

KEIO UNIVERSITY
KEIO/KYOTO MARKET QUALITY RESEARCH PROJECT
(Global Center of Excellence Project)

KEIO/KYOTO GLOBAL COE DISCUSSION PAPER SERIES

DP2008-028

**Market Share Dynamics Based on the Emergence
and Collapse of Brand Values:
Simulations Focusing on Communications between Consumers**

Kosaku Morioka*

Abstract

Prior research on brand equity or brand value has assumed that all products are the same in their functions but different in their marketing activities of firms. However, although we can assume that products are the same in not only their functions but also their marketing activities, prior research has paid little attention on this assumption. So, this paper aims to explore how the emergence and collapse of products' brand values when all products are same in all aspects. At first, we base on Niklas Luhmann's social system theory to explain the emergence and collapse of brand values. The social system theory suggests that the brand value as the structure of consumption system can emerge and collapse without assuming different marketing activities. Then, to understand these phenomena, we conduct experiments using multi-agent simulation model. As a result, market share of a product which is based on its brand value usually shows dynamics because of consumers' communications. This is the way we imply the frontiers of brand research by suggesting that the social system theory is useful in analyzing the emergence and collapse of brand value.

*Kosaku Morioka

Graduate school of business and commerce, Keio University

KEIO/KYOTO MARKET QUALITY RESEARCH PROJECT

(Global Center of Excellence Program)

Graduate School of Economics and Graduate School of Business and Commerce,
Keio University

2-15-45 Mita, Minato-ku, Tokyo 108-8345 Japan

Kyoto Institute of Economics,
Kyoto University

Yoshida-honmachi, Sakyo-ku, Kyoto 606-8501 Japan

Market Share Dynamics Based on the Emergence and Collapse of Brand Values: Simulations Focusing on Communications between Consumers *

Kosaku Morioka**

January 2009

Abstract

Prior research on brand equity or brand value has assumed that all products are the same in their functions but different in their marketing activities of firms. However, although we can assume that products are the same in not only their functions but also their marketing activities, prior research has paid little attention on this assumption. So, this paper aims to explore how the emergence and collapse of products' brand values when all products are same in all aspects. At first, we base on Niklas Luhmann's social system theory to explain the emergence and collapse of brand values. The social system theory suggests that the brand value as the structure of consumption system can emerge and collapse without assuming different marketing activities. Then, to understand these phenomena, we conduct experiments using multi-agent simulation model. As a result, market share of a product which is based on its brand value usually shows dynamics because of consumers' communications. This is the way we imply the frontiers of brand research by suggesting that the social system theory is useful in analyzing the emergence and collapse of brand value.

Keywords: brand value, social system theory, autopoiesis, communication, bandwagon effect, snob effect, market share, agent-based simulation

* The author would like to thank Professor Ikuo Tkahashi, Professor Yutaka Hamaoka, and Associate Professor Akinori Ono for helpful comments. Also, I would thank for KOZO KEIKAKU ENGINEERING Inc. for licensing to use "artisoc 1.0" free.

** Kosaku Morioka is a doctoral candidate at graduate school of business and commerce, Keio University, Japan. Phone: +81-80-5042-8014. E-mail: cultivation.foresthill@gmail.com

1. Introduction

Current consumer and marketing research places a very high priority on branding. Despite the importance of branding indicated in early works (e.g., Gardner and Levy 1955; Levy 1959), Aaker (1991) indicated that issue has still not received sufficient attention. Aaker's (1991), one of the earliest investigations on brand equity, captured the interest of marketers and researchers by suggesting that brand equity is defined as the marketing effects or outcomes that accrue to a product because of its brand name compared to those that would accrue if the same product did not have the brand name (Farquhar 1989; Aaker 1991; Ailawadi, Lehmann, and Neslin 2003). Aaker's (1991) proposition may stimulate increased attention toward branding in research and practice.

Two research streams exist in branding. One is customer-based brand equity (e.g., Keller 1993, 1998), and the other is brand identity (e.g., Aaker 1996; Aaker and Joachimsthaler 2000). The former approaches brand equity from the perspective of the consumer and suggests that the different values added by brands result from the consumer's knowledge about these brands (Keller 1998). This approach has advanced the concept of brand equity in as much as brand values can be resolved into consumer knowledge. However, this leads to the following unanswered question: why is the consumer's knowledge about the products different from the products themselves? In contrast, research on brand identity focuses on firms' activities (e.g., marketing activities including the 4Ps of product, price, place, and promotion) and suggests that the various activities based on the particular brand identities of the firms result in consumers

having differential knowledge about the products that lead to different brand equities (Aaker 1991, 1996). Although the difference between brand identity and activities is clearly a significant factor that influences consumers' knowledge, is that really all there is?

This article implies that consumers can create different knowledge about the same product on their own. In other words, consumers may perceive each product differently based on their interactions, and especially their communications with other consumers even if the products are the same. Thus, our objective was to explore how the emergence and collapse of a product's brand value resulting in its variable market share can be possible. To achieve this goal, we defined two research objectives: to explain the emergence and collapse of brand value based on Niklas Luhmann's social system theory (Luhmann 1984, 1989, 1990) and to understand this phenomenon through experiments using an agent-based simulation.

2. Theoretical Background

2.1. Social System Theory

We based our examination of the question on the social system theory developed by Niklas Luhmann (Luhmann 1984, 1989, 1990). Because of limited space and his vast volume of work, however, we restricted our study to a review of the theory's outline and focused on the four concepts in his social system theory: autopoiesis, communication, reduction of complexity, and structures of social systems.

The concept of autopoiesis is the most important part of Luhmann's theory (Luhmann

1989, 1990). This originated with Maturana and Varela (1980) who invented it to describe life as a living system. Luhmann applied autopoiesis to social systems that he regarded as autopoietic systems (Luhmann 1984). Autopoiesis in a social system now refers to its operation; a social system operating autopoietically produces all its components, i.e., everything that is used as a unit by the system including the structures of social systems described below. Thus, the key operational characteristic of an autopoietic social system is the closed manner in which it produces its components by itself; old components produce new ones in the social system. However, that begs the question, what are the components of a social system? Luhmann insisted that they should be communications (Luhmann 1984, 1986, 1990). Therefore, in the social system, old communications produce new ones. Note that each individual is an environment for the social system and vice versa (Luhmann 1984; Kneer and Nassehi 1993).

We consider the reduction of complexity based on the two concepts (autopoiesis and communication). At first, complexity is simply defined as all possibilities in the environment for the social system (Luhmann 1984, 1986, 1990). In other words, this may be regarded as the condition under which each person thinks differently. Therefore, the reduction of complexity can be considered the selection of possibility, and this can be achieved by communications, which are the components of social system. In other words, communications between two individuals select one possibility from the environment of the social system in which all possibilities exist. Although this is the way one reality can emerge, communications are no more than events, and therefore, the social system that emerges as a reality cannot help

being transient, for communications are its components. The structure of the social system can play an important role when the system continues to exist. The structure of the social system, which we can regard as an expectation (Luhmann 1984), is not temporary but stable to some extent. In this sense, the structure (the expectation) can reduce the complexity of each person essentially thinking in different ways. Although the structure can function as the reduction of complexity, for example, communications, its function does not include homeostasis. So far, as the social system consists essentially of communications alone and it self-produces everything that is used as a unit by the system, its structure can be rebuilt by communications.

2.2. Assumptions about the Consumption System and Brand Value

Since Luhmann's theory refers to four key concepts in general statements (Luhmann 1984, 1990), we must apply them to the specific context, for example, to consumption. To do this, we made the following four assumptions based on the four key concepts described above.

Assumption 1: The consumption system is an autopoietic system.

Assumption 2: The components of the consumption system are communications between consumers.

Assumption 3: Communications between consumers transfer the difference of product choices and can select a possibility by acceptance or rejection of a particular product.

Assumption 4: The brand value as the structure of the consumption system can be only determined by the autopoietic operation of the consumption system.

3. Autopoiesis of the Consumption System: Two Types of Communication

3.1. Bandwagon and Snob Effects

To clarify the preceding discussion and describe a chain of consumer communications (the autopoietic operation of the consumption system) more concretely, let us review the work of Leibenstein (1950). While he identified three external effects on utility, two of them, the bandwagon and the snob effects, are especially important in this paper. The third effect, the Veblen effect, refers to the differences in prices and is outside the scope of this paper.

First, by the bandwagon effect, Leibenstein was referring to the fact that one person buys because another is buying the same thing (Leibenstein 1950, p. 183). This implies that existing demands produce similar follow-on demands, and these demands continue to increase as long as consumers keep reacting positively to the increase of demand (Leibenstein 1950, chap. 3). Because the bandwagon effect is a nonfunctional one (one in which the demand for a product is not due to its quality), we can consider this effect as one of the functions of communications. More specifically, a consumer may decide which product to choose by communicating with other consumers provided that products in a market are of the same quality. For example, if as a result of communications, the consumer observes that some product is chosen more so by others, the consumer will also choose the same product. Therefore, a chain of communications with the bandwagon effect produces increasing demands for a certain product, which means the emergence of the brand value added to the product.

Second, let us consider the snob effect. By this effect, Leibenstein meant the

phenomenon in which the individual consumer's demand is negatively correlated with the total market demand (Leibenstein 1950, p. 199). Although the snob effect is similar to the bandwagon effect in that they are both nonfunctional effects on consumer product choices and imply that existing demands can influence subsequent ones, the former differs from the latter based on the impact of the previous demands; the bandwagon effect is positive while the snob effect is negative. Therefore, we can infer that the functions of communications with the snob effect are different from those of communications with the bandwagon effect. A chain of communications with the snob effect decreases demands for a certain product, which means the collapse of the brand value added to the product.

3.2. Threshold Model

Thus, we can see that the autopoiesis of the consumption system has two types of communications: those with the bandwagon effect that lead to the emergence of the brand value and those with the snob effect that trigger the collapse of the brand value. However, this leads to the unresolved question, “when do the two communications occur?”—a limitation of Leibenstein's (1950) discussion. To answer that question, we will review the threshold model (Granovetter 1978; Granovetter and Soong 1985; Rogers 2003; Watts 2003).

Granovetter (1978) developed the threshold model to describe collective behaviors in societies such as diffusions of innovations, strikes, and voting. In this model, each individual is assumed to have a personal threshold of whether to adopt the behavior of the group. For example, a person whose threshold is 100 behaves the same as the others when the number of

those who behave identically is more than 100. This suggests the time when a person will start communications with the bandwagon effect. In other words, a consumer starts communications with the bandwagon effect when he or she observes that the number of others who choose the same product is greater than that consumer's personal threshold. Furthermore, the threshold model assumes that each individual has a different personal threshold. This assumption indicates how a chain of communications with the bandwagon effect is possible: consumers with different thresholds choose the same product at different times.

Although the threshold model can formalize the communications with the bandwagon effect, it does not cover communications with the snob effect (c.f. Delre, Jager, and Janssen 2007). This is because the model aims to explain the dynamics of diffusion by focusing on positive feedback (the bandwagon effect). As Leibenstein (1950) implied, however, consumers have two nonfunctional effects, and the bandwagon effect is only one of them. Therefore, the snob effect should also be formalized, since we are attempting to explain not only the emergence of the brand value by communications with the bandwagon effect, but also the collapse of brand value by communication with the snob effect.

We have assumed that consumers have a second threshold in addition to the bandwagon threshold described above, that is, the snob threshold. Two separate thresholds allow us to distinguish the two types of communications and identify when they will occur. Consumers start communications with the bandwagon effect and choose the same product as others when the number of people choosing it is larger than their own bandwagon thresholds. In contrast,

they start communications with the snob effect and switch to other products when the size of the group choosing the same product is greater than their own snob thresholds.

This provides a framework to explain how the brand value added to a product can emerge and collapse through two aspects of consumers' communications, that is, communications with the bandwagon effect and those with the snob effect. The interplay of these communications is related in a complex manner due to the different thresholds in a market in which the same products exist. This is the mechanism of the emergence and collapse of the brand value in the consumption system.

4. Simulation Model

4.1. Agent-based Simulation

We use an agent-based simulation to clarify the process of brand value emergence and collapse. This type of simulation makes it possible to model autonomous systems in which agents (the people living in the virtual world) only interact locally but a global phenomenon can emerge. The agent-based simulation, therefore, can be applied appropriately to the consumption system as an autopoietic system. According to Epstein and Axtell (1996), we require the three components described in the next three sections: an environment, agent equipment, and rules for communications between agents.

4.2. Environment

At the start of the simulation, each agent or virtual consumer lives in one of $n \times n$ squares.

Thus, the virtual world has n^2 agents. The edges of the world in which the agents live are eliminated by closing the array like a torus, so that every agent has the same environment and the same number of neighbors.

Agents can choose one of two alternative products (product x or product y), which are identical except for their colors. This is analogous to all products being the same except for their names. Moreover, each agent is assumed to initially choose one product at random, or more specifically, that the market share of each product is nearly equal at the start of the simulation. This assumption implies that a certain product initially achieving the larger market share would influence subsequent communications as little as possible; our objective is to examine only the effects of the two thresholds.

The final environmental setting concerns time. We define time as discrete (i.e., $t = 1, 2, \dots$). Each agent can choose only one product through communications with the bandwagon effect or the snob effect in each period. The rules governing the communications among agents are formalized below.

4.3. Agent Equipment

We next define the internal state of each agent, $i = 1, 2, \dots, n^2$. Each agent is assumed to have a fixed bandwagon threshold BT_i and a fixed snob threshold ST_i assigned at random. Agents are assumed to have the ability to communicate with the eight neighbors who live in the adjacent squares.

4.4. Communications among Agents

Here we define the rules for communications among agents. First, we assume that agents can use both the information about their neighbors' product choices (i.e., the network share of product x : NS_x) and the information about the market shares of the products (i.e., the market share of product x : MS_x) in their communications. However, they can obtain the information in the previous time period (i.e., at $t - 1$) because the simulation time is discrete and an agent can act only once in each period. Thus, the agents have access to two items of information at time $t - 1$. We define $NS_{t-1,x}$ as

$$NS_{t-1,x} = \frac{\sum_{j=1}^8 C_{t-1,j,x}}{8}, \quad (1)$$

where

$C_{t-1,j,x}$ is the product choice of agent j who is one of the neighbors of agent i at time $t - 1$.

We define $MS_{t-1,x}$ as

$$MS_{t-1,x} = \frac{\sum_{i=1}^{n^2} C_{t-1,i,x}}{n^2}, \quad (2)$$

where

$C_{t-1,i,x}$ is the product choice of agent i at time $t - 1$.

Second, we formalize the communications with the bandwagon effect and the snob effect.

Agents can start communications with the bandwagon effect using the information about

$NS_{t-1,x}$ directly. Agent i is assumed to start communications with the bandwagon effect in

period t when the parameter $B_{t,i,x}$ is equal to 1, where

$$B_{t,i,x} = \begin{cases} NS_{t-1,x} \geq BT_i \rightarrow 1 \\ otherwise \rightarrow 0 \end{cases}. \quad (3)$$

Similarly, agent i is assumed to start communications with the snob effect in period t when the parameter $S_{t,i,x}$ is equal to 1, where

$$S_{t,i,x} = \begin{cases} NS_{t-1,x} \leq BT_i \rightarrow 1 \\ otherwise \rightarrow 0 \end{cases}. \quad (4)$$

Finally, we formalize the product choice of agents at period t . The start of communications with the bandwagon and snob effects are controlled by Eqs. (3) and (4), respectively, but these do not include the information about the market shares of the products ($MS_{t-1,x}$), which can be obtained by agents. Each agent can consider $MS_{t-1,x}$, as well as $NS_{t-1,x}$, when deciding to choose a certain product. Thus, the product choice of agent i in period t , $C_{t,i,x}$, is a function of $MS_{t-1,x}$ and $NS_{t-1,x}$,

$$C_{t,i,x} = f(MS_{t-1,x}, NS_{t-1,x}). \quad (5)$$

Equation (5) can be further developed by introducing $B_{t,i,x}$, $S_{t,i,x}$ and two parameters α and β that depend on $MS_{t-1,x}$. Agent i chooses product x in period t when $C_{t,i,x}$ is equal to 1, where

$$C_{t,i,x} = \alpha \cdot B_{t,i,x} + \beta \cdot S_{t,i,x}, \quad (6)$$

and

$$\alpha = \begin{cases} MS_{t-1,x} \leq a \rightarrow 1 \\ otherwise \rightarrow 0 \end{cases}$$

$$\beta = \begin{cases} MS_{t-1,x} > a \rightarrow 1 \\ otherwise \rightarrow 0 \end{cases},$$

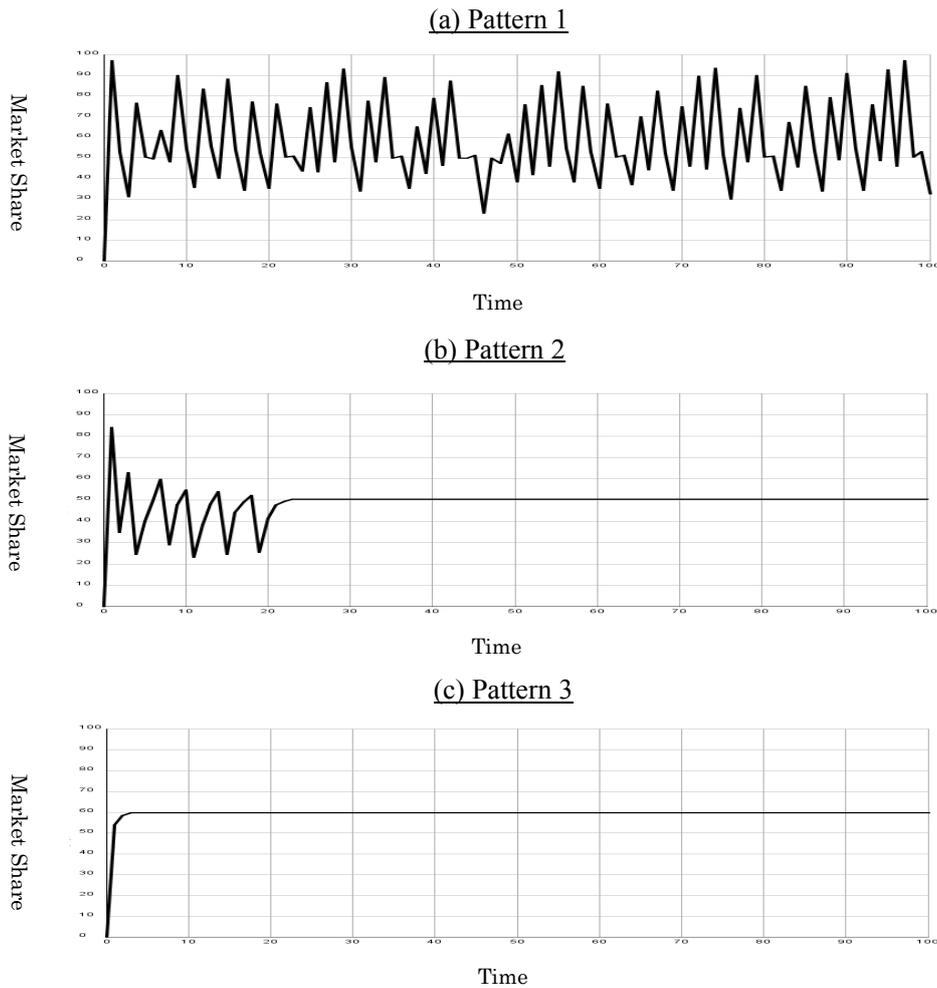
where

a is a fixed parameter assigned at random.

5. Experiments

We simulated a virtual world with 400 agents (i.e., $n = 20$) using the “artisoc 1.0” simulation program. We observed each simulation for 100 time increments. Figures 1 summarize the results for typical runs.

Figures 1: Results of Typical Runs



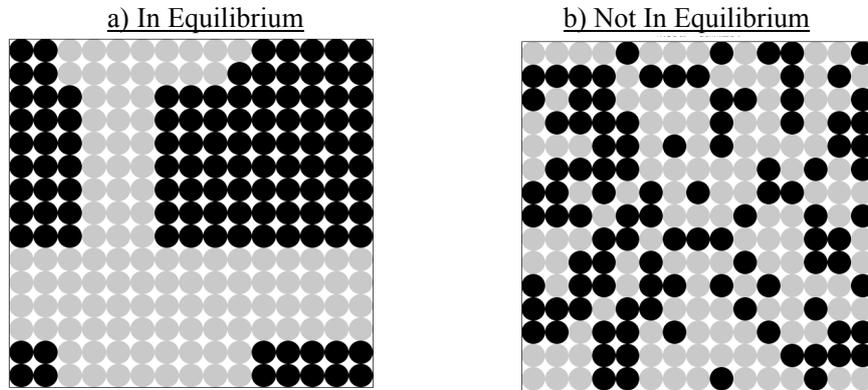
Note: In each figure, only market share of product x is depicted.

First, let us consider the emergence of the brand value. Since all agents have different bandwagon thresholds, each agent chooses a certain product at a different time. In other words, one agent with a lower bandwagon threshold chooses earlier, and second agent with a higher bandwagon threshold does not choose the same product at the same time as the first agent. Increasing the number of agents who choose the same product, however, changes the conditions around the agent with the higher bandwagon threshold. Then that agent decides to switch to the product because $MS_{t-l,x}$ exceeds the agent's personal bandwagon threshold. This implies that the number of consumers who are impressed by a product, and the brand value of the product itself, can increase gradually. It is through the chain of communications with the bandwagon effect that the brand value can emerge in the consumption system.

Second, we can observe the collapse of the brand value. While it is true that the brand value can emerge by communications with the bandwagon effect, it cannot continue to be stable. The results of each simulation show that the market share of a product eventually decreases. Since each agent has a different snob threshold, each agent will abandon a product at a different time. This implies that each consumer evaluates a product lower because it is chosen by too many others to a different extent than all other consumers. If a chain of communications with the snob effect occurs, the brand value added to the product will decrease in the consumption system.

Third, we can observe the equilibrium of market share. Figure 1 (b) and (c) clearly depict this situation. So, we further check the situations of consumers' choices at an arbitrary

Figures 2: Situations of Consumers' Choices



Note: In the figures, black circles show agents who choose product x and gray circles show agents who choose product y .

time and compare the situation in equilibrium with that not in equilibrium. Figures 2 (a) and (b) show the situations of consumers' choices in equilibrium and not in equilibrium, respectively. As shown in Figure 2 (a), when in equilibrium, agents who choose the same products are locked-in spatially. In contrast, Figures 2 (b) demonstrates that agents who choose the same products are dispersed geographically when in not equilibrium. This comparison implies that the emergence and collapse of the brand value is determined partly by spatial conditions. More specifically, consumption system cannot function well when communications with bandwagon effect and snob effect do not occur due to spatially constant consumers' choices. Although this finding is beyond our prediction, it would provide the interesting research subject.

6. Conclusions

We demonstrate that the brand value of a product can emerge and collapse spontaneously in the consumption system. Even if the same products exist in a market, a chain of

communications with the bandwagon effect adds to the brand value to a certain product, while a chain of communications with the snob effect reduces it. This is expected to provide a new perspective to branding research. In other words, branding can be achieved not only by a firm's activities as suggested by the research on brand identity, but also by autopoietic communications in the consumption system. This also implies that the social system theory is a promising basis for research into consumer behavior and marketing. We suggest that it is also useful for simulating consumer behavior. Agent-based simulation in particular is expected to provide more insight into the dynamics of consumer behavior at the aggregate level.

Even so, our discussion is somewhat limited. First, we lack an empirical test to demonstrate the emergence and collapse of the brand value. We cannot test the validity of the phenomenon with a simulation because it is a mere analogy of the empirical world, and collecting concrete data about the phenomenon poses a major challenge. Because the consumption system is only one side of the marketing system, we should also consider the specific marketing context, that is, exchanges or communications between consumers and firms. By considering that the brand value or brand equity is created not only by consumers' communications but also by firms' activities, we can conclude that the value added to a product is the structure of the marketing system. To demonstrate this concept more clearly, we should develop the model to also include the marketing system.

References

- Aaker, D. A. (1991), *Managing Brand Equity: Capitalizing on the Value of Brand Name*. New York: The Free Press.
- (1996). *Building Strong Brands*. New York: The Free Press.
- and Joachimsthaler, E. (2000), *Brand Leadership*. New York: The Free Press.
- Ailawadi, K. L., Lehmann, D. R., and Neslin S. A. (2003), "Revenue Premium as an Outcome Measure of Brand Equity. *Journal of Marketing*, 64(4), pp. 1-17.
- Delre, S.A., Jager, W., and Janssen, M. A. (2007), "Diffusion Dynamics in Small-World Networks with Heterogeneous Consumers," *Computational & Mathematical Organization Theory*, 13(2), pp. 5-12.
- Epstein, J. M. and Axtell, R. (1996), *Growing Artificial Societies: Social Science from the Bottom Up*, Massachusetts: The MIT Press.
- Farquhar, P. H. (1989), "Managing Brand Equity," *Marketing Research*, 1(3), pp. 24-33.
- Gardner, B. B. and Levy, S. J. (1955), "The Product and the Brand," *Harvard Business Review*, 33(2), pp. 33-39.
- Granovetter, M. (1978), "Threshold Models of Collective Behavior," *American Journal of Sociology*, 83(6), pp. 1420-1443.
- and Soong, R. (1986), "Threshold Models of Interpersonal Effects in Consumer Demand," *Journal of Economic Behavior & Organization*, 7(1), pp. 83-99.
- Janssen, M. A. and Jager, W. (2001), "Fashions, Habits and Changing Preferences: Simulation of Psychological Factors Affecting Market Dynamics," *Journal of Economic Psychology*, 22(6), pp. 745-772.
- Keller, K. L. (1993), "Conceptualizing, Measuring, and Managing Customer-Based Brand Equity," *Journal of Marketing*, 57(1), pp. 1-22.

- (1998). *Strategic Brand Management: Building, Measuring, and Managing Brand Equity*, New Jersey: Prentice Hall.
- Kneer, G. and Nassehi, A. (1993), *Niklas Luhmanns Theorie Sozialer Systeme*. Frankfurt am Main: Wilhelm Fink Verlag.
- Leibenstein, H. (1950), "Bandwagon, Snob, and Veblen Effects in the Theory of Consumer's Demand," *Quarterly Journal of Economics*, 64(2), pp. 183-207.
- Levy, S. J. (1959), "Symbols for Sale," *Harvard Business Review*, 37(4), pp. 117-124.
- Luhmann, N. (1984), *Soziale Systeme: Grundriß einer allgemeinen Theorie*. Frankfurt am Main: Suhrkamp Verlag, translated by Bednarz, J. Jr. with Baecker, D. (1995), *Social Systems*, California: Stanford University Press.
- (1989), *Ecological Communication*, Cambridge: Polity Press (translated by Bednarz, J. Jr.).
- (1990), *Essays on Self-Reference*. New York: Columbia University Press.
- Maturana, R. H. and Varela, F. J. (1980), *Autopoiesis and Cognition: The Realization of the Living*, Dordrecht: D. Reidel Publishing Company.
- Rogers, E. M. (2003), *Diffusion of Innovation 5th ed.*, New York: The Free Press.
- Watts, D. (2003), *Six Degrees: The Science of a Connected Age*. New York: W. W. Norton & Company.