Title:

Anxiety, Resistance and Disruptive Innovations: A Methodology for measuring Receptivity of Eye Surgeons to Disruptive Laser Technologies

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Abstract:

Attempting to measure receptivity to new innovations based on subjective methods is fraught with challenges. This is especially true in medical markets, where new technologies offer a possible way out to control increased patient demands, rising costs, and the ethical needs to treat a broader range of patients with more predictability and safety. Based on the literature on adoption of technology in the dental field, quantitative measurement of physiological changes, such as blood pressure, heart rate and blood volume may represent a better way of measuring surgeon resistance or receptivity to new products. This is a study that provides a literature review and conceptual development justifying a pilot study in the eye surgery market conducted in Australia. Results from this ophthalmic study support the theory contained in the literature that it is disruptive technologies that often ‘leapfrog’ or jump ahead in health care markets which are often resistant to innovation.

Introduction:

The gap between attitudes and final behaviour remains a challenge to marketers, as many buyers announce intentions in survey research, but ultimately buy a different product. Moreover, literature on ‘switching behaviour’ notes that supposedly satisfied customers still defect. This is especially problematic in medical markets, where high-value, high volume devices and drugs represent an increasingly attractive market.

Literature from the psychology field, especially related to polygraph testing or measurement of stress or other difficulties, suggest that quantitative measures of physiological changes are a more valid measurement compared with

Table 1
Worldwide Revenue for Intralase Femtosecond lasers vs. Mechanical Microkeratomes (USD$MM, Source: Merrill Lynch 2006)
Laser vision correction is a growing segment within the $10 billion global ophthalmology business, and currently some 70,000 eye doctors operate in this business worldwide, with surgical devices and products comprising a significant investment for eye clinics. Traditionally, marketing has been undertaken by large drug and devices companies, using standard sales promotion strategies. Also, efforts to encourage health regulators, national health authorities, and insurance companies to support innovations has been concurrently pursued along side traditional marketing activities. Like all medical businesses, the eye care business has become increasingly competitive, with ‘clutter’ of advertising and marketing messages—with many scientific studies being financed by the drug and device companies themselves—making it difficult for surgeons to know which innovations actually benefit their patients. Table 2, below describes the increasingly lucrative nature of the refractive marketplace, of which LASIK is a primary driver of value.

Table 2:
Worldwide Refractive Market Revenue
(USD$MM, Source: Merrill Lynch 2006)
Conceptual Development and Methodology:

Comparisons of technical features and functions of mechanical microkeratome blades and Intralase femtosecond lasers exist in the literature, however no quantitative measures of surgeons preferences or resistance to adoption of this laser technology have yet been published (Lim, Yang, Kim and Tchah 2006, Sonigo 2006). Selection of a healthy, well experienced LASIK surgeon in Brisbane, Queensland Australia was undertaken at the LaserSight group, which encompasses 14 eye hospitals, and has significant experience with both Intralase and microkeratome technologies (see www.lasik.com.au). The small sampling, namely one healthy eye surgeon of 31 years of age in good cardiovascular health was justified in the literature on anxiety (Lewis and Drewett 2005), and the surgical list of 8 patients was an average sized list for the Brisbane clinic within LaserSight.

Use of ‘anxiety’ and the attendant cardiovascular response (eg heart rate, blood volume) has been validated in the literature on new dental technologies (Brand 1999; Brand & Abraham 1996). Shear (1987) suggests that ‘heart rate’ is the most valid measure of anxiety, and this is validated in the literature on polygraph testing and anxiety, as well as cardiology (Lindauer 2006, Pollina, Dollins, Senter, Kraphol & Ryan 2004). A standard heart rate monitor was affixed to the surgeon at the outset of his surgical list (Hamilton 1959). As a control, the surgeon undertook to do 20 push-up exercises to elevate the heart rate and determine an appropriate range for further analysis. Also, videotaping of the procedure, with digital time coding, was undertaken as a further control to improve
the reliability and validity of the study (Pollina, Dollins, Senter, Kraphol & Ryan 2004). A randomly generated surgical list of Intralase and microkeratome blade patients was then undertaken on 8 patients, consisting of 6 males and 2 females, with a mean age of 29.5 years of age.

**Results and Discussion:**

Preliminary analyses involving correlation of heart rate with timing of (a) laser or blade aiming and alignment, and (b) cutting of the epithelial flap with, variously, the blade and the Intralase, are currently being undertaken and will be presented at the conference. The patient list is described in Table 3, below. Surgeon resting heart rate ranged from 70 beats per minute, up to 90 beats per minute during various activities involved in eye surgery. The Patient population treated is described in Table 3, below.

### Table 3
**Surgical List of Blade vs Intralase**

<table>
<thead>
<tr>
<th>Patient</th>
<th>Sex</th>
<th>Age</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC</td>
<td>M</td>
<td>24</td>
<td>Intralase</td>
</tr>
<tr>
<td>NHP</td>
<td>F</td>
<td>37</td>
<td>Blade</td>
</tr>
<tr>
<td>NP</td>
<td>M</td>
<td>32</td>
<td>Intralase</td>
</tr>
<tr>
<td>AM</td>
<td>M</td>
<td>26</td>
<td>Intralase</td>
</tr>
<tr>
<td>AD</td>
<td>M</td>
<td>29</td>
<td>Intralase</td>
</tr>
<tr>
<td>JR</td>
<td>M</td>
<td>32</td>
<td>Blade (PRK)</td>
</tr>
<tr>
<td>TD</td>
<td>M</td>
<td>29</td>
<td>Blade</td>
</tr>
</tbody>
</table>

M=6, F=6
Mean age: 29.5
Intralase=5; Blade =3

Data analysis

Based on Ramon (2006) additional data analysis was undertaken, relating heart rate to specific steps in the surgical procedure. Moreover, data analysis was reviewed based on the digital video taken during the surgical procedures. Key data points on old technology blades (Patient NHP, blade cut heart rate 88 BPM, Time Code 2.50.21) vs new technology (Patient MC, laser cut heart rate 79 BPM, Time Code 3.07.05). Further, Heart Rate Monitor data was interposed onto digital video segments of key data points, and will be presented at the conference. Patient Consent and ethics approval was received prior to presenting this data.

Both marketers and health care policy makers will benefit from review of this study. Encouraging adoption of beneficial, and often radical, new technologies is a major challenge for major drug and device companies, insurers, and the public policy makers responsible for improving health care systems. Also, retention of key surgeons is critical to the marketing success of major eye care players.

**References:**


Mittal, V and W Kamakura (2001) “Satisfaction, repurchase intentions, and repurchase behaviour, investigating the moderating effect of consumer characteristics,” Journal or Marketing Research 38, 1, 131-142.


