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## NETWORK EXTERNALITIES IN KNOWLEDGE: A MANAGEMENT PERSPECTIVE

We are presenting a generalization of the network externality approach frequently used in industrial economics to the needs of marketing and communication systems. It is our conviction that this generalization and adaptation is feasible and useful for assessing the effectiveness and efficiency of communication measures and decisions concerning product design.

### 1. Background of Research

While communication studies frequently stress the importance of interpersonal contacts, they hardly ever touch the question as to how exactly this mechanism works. Is it stochastic or deterministic? Does it work rationally or is it more about sympathy? Although theories of collective behavior gained much influence since Durkheim's time, they do not fully reflect the true importance of the individual's *Verstand* and the sovereignty of individual behavior.

Economics on the other hand, at least mainstream neoclassical economics, does usually stress the individual's motivation for economic (and such almost all) behavior, but its basic formal models frequently ignore the role of interpersonal communication. As well, models of homini oeconomici demand too much knowledge and too much rationality from its subjects: *People (you and me included) violate rules of rational behavior because of ignorance, cognitive limitations, and psychological concerns. (Sarin 1992): 144)*

This unsatisfactory situation leaves two possible solutions: one can ei-

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ther assume that it is impossible to model human and social behavior due to the agents' internal and external complexity, or one can try to identify a subset of important variables, including social ones, and formulate models that are "good enough" to cover a class of problems.

This second line of argument is the basis for our research: we concentrate on the effects of interpersonal communication in networks and assume that agents act within bounded rationality. The concrete phenomenon in question is that of network externalities, e.g. external effects of network size on members' utility (Katz & Shapiro 1985; Katz & Shapiro 1992). It is our aim to identify means of increasing a product's value in order to guide management decisions concerning product design and communication strategies.

## 2. Product and Communication Design

While many speak of convergence on an institutional level, researchers frequently ignore the role of communicatory convergence, that is taking place in the cognition of the individual: all information regarding a certain issue is "converged" into a single cognitive picture of this issue in a person's brain (Forgas 1999). Based on this understanding, Schmid et al. speak of the "internal medium" when referring to an individual's cognitive system (Schmid et al. 2000).

If this is true, we cannot only concentrate on classical communication acts when analysing a communicatory system.<sup>1</sup> We rather have to include all information flows that arrive at the individual's senses and construct the internal picture of the issue in question. This means that tactile signals resulting from a product's form factor are just as much integrated into the picture as acoustical or optical signals coming through classical media channels, interpersonal communication or the product itself.

In answer to these challenges, researchers at the Institute for Media and Communications Management developed a management approach that aims at integrating all streams of communication concerning a product. As the convergence takes place on the demand side, the focus of at-

<sup>1</sup> We use the term communicatory system in order to avoid the notion of computers playing an important role. In fact, computer mediated communication may or may not be part of a communicatory system, but on our basic level of abstraction this question is not essential: we do not care about the actual physical connection between the agents as long as there is any.

tention naturally shifts from the company to the consumer perspective: A company must “design” the customer’s image of a product just as carefully as the actual product (Schmid 2001). In this perspective it becomes obvious that the product development itself must start with analysing the prospective customer’s needs and wants as has long been known in Marketing.

Putting the customers and their communication streams at the center of analysis, we come to a network structure of significant complexity: agents interact with their peers, watch television, read newspapers, use a company’s products and may be in direct contact with the firm itself, e.g. because they need service. Add the increased power of information and communication technologies and every customer will have all information a company issues and will expect personal service and personalized products (Tapscott 1999). Companies do in fact face enormous pressure to deliver goods of maximal utility to their customers.

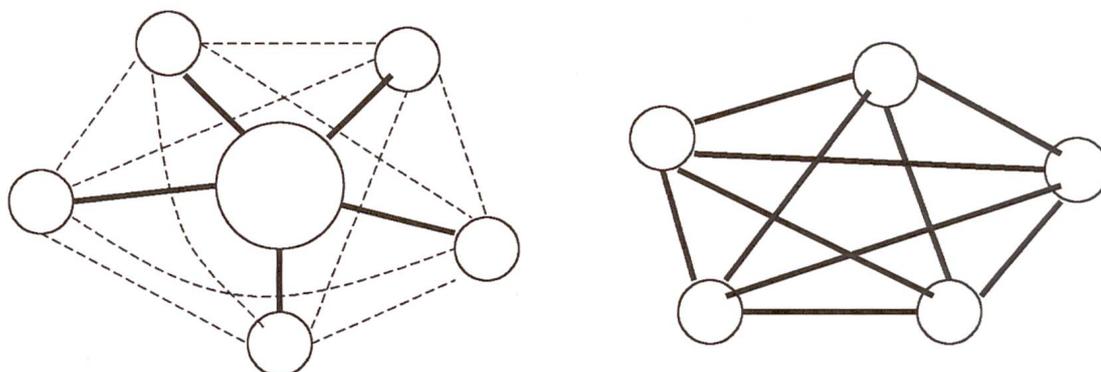
### 3. The Network Externalities Approach

Network Externalities are a major source for increasing returns in the utility of a product with the number of adopters. Insofar, they are the equivalent to economies of scale in production on the supply side of the market model. Their basic logic is expressed in the saying “the more, the better”: Every new user of the network adds utility not only to himself but also to the other users (Shapiro & Varian 1999).

While the theory has traditionally been applied to technical networks, we see a large field of application in the assessment of communication quality and value. If combined with theories of social networks like those developed by Granovetter 1985, it becomes clear, that network externalities do not only characterize the utility dynamics of technical communication networks but of social networks in general, e.g. networks of people who are communicating. Turning back to a general understanding of communication as for example deployed by Hayek 1945, we have to admit that network externalities are a fairly frequent phenomenon: Isolated are only those individuals who are in a narrow sense not interacting with any other human being. Otherwise they do communicate – through the media of language, trade, traffic, gesture etc.

This allows us to distinguish two kinds of social networks that are at least theoretically able to cause network externalities: Traditional (technical) networks as given by communication systems, e.g. telephone, e-mail

etc. and “pure” social networks that do not depend on one central means of communication, e.g. a company, sports club etc.



*Figure 1: Technical and (purely) Social Networks*

The major difference in our analysis is that only the first kind of network can exhibit “direct” network externalities, while both examples can exhibit “indirect” network externalities. This means that in the first case, the joining of one additional member does directly contribute not only to her own utility but also to all other member’s utility by enabling them to communicate with one additional node. In the second case, the connection is not quite as obvious, but we can easily explain the gain as a mass effect on complementary goods: if a sports club wins more members, it might negotiate better rates with suppliers of sport equipment or improve its ability to lobby for public support.

But indirect network externalities in communicatory systems have an additional field to work: knowledge and its widespread usability. If everybody knows how to use Microsoft Windows, this is essentially a complementary good to the actual software package. If nobody does, this means a necessary complement is missing and expensive to acquire and the product offers significantly less utility and value. Note that this does not at all reflect a change in product attributes as such. It is entirely a demand side phenomenon.

And there is a third dimension of network externalities in knowledge. Since Leibenstein’s seminal paper on “Bandwagon, Snob and Veblen Effects” it is generally accepted that products can offer “non-functional” value components (Leibenstein 1950). Integrated into the theory of network externalities in media and communications management, this means that companies who succeed in building a fashion around their products can dramatically increase their product’s value and indirectly

their profits: an expensive watch made by IWC may just display the time like a cheap plastic watch. However, its value is much higher, because consumers do not only buy a watch but also a means to display their taste and social status. The ability to do so depends critically on the knowledge about IWC watches, their prices and social esteem within the consumer's personal community.

As systems with increasing returns tend to show path-dependency and lock-in, the cultivation of network externalities offers an enormous potential for business (Arthur 1994). Once established, the network externalities may shield a company from competition, and consumers tend to stick with a product in which they have invested a significant amount of learning that would otherwise be lost.

#### 4. Conclusion

Convergence is not only a supply but also a demand side phenomenon. People integrate different flows of information within their cognitive system and evaluate them accordingly. For companies, this situation is both, a challenge and a chance for more profitable business.

The challenge is to carefully design and communicate a product without contradiction on any level. Managers are well advised to start from a consumer perspective when analysing needs and wants and act accordingly. A major threat is the unpredictable behavior/communication of customers within their groups.

The chance on the other hand is to consciously draw on the explosive dynamics of network externalities in product design and, even more, in communication and knowledge. By building on existing consumer knowledge, companies can increase a product's utility and value. If this is combined with measures to stipulate mouth-to-mouth communication, it may be possible to exert value and profits from non-functional utility components and lock-in the market.

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