CONSUMER CHOICE, INFORMATION PRODUCT QUALITY, AND MARKET IMPLICATIONS

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Abstract: The paper concerns with the peculiarities of consumer choice in information product markets. This is a multidisciplinary study based on both information system research and microeconomic theory. An extension is introduced to the conventional general theory of consumer choice for explicitly taking into account the impact of information product quality on consumer behaviour. Multiple quality characteristics, considered against the price of product, are an essential reason for consumer choice of high tech product in general and information product in particular. We assume that consumers are able to aggregate their preferences of multiple product characteristics into a product preference order. On the supply side, the product quality characteristics incur costs. In the case of information product, those costs are the costs of the first copy, and marginal costs are near zero. All of the above constitute the distinctive characteristics of the competitive mechanism in the digital economy and in information product markets. A model, based on the game theory is used to consider two special cases. The first one deals with monopolistic competition for a share of the market with a limited number of customers. Conditions are derived for IT firm survival. The second one considers conditions at which a monopoly is able to successfully introduce a new version of its information product.

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1. INTRODUCTION

The phenomenon of electronic commerce is relatively new. This year Internet reaches 33, the age blessed with maturity and wisdom. The use of Internet for commerce and business is much younger. For about a decade we watch the explosion of electronic commerce applications, and fast growth of e-business as an important subset of Information Economy. As for any business, key issue for electronic business is achieving success and being competitive. Despite the short history of this phenomenon, we witness examples of spectacular rises and collapses of companies starting a journey into the untravelled lands of virtual space.

There are many problems leading to failures. One of them is inability to recognise how new technology can change the delivery method and physical form of information, and pose a serious threat to otherwise highest quality product (E.g. Encyclopedia Britannica. See E-Commerce survey (2000), Torlina et al (1999)). A typical reason for Dot.com crashes in 2001 was minimal knowledge of the specifics regarding information markets. Subsequently, their business models and market strategies failed to accommodate particular features of information products and services, especially those offered via digital channel such as the Internet. The success stories are convoluted. For example, there is an ongoing debate about product quality, business methods, marketing and competitive strategies of Microsoft. Is Microsoft a successful innovator taking advantage of Information Economy, or a ruthless monopolist using the worst practices to retain their leading position? These questions were discussed, for example in BBC news (2001), Economides, N. (2001), Torlina & Kazakevitch (2001b).

Contradicting messages from practice about e-business successes and fiascos are under scrutiny and investigation by researchers from different perspectives and disciplines.

The goal of this paper is to establish a link, from the theoretical perspective, between the quality of information products, consumer choice and market success of information product provider. We are suggesting an integrated approach to understanding the consumer and producer behaviour in information product markets.

The theoretical framework and models developed within suggested approach are applicable to a wide range of information products in digital form, especially multi-functional, such as software and complex IS products, e.g. information systems, e-commerce applications, communications software, and on-line services. We investigate market structure of such products, market behaviour of both consumers and producers, conditions for survival, and competitive success for companies with significant information component in their products or services.

Figure 1. A conceptual model of e-business success

This is a multidisciplinary study based on both information system research and microeconomic theory. Figure 1 shows the conceptual framework of this study. First of all, we consider findings from an extensive information systems research in the area of information systems quality modeling, measuring, determination, and investigation of factors leading to information systems success. Secondly, we incorporate these findings into a model of consumer choice based on quality perception. Our approach radically differs from the traditional one, where consumer demand depends only on prices, and product quality is not explicitly included in the theory (See for example Varian & Varian, 1984). In e-business, the information component of product or service always needs to be taken into account. As was shown in Torlina & Kazakevitch (2000), product valuation, in such a case, is more complicated and essentially depends on specific characteristics of information products. The third component of our research framework includes a supply-side model. Consumer valuation and demand play key roles in price determination in information markets, and therefore, in the formation of a market equilibrium. The model captures the interrelation of

producer costs/quality/price decisions and customer quality/demand feedback.

We use this approach to integrate and extend our earlier models and to analyse elements of consumer behaviour in information product markets where suppliers exercise considerable market power. One of them, initially discussed in Torlina & Kazakevitch (2001a), incorporates quality variables into the traditional theory of monopolistic competition, to allow application of this theory to information product market strategies, where several companies compete for their market shares within a limited customer base. In another one (initially introduced in Kazakevitch & Torlina, 2001b), the traditional economic analysis of monopoly market is modified to include specific characteristics of information products. This model allows for some conclusions about economic limitations to the quality of information products supplied by monopolies or companies, like Microsoft, occupying a considerable market share. In particular, we consider possible profit-optimising strategies towards issuing updates to existing products, inevitably leading to quality compromise.

We believe that this paper contributes to the better understanding of consumer decision making patterns, and therefore, may help in better planning product development and marketing strategies by information product suppliers.

2. MULTIPLE QUALITY CHARACTERISTICS OF INFORMATION PRODUCTS, AGGREGATION AND CONSUMER CHOICE

For a number of years, different aspects of information product quality have been of wide interest to the academia and industry alike. In the field of information systems research the most developed and widely used models, which integrate different aspects of IS product quality, and capture users' individual perceptions are: the model of IS success (DeLone & McLean, 1992), Technology Acceptance Model (Davis, 1989), End-user computing satisfaction measuring instrument (Doll & Torkzadeh, 1988), User Information Satisfaction (Ives & Olson, 1984). On the basis of these models, and identified dimensions of success, hundreds of measures, scales, measuring tools have been developed, and numerous model modifications have been suggested.

The main problems with these models are that there is no consensus among researchers on how to define information system success, which measures should be used, and what are the significant factors. The findings

of individual cases are not robust, and vary considerably depending on application type, stakeholders and users involved, organisational settings, and external conditions (Seddon 1996, Seddon et al, 1998). At the same time, the approach can be very useful for early application evaluations, or pre-purchase decisions. (Doll et al, 1998)

A number of authors distinguish the success factors, significant for the adoption of information products from the success factors of continued usage. The findings in E. Karahanna, Straub & Chervany (1999) have important implications for theory and practice. Their study provides some evidence that adoption is solely influenced by normative considerations, while continued usage is determined by attitudinal factors. These findings can help software producers and potential buyers to select most suitable product development and implementation strategies.

Information product variety and quality available under different market conditions have been discussed in economic literature. Varian (1998) describes different forms of versioning information products available due to flexibility of digital media. Varian (1993) shows that under specific market conditions software providers are more interested in designing easy to learn interface, rather than invest in a better software functionality. Waterman (1991) analyses welfare tradeoffs between product quality and variety under the conditions of different pricing arrangements (direct payments from consumer versus advertiser's supported products), and fixed or varying investments in the first copy of information product. Meanwhile, the literature pays more attention to the supply side, cost structure, and pricing mechanisms, then to the demand side and consumer choice factors.

To summarise the above, the quality of an information product is a complex matter and may include product content and functionality, user interface, ease of learning, warranty, service and support provided, and many other things. "Quality" may be the *perceived quality*, which may include both real improvement as well as a successful marketing component. The latter may also appear to be a marketing hype.

For the purpose of this study, we assume that multiple sources of value embedded in the information product, including both tangible and intangible components should be reflected in the product quality and price determination. Each information product, like any high tech one, may be distinguished by a considerable number of quality features. In this section, we will introduce some extensions to the standard consumer choice theory, to demonstrate, from the theory viewpoint, a rationale for consumer preferences of one product to another based on multiple quality characteristics.

According to the standard theory of consumer choice, a consumer is faced with possible consumption bundles of n goods. Bundles differ by a quantity of each of the goods consumed. A rational consumer will always choose a most preferred bundle from the set of feasible alternatives, where feasibility is restricted by the consumer's budget and the prices for goods included in the bundle (See, for example, Varian, 1984). Meanwhile, the standard theory does not explicitly take product quality into consideration.

There is no reason why this theory can't be applied to a subset of the consumption bundle, provided that a fixed budget is allocated for such a subset. Initially, we consider a very special case:

- Just one type of information product;
- Multiple quality characteristics ($\mathbf{q} = (q_1, \dots, q_n)$);
- Dollar market values – “prices” $\mathbf{p} = \mathbf{p}(\mathbf{q}) = (p_1(q_1), \dots, p_n(q_n))$ attached to each of the quality characteristics (the nature of these dollar values will be discussed in the next section);
- The price for the product is a function of “prices” for quality characteristics $p = p(\mathbf{p})$; and
- Fixed budget constraint (y) (the maximum amount of money available for the purchase of this good).

The consumer chooses the variant of the product that maximizes *utility* (U) or *satisfaction* at given budget constraint y . Utility depends on quality characteristics ($U = U(\mathbf{q})$) as like, according to the standard theory, it depends on the quantity of goods in the bundle. $U(\mathbf{q})$ is a monotonic transformation. That is, if one set of qualities is preferable to another one ($\mathbf{q}_1 \prec \mathbf{q}_2$) then $U(\mathbf{q}_1) < U(\mathbf{q}_2)$. Consumer choice is based on utility maximization at given budget constraint:

$$\begin{aligned} & \max U(\mathbf{q}) \\ & \sum_j p_j(q_j) \leq y \quad (1) \end{aligned}$$

The two-dimensional case of the problem (1) allows for a geometrical illustration, analogous to the standard theory (Figure 2).

Figure 2. The combination of quality characteristics that maximizes consumer's utility.

Figure 3. Consumer's reaction on increase in the "price" for one of the quality characteristics.

The curve U^* in Figure 2 as well as curves from U_1 and U_2 in Figures 3 and 4 are **quality indifference curves**. Each of them represents different combinations of qualities q_1 and q_2 delivering the same level of satisfaction consumer gets from the consumption of one unit of information good. The consumer prefers the product variant and corresponding level of satisfaction (utility U^*), where the combination of quality characteristics q_1 and q_2 fully utilizes the budget Y at given prices p_1 and p_2 .

Figure 4. Consumer's reaction on increase in "real" budget.

The conclusion from the standard theory, with regard to consumer's reaction on change in prices or budget, can be also re-interpreted for this model.

If one of the quality characteristics (q_2) becomes more expensive (Figure 3), then the whole product becomes more expensive. This diminishes the real value of the budget allocated for the purchase and shift from higher (U_1) to lower (U_2) level of satisfaction. Also, if increase in the "price" for this quality feature is transparent to the consumer, then the consumer preference may be shifted to other quality parameters. The opposite conclusions apply if one of the quality characteristics becomes cheaper.

Figure 4 illustrates one of two situations: either the allocated budget increases; or decrease in the "price" for a particular quality feature is not transparent to consumer and just as decrease in price for the product. This corresponds to increase in utility from (U_1) to (U_2) and increase in both level of both quality features demanded.

The consumer, therefore, accepts multiple quality characteristics of information product as the "bundle of qualities maximizing his/her satisfaction. The utility function can be considered as a theoretical function aggregating the quality characteristics into a scalar variable from the consumer perspective. At the same time, price for the product can be considered as a sum of market values of all quality characteristics $\sum_j p_j(q_j)$.

Transition from the utility of single consumer to the group/community utility can be done similarly to the theory of trade. It is based on the perception of the similarity of tastes within a particular group or community of customers, which allows for considering group, common or average preferences.

3. INFORMATION PRODUCT QUALITY AND PRODUCTION COSTS

In this section we consider the nature of dollar values – “prices” attached to each of the quality characteristics of information products, from the supply side, and their link with the cost of production.

From the supply side perspective, core information products possess some distinctive characteristics and properties, which take their extreme form when information products are digitized. See Varian and Shapiro (1998) for discussion of information products costs structure. Torlina et al (1999) discuss different categories of information products and implications of their conversion to digital form on value attributes. Whinston et al (1996), Wigand et al (1998), Willcocks et al (1997) discuss essential properties of information and digital goods.

Those properties include:

- (i) Multiple and heterogeneous sources of value embedded in the product itself;
- (ii) Specific cost structure - high fixed costs, near-zero variable costs and zero marginal cost. Initial fixed costs, including usually high marketing and promotion expenditure, in most cases are sunk costs, that is, they cannot be recovered if a product fails;
- (iii) Extreme economies of scale - in the general case of an information good there are no natural or economically justified limits to production of additional copies;
- (iv) No direct interconnection between costs spent on first copy production and product price: and
- (v) Consumers valuation and demand are key price determinants.

In the case of information product, fixed costs are the costs of the development of the first copy of product. We assume that, in the short run, the quality q_i depends upon the costs C_j of the production of the original copy:

$$q_j = q_j(C_j), \text{ where } \frac{dq_j(C_j)}{dC_j} > 0; C_j \in C_j \subset \mathbf{R}^+.$$

Here and below, differentiability of functions within continuous intervals of independent variables is assumed by default.

For the purposes of this model we also assume, that there is no problem of aggregation of functions $q_j = q_j(C_j)$ into a scalar function $Q = Q(C) = Q(\sum_j C_j)$.

4. MONOPOLISTIC COMPETITION AND INFORMATION PRODUCT QUALITY

The model is based on the common understanding of market behaviour. The company's objective is profit maximisation. The willingness of the company to supply is elastic and increases with increase in price. The consumer's objective is utility maximisation. The consumer demand is elastic and decreases with the increase in price. The model incorporates the generic assumptions characterising the monopolistic competition.

We consider a market for an information technology product that satisfies the conventional properties of monopolistic competition (See for, example, H.L. Varian, 1984; G. A. Jehle, 1991). The market consists of n mono-product firms. The products $i \in [1, n]$ are viewed by the buyers as close though not perfect substitutes for one another. Therefore, each of the sellers can be considered as the monopolist of its particular product variant with a limited degree of monopoly power. Such a monopolist is enjoying a monopoly power and making economic profit during only a short period of time from the introduction of a unique product or technology until such a technology becomes available to rivals, or until a new "more innovative" product is introduced by a rival.

The following specific features of the monopolistic competition in the IT sector discussed in previous sections are incorporated in the model. Traditionally it is assumed that the cost functions are identical across firms. We assume that the firms are characterised by different cost functions. In general case marginal cost is non-zero. For information market zero marginal cost assumption is essential. In general, technology is perfectly available to existing and new market participants. We assume that cutting-edge technology does not spill over immediately. For the time being, each firm possesses some unique product-attributable elements of otherwise common technology. These unique elements make the product variants

different. The differences are viewed by the buyers as differences in quality characteristics. We consider the simplest case when all the quality characteristics of each product can be aggregated into a *scalar quality characteristic*. Increase in quality generates increase in consumer demand. Increase in quality can be achieved by a firm only through increase in the cost of the first copy. Each firm is characterised by its cost elasticity of quality.

The model describes the competitive behaviour of the IT firm in the information product market.

Aiming initially at covering first copy costs and then at earning profit, IT firm struggles for consumer demand and invests in the competitive quality of its product.

Increase in quality can be attained only at additional costs. The firms are characterised by generally different cost functions. Therefore, the incremental cost of increase in quality differs from one firm to another. Each of the firms sets the price to cover the costs and to earn profit, depending on anticipated demand. Different incremental costs allow them different degrees of freedom in setting a minimum price, which covers the firm's costs and returns a normal profit. On the demand side, increase in quality causes increase in demand. Increase in price causes decrease in quantity demanded. The total change in demand for a product of a particular firm can be negative or positive and varies from one firm to another. The firms' cost-quality decisions affect their relative competitive positions.

To ensure economic profit, relative increase in demand, associated with increase in quality per unit of relative increase in cost should not be offset by relative decrease in demand per unit of relative increase in price. Otherwise, the firm is not competitive.

As it was mentioned earlier, we assume the case where all the quality characteristics of each of the products i can be aggregated into the scalar quality characteristic q_i . We assume quality functions for each of the firms as defined in the previous section. This means increase in the value of the quality variable as the result of increase in costs within a particular range of costs C_i for a particular firm i . However, it does not say anything about comparison between the values of quality variables of two firms. They depend upon the differences between the cost functions of different firms. In other words, a greater costs of firm i compared to firm j generally can lead to a lower value of the quality variable of firm i , as it is viewed by buyers. In the long run, the quality can be also improved using technological innovations, which are not directly associated with the cost C_i .

The key assumption about the IT product is that the costs C_i associated with the first copy of the product is the actual total cost of production of the first and any further number of copies: $C_i = C_i(y_i) = \text{const}$ or, in other words, marginal cost is equal to zero.

The demand y_i for product i is measured in the quantity of copies. We assume that the same buyer does not simultaneously purchase two analogous products from two different competitive sellers. Therefore, it is possible to measure total demand for all the variants of the product (y) by adding together the number of copies sold by each of the firms:

$$y = \sum_{i=1}^n y_i . \quad (2)$$

We assume that demand conventionally negatively depends upon the price p_i as well as upon the demand for the competitive products

$$y_{-i} = \sum_{j \in [1, n]; j \neq i} y_j . \text{ Based on (2) it can be measured as } y_{-i} = y - y_i . \text{ It}$$

also positively depends upon the quality variable q_i . Therefore, the demand for product i , as viewed by a seller i , can be represented as a function: $y_i = y_i(p_i, y_{-i}, q_i(C_i))$ or its inverse

$$p_i = p_i(y_i, y_{-i}, q_i(C_i)) . \quad (3)$$

Even though non-conventional demand functions are assumed, we model such a market as a non-coalition game with profit as pay functions. In other words, each of the firms maximises its profit:

$$\Pi_i = y_i p_i(y_i, y_{-i}, q_i(C_i)) - C_i \rightarrow \max . \quad (4)$$

We are also adopting the standard behavioural hypothesis. Firm i makes its product/expenditure/price decision assuming the other firms' behaviour will be constant.

The first order equilibrium conditions for (4) appear to be more sophisticated than for the standard model:

$$y_i \left(\frac{\partial p_i(y_i, y_{-i}, q_i(C_i))}{\partial y_i} + \frac{\partial p_i(y_i, y_{-i}, q_i(C_i))}{\partial y_{-i}} \frac{\partial y_{-i}}{\partial y_i} \right) + p_i(y_i, y_{-i}, q_i(C_i)) = 0 ; \quad (5)$$

$$y_i, \left(\frac{\partial p_i(y_i, y_{-i}, q_i(C_i))}{\partial y_{-i}} \right) = 0; \quad (6)$$

and

$$\frac{\partial p_i(y_i, y, q_i(C_i))}{\partial C_i} y_i - 1 = 0 \quad (7)$$

Combining (5) and (6) gives:

$$y_i, \frac{\partial p_i(y_i, y_{-i}, q_i(C_i))}{\partial y_i} + p_i(y_i, y, q_i(C_i)) = 0 \quad (8)$$

The interpretation of the equilibrium conditions is rather difficult in the general case (7) - (8). However, a meaningful interpretation can be obtained at the assumption of the separability of the demand functions in the Cobb-Douglas form:

$$y_i = a C_i^{\alpha_i} p_i^{\beta_i} (y - y_i)^{\gamma_i}, \quad (9)$$

where $\alpha_i > 0$ is the cost elasticity of demand. It is positive because it contributes to the quality of the product, and the quality is positively related to demand. $\beta_i < 0$ is the conventional negative price elasticity of demand. $\gamma_i < 0$ is the elasticity of demand for product i with respect to the demand for the competitive variants of the product. It is negative because, in the short run, within a given capacity of the market, the demand for product i decreases, with increase in demand for competitive products.

The inverse form of (8) is:

$$p_i = p_i(y_i, y_{-i}, q_i(C_i)) = \frac{1}{a} C_i^{-\frac{\alpha_i}{\beta_i}} y_i^{-\frac{1}{\beta_i}} (y - y_i)^{-\frac{\gamma_i}{\beta_i}}. \quad (10)$$

Substituting (9) into (7) and (8) after some transformations gives the following equilibrium conditions:

$$p_i y_i = -\frac{\beta_i}{\alpha_i} C_i \quad (11)$$

and

$$\frac{1}{\beta_i} \frac{1}{y_i} + \frac{\gamma_i}{\beta_i} \frac{1}{y - y_i} + 1 = 0 \quad (12)$$

Equation (12) means that the distribution of demand among the competitive firms does not depend upon the absolute level of prices. It is determined, however by relative values of the parameters of elasticity. Meanwhile, (11) is the key condition for the understanding of the IT firm's i situation in the market. It means that the firm earns a positive profit only if

$$-\frac{\beta_i}{\alpha_i} > 1 \text{ or } -\beta_i > \alpha_i.$$

Combining the last inequality with the interpretation of the elasticity parameters in (9) gives the following theoretical outcomes with regard to the ability of the firm producing an information product in making a positive economic profit. At zero marginal costs, firm i absorbs the equilibrium distribution of demand (y_i) following from (12)). At this value of demand, the equilibrium price (p_i) and cost level (C_i) are established. To ensure economic profit, relative increase in demand, associated with increase in quality per unit of relative increase in cost, should not be offset by relative decrease in demand per unit of relative increase in price. The case, when the inequality $-\beta_i > \alpha_i$ is not held, means that the firm's technology is not capable of delivering a competitive level of quality per unit of its costs.

5. MONOPOLY AND QUALITY OF A NEW VERSION OF INFORMATION PRODUCT

In this section, we consider a special case where the information product is supplied by a monopoly. The monopoly has captured a particular market share and the overall number of users is limited. For simplicity, we restrict our consideration to a one-product company. The only way for such a company to keep its market share, and to continue extracting revenue, is to eventually offer a new version of the information product.

Like in the previous section, we assume that quality variable q depends upon the cost of the production C of the original copy of a new version:

Therefore, the demand for the IT product, as viewed by a monopoly, can be represented as a function:

$$p = p(y, q(C)), \quad (13)$$

$$\text{with } \frac{\partial p(y, q)}{\partial q} > 0; \quad q \in \mathbf{Q} \subset \mathbf{R}^+ \quad \text{and} \quad \frac{\partial p(y, q)}{\partial y} < 0; \quad y \in \mathbf{Y} \subset \mathbf{R}^+$$

However the willingness of the market to accept a higher price diminishes with each next increment in quality: $\frac{\partial^2 p(y, q)}{\partial q^2} < 0; \quad q \in \mathbf{Q} \subset \mathbf{R}^+$. Even though, a non-conventional demand and cost functions are assumed, we can consider the conventional monopoly's profit maximization problem as:

$$\Pi = yp(y, q(C)) - C \rightarrow \max, \quad (14)$$

The first order equilibrium conditions for (14) appear to be different to the standard model:

$$y \frac{\partial p(y, q(C))}{\partial y} + p(y, q(C)) = 0; \quad (15)$$

$$y \frac{\partial p(y, q(C))}{\partial q} \frac{dq(C)}{dC} - 1 = 0 \quad (16)$$

Condition (15) is equivalent to the condition $\frac{dy}{y} = -\frac{dp}{p}$. It means that, at zero marginal costs there is no optimal scale of production, which would maximise profit. Meanwhile, due to the decreasing demand, increase in the volume of sales requires and allows for a proportional decrease in price.

Condition (16) or $y \frac{\partial p}{\partial q} = \frac{dC}{dq}$ means that there is an optimal combination

of the cost of the first copy, price and the volume of sales, which says by itself about a limited incentive for expenditure for quality.

Figure 5. Quality-price-cost relationship at a constant volume of sale.

The case of fixed output ($y=y^*$), however, appears to be especially interesting. This case corresponds, for example, to the situation where a monopoly attempts to convince all the customers to buy a new version of its product. At a fixed output (Figure 5), the price as a function of quality is represented by a convex upward curve. In contrary, the cost as a function of quality is represented as a convex downward curve. Therefore, in the general case, (Figure 5A) the quality is feasible within the interval $q_1 < q < q_2$. Outside of this interval, the price, at which all the customers accept the new version, appears to be below the cost of the first copy. Therefore, a better quality, beyond q_2 is infeasible. Figure 5B corresponds to an extreme case, where the customers accept any quality improvement at a price corresponding to such an improvement. However, as in the case A, the quality is limited by q_2 . Figure 5C demonstrates the opposite extreme where neither quality improvement is affordable by the company due to prices acceptable by the customers lower than costs. Thus, a new version is not feasible.

6. CONCLUSION

The paper provides some insight into the competitive mechanisms of e-business success. We link e-business success to specific characteristics of information products and e-business services.

The traditional theoretical approach to market structures and competition has been modified to include factor quality of information products and services as an endogenous variable.

In the traditional monopolistic competition a partial monopoly power is achieved by releasing an innovative product. The monopoly power ends with rivals gaining access to the new technology and taking over some of the leader's market share. Meanwhile, the rivals' cost functions are not

distinguished. In contrary, the essential feature of the information product or service markets, considered in this paper, is different firms' cost functions. This allows concluding that an essential condition of a firm's survival and competitiveness depends on its ability to contribute to the quality of its information product or service with less than proportional increase in cost components that may affect the product's minimum price.

As long as the monopoly is concerned, we show the economic constraints that such a company faces on the quality of the information product or service. The existence of such constraints causes limitations of the quality of products supplied by monopolists. In particular, this partially explains the phenomenon of Microsoft building financial success on products, continuously generating customer complaints.

This theoretical analysis of competition in information product and service markets, provided in the paper, may be applied to developing practical e-business strategies.

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