz.	4 inches, 5 oz.	3.5 inches, 4 oz.
Touchscreen	Full Multi-Touch, Auto-Switch (1 to 2 Fingers), Rubber-band, Tap to Re-center after Zoom	Very Limited Multi-Touch, Auto-Switch (1 to 2 Fingers), Rubber-band, Tap to Re-center after Zoom	Full Multi-Touch, Rubber-band, Tap to Re-center after Zoom	Full Multi-Touch
Storage/memory	64 GB (16,000 songs or 23,000 photos)	32 GB (8,000 songs or 12,000 photos)	16 GB (4,000 songs or 6,000 photos)	8 GB (2,000 songs or 3,000 photos)
Connectivity	Cellular, WiFi, Tethering, MicroUSB, HDMI	Cellular, WiFi, Tethering, MicroUSB	Cellular, WiFi, Tethering	Cellular, WiFi
Number of apps available	600,000	450,000	300,000	150,000
Price	$299	$199	$99	Free ($0)

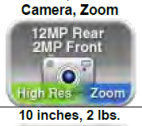
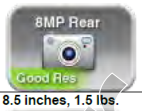
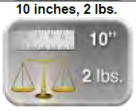
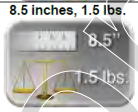
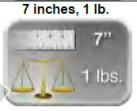
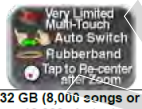
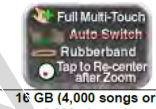
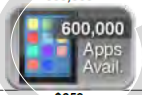
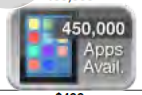
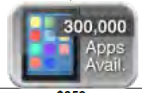
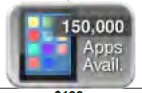
Source: Exhibit A in expert report of John Hauser, http://docs.justia.com/cases/federal/district-courts/california/candce/5:2011cv01846/239768/1363.

Quite often in practice, conjoint choice tasks also include a "none" option that allows consumers to indicate their lack of interest in any of the alternatives presented to them in that specific question. Based on the proportion of respondents who choose this "none" option, researchers can estimate primary demand for the product (i.e., how attractive the entire set of the attributes and levels is to the market as a whole). This is a significant and singular advantage of the conjoint analysis approach. However, the "none" option was not

included in this study, as the intention was only to estimate price premium relative to a specific feature, and not primary demand.

In total, sixteen choice tasks (each with four product profiles) were used in the study. See Table 2 for a sample choice task.

TABLE 2. A SAMPLE CHOICE TASK.

With this camera:	12 MP Rear Camera, HD Video Recording, Autofocus, 2MP Front Camera, Zoom	8 MP Rear Camera, HD Video Recording, Autofocus, 2 MP Front Camera	8 MP Rear Camera, HD Video Recording, Autofocus	3 MP Rear Camera, Standard Video Recording, Autofocus
				
With this size and weight:	10 inches, 2 lbs.	9 inches, 1.75 lbs.	8.5 inches, 1.5 lbs.	7 inches, 1 lb.
				
With this touchscreen:	Full Multi-Touch, Auto-Switch (1 to 2 Fingers), Rubberband, Tap to Re-center after Zoom	Very Limited Multi-Touch, Auto-Switch (1 to 2 Fingers), Rubberband, Tap to Re-center after Zoom	Full Multi-Touch, Rubberband, Tap to Re-center after Zoom	Full Multi-Touch
				
With this storage/memory:	64 GB (16,000 songs or 23,000 photos)	32 GB (8,000 songs or 12,000 photos)	16 GB (4,000 songs or 6,000 photos)	8 GB (2,000 songs or 3,000 photos)
				
With this connectivity:	WiFi, Bluetooth, MicroUSB, HDMI	WiFi, Bluetooth, MicroUSB	WiFi, Bluetooth	WiFi
				
With this number of apps available:	600,000	450,000	300,000	150,000
				
With this price:	$659	$499	$359	$199
				

Source: Exhibit E in expert report of John Hauser, http://docs.justia.com/cases/federal/district-courts/california/candce/5:2011cv01846/239768/1363.

Respondents to each survey were carefully screened using industry-standard criteria and were included in the study only if they were a Samsung (smartphone or tablet) user. After running through standard quality checks, the smartphone (tablet) study had a final tally of 455 (415) respondents. The surveys also included some other questions beyond the conjoint choice tasks, including demographics.

The Results: Adding up the "Partworths"

Primary results from conjoint studies are *partworths*—essentially, attractiveness scores for each level of each feature. The more attractive a level is (say 32 GB compared to 16 GB), the higher the partworth of that level. The total worth score (or attractiveness of the whole product) is simply the sum of the individual partworths of the features that comprise that

particular product. In other words, partworths provide a common and convenient metric for evaluating the total value of a product. This, of course, makes it possible to compare two different products and evaluate their relative value in the eyes of the consumer. After that, it is only a short jump to figuring out how to evaluate the premium that consumers are willing to pay for specific features.

To illustrate this methodology, consider two products that are very similar in every aspect, except price and the level of the touchscreen feature. Let's say one product has a better touchscreen (say, "multi-touch") and costs more, while the other one has an inferior touchscreen ("single-touch") and costs less. If more people prefer the former, it implies that the higher quality touchscreen indeed has good value in the marketplace with consumers being willing to pay more. But how much more, exactly?

In conjoint analysis, a very useful tool called a *market simulator* is often used. Its input is the partworth scores of individual respondents. Assuming that respondents chose the product with the highest value, preference shares can be calculated for any product that can be constructed with the features and levels included in the study. The output is a simulation of the expected market share for each product.

For the Apple analysis, a market with two products (identical on every feature except one, and price) would have been constructed, yielding different shares for each one based on attractiveness of the products. Then by changing (dropping) the price on the product with the lower share, the shares can be equalized. In practice, this means the value of the two products has equalized and the consumers are now indifferent between them. But the difference in price between the two products provides an estimate of the premium that can be charged for the superior touchscreen capability. Such an analysis allows calculation of consumers' willingness to pay a price premium for certain features. [2]

Using this approach, the Apple team found, for example, that consumers would be willing to pay a premium of $39 to have the "pinch-to-zoom" feature in their smartphone and a premium of $45 for the same feature in their tablet.

TABLE 3. BASE PRICE WITHOUT PATENT-RELATED FEATURE

	Smartphones $199	Tablets $499
Patent:		
'915: "Pinch-to-zoom"	$39	$45
'915 + '163 + '381: "Pinch-to-zoom"; "double-tap-to-zoom"; "rubber-banding"	$100	$90

Source: Exhibit A in Expert Report of John Hauser, http://docs.justia.com/cases/federal/district-courts/california/candce/5:2011cv01846/239768/1363.

[2] This is a streamlined explanation for the purposes of the case; the actual analysis involved a higher degree of complexity.

This vital information was combined with additional data (such as units sold, time period, etc.) to develop the $2 billion figure that was ultimately featured in the lawsuit.

Unwilling to accept Apple's calculations, Samsung hired its own experts. Not surprisingly, these experts proceeded to point out flaws in the design of the conjoint conducted by Apple.

Questions for Discussion

1) Do you believe this study design is capable of accurately estimating the willingness to pay for the product features under the alleged patent violation?
2) What are the potential flaws in the study design? Could they have been corrected?
3) Are there other preference elicitation methods that you would suggest to get a more accurate estimate of willingness to pay for the multi-touchscreen feature?

References

Apple Inc. v. Samsung Electronics Co. Ltd. et al, Docket No. 5:11-cv-01846.

Apple Inc. v. Samsung Electronics Co. Ltd. et al, Filing 1363, Unredacted Declaration of John R. Hauser re 1256 Order on Administrative Motion to File Under Seal, (Dkt. No. 991), U.S. District Court, Northern District of California, San Jose Division, May 31, 2012.

Apple, Inc. v. Samsung Electronics Co. Ltd. et al., Redacted Order Denying Apple's Renewed Motion for Permanent Injunction, 2014 WL 976898 (N.D.Cal.), http://www.sw.com/site/rte_uploads/files/Apple,%20Inc%20v%20Samsung%20Electrics.pdf.

Rajan Sambandam, "How Apple, Samsung and Conjoint Came Together" *TRC Pricing Research* (blog), April 28, 2014, http://www.trchome.com/blog/categories/listings/pricing-research.