Assessing market structure and company fit based on consumer perceptions in dynamic information technology markets

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Abstract

Convergence between computing, home entertainment, and telecommunications has become a technologically driven reality during the nineties. However, little attention has been paid to how consumers will evaluate products resulting from the combination of these industries. Ultimately, it is consumer choice that will drive the economic success of companies participating in these markets and a precursor to that choice is high perceived utility. Utility in turn is determined by consumer beliefs about product attributes. This paper examines consumer perceptions of various existing electronic information product categories and calibrates preference for manufacturers that compete within them. It shows how manufacturers can be represented in the same perceptual space as categories, and it estimates the preference drivers of both product categories and suppliers overall, as well as supplier performance in specific categories. Analysis of the existing market provides a platform from which to examine how consumers will evaluate new categories. In particular, we examine the convergence of television sets and personal computers, and estimate how well different suppliers are positioned to take advantage of this evolving market, including strategic alliances between similar and diverse manufacturers. © 2002 Elsevier Science Inc. All rights reserved.

1. Introduction

The structure of high-technology markets involving dramatic changes in penetration among consumers and product functionality from suppliers is likely to be highly dynamic (Nystrom, 1990). Convergence between the communications and computer industries has attracted considerable attention from a supply-side perspective because of the new product opportunities that such technology provides. As this supply-side-driven trend occurs, a consumer perspective becomes critical to evaluate the likely market acceptance of new product categories. Consumer perceptions will also be a key factor in determining the success of specific manufacturers within them.

Literature on choice between different new products is extensive (e.g. see Lilien et al., 1993 for a review). However, these approaches assume that consumers are able to accurately predict the utility that they expect to derive from the new product when they make a purchase decision (see Urban et al. 1993 for an exception).

In this paper, we examine the structure of eight categories from three different information markets: communications, computers, and sound and vision. We analyze these categories separately and then look at the fit between the markets when integrated onto the same map. Morrison and Roberts (1998) demonstrate that if there is no perceived congruence between elements of the product mix, consumer acceptance will be low. We examine the congruence of the different categories to see if it will be a constraint on diffusion rates of integrated products crossing traditional category boundaries. In addition to looking at consumers' perceptions of new categories and the drivers of preference for them, we also examine the relative position of different manufacturers to succeed within them. Finally, we elicit consumers' reactions to joint ventures on cobranded products that have the potential to marry the best capabilities and associations of each supplier, but run the risk of also transferring negative associations.

2. Modeling approach

The objective of this research is to study consumer beliefs about high-technology markets and manufacturers within

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them, and to see how those beliefs affect preference. The modeling approach we took was to use principal components factor analysis to investigate the structure of beliefs, and preference regression to relate the resultant factors to preference (see Urban and Hauser, 1993, p. 268–270).

We represent the beliefs that consumer i has about category j on attribute k by y_{ijk} and the beliefs about manufacturer m by y_{imk}. Using factor analysis, the attribute set $\{k\}$ can be distilled down to a smaller number of underlying factors $\{l\}$ to parsimoniously represent the data. F_{ijl} is the score that respondent i gives category j on factor l, and F_{iml} the factor score for the manufacturer m.

We use our analysis of consumer beliefs about attribute levels to study preference for both existing product categories, U_{ij}, and existing manufacturers overall, U_{im}. There is a strong tradition in marketing of linearly weighting attributes by their relative importance to explain preference (see Hauser, 1984 for an example in high-technology markets). Pras and Summer (1978) suggest that for products involving high uncertainty, consumers' utility should be linearly discounted by uncertainty or perceived risk, σ^2. Using a decision analytic framework, Roberts and Urban (1988) provide a theoretical justification for this. This motivates the functional form of the preference function that we use to model both consumer preferences between product categories U_{ij}, and consumer preference among product manufacturers, U_{im}:

$$U_{ij} = a_j + \sum_l w_{lj}F_{ijl} - \frac{r_j}{2}\sigma_{ij}^2 + \varepsilon_{ij}' \tag{1}$$

$$U_{im} = a_m + \sum_l w_{lm}F_{iml} - \frac{r_m}{2}\sigma_{im}^2 + \nu_{im}' \tag{2}$$

where w_{lj} and w_{lm} are the importance weights of the factors in determining category and manufacturer preference, respectively, r is the consumer's risk aversion and ε' and ν' are error terms.

Eq. (2) gives the preference consumer i has for a manufacturer overall. This may vary from category to category. To examine preference for manufacturer, m, within a product category, j, U_{ijm}, we appeal to the brand equity literature. Aaker and Keller (1990) suggest that the performance of a manufacturer in a specific market will depend partly on the strength of the brand name and partly on the perceived fit between the manufacturer and the category being examined, D_{ijm}. Category-specific uncertainty associated with the manufacturer, σ_{ijm}^2, may also play a role in driving preference. Therefore, U_{ijm} may be expressed as:

$$U_{ijm} = a_{jm} + b_{jm}U_{im} + c_{jm}D_{ijm} - \frac{r_{jm}}{2}\sigma_{ijm}^2 + \nu_{ijm}' \tag{3}$$

where a_{jm}, b_{jm}, and c_{jm} are constants and ν_{ijm}' is an error term.

Eq. (1) demonstrates how consumers compare different categories overall and Eq. (2) how they compare different manufacturers. Eq. (3) then looks at manufacturer perform-

ance within specific categories. This understanding of existing markets and existing manufacturers provides the springboard from which we can examine new categories and new players within them. We may use an analogue of Eq. (1) to see if the same factors drive consumer preference for new categories $U_{ij'}$ as existing ones:

$$U_{ij'} = a_j' + \sum_l w_j'F_{ij'l} - \frac{r_j'}{2}\sigma_{ij'}^2 + \varepsilon_{ij'}'' \tag{4}$$

Ratneswar et al. (1999) provide an interesting behavioral framework for how this utility can evolve. Analogously, manufacturers' performance within new categories may be evaluated using a specification similar to that used within existing categories in Eq. (3):

$$U_{ij'm} = a_{jm}' + b_{jm}'U_{im} + c_{jm}'D_{ij'm} - \frac{r_{jm}}{2}\sigma_{ij'm}^2 + \nu_{ij'}'' \tag{5}$$

Finally, we are interested in examining the incremental effect of manufacturer m' cobranding with manufacturer m, forming the alliance mm'. Rao and Ruekert (1994) suggest that preference for the resulting alliance relative to preference for m by itself will depend on the preference for m' and the fit of m' with m. To this, we add uncertainty; that is, the perceived risk in terms of the expected benefits of the cobranded product not materializing, $\sigma_{imm'}^2$, to obtain:

$$U_{imm'} = a_{mm'} + b_{mm'}U_{im'} + c_{mm'}D_{imm'} - \frac{r_{mm'}}{2}\sigma_{imm'}^2$$
$$+ \nu_{imm'} \tag{6}$$

This sequential analysis leads to a progressive understanding of consumer beliefs and preferences for existing categories, manufacturers overall, and manufacturer performance in specific categories. We then move to examine new categories and new manufacturer combinations.

3. Study methodology

We used the convergence of the television and personal computer market to test our model. This required a population with familiarity in both product categories. We surveyed 102 full-time white-collar workers in the 20–40 age bracket who were undertaking part-time postgraduate study. Respondent perceptions of different information technology products, preferences, perceived uncertainty, ownership levels, and evaluation of four manufacturers was measured. Perceptions were measured on a five-point, verbally anchored scale while preference was measured using both a 100-point thermometer scale and a ranking task. The attributes used to calibrate perceptions were derived from qualitative research and an examination of the previous literature in this area.