9 Mass-Individualised markets

9.1 Introduction

9.1.1 In Chapter 5 we have illustrated interactive dynamic order as an alternative principle governing the relationship between entities in business processes as well as the underlying order in complex dynamic systems. We have already referred to the non-linear dynamic characteristics of a free market economy in Chapter 8.7. In this Chapter we will address the potential impact of such insights on the theory in contemporary marketing literature an the practice of marketing processes in most companies.

9.1.2 However, the aim of this and subsequent chapters is not to develop a complete new marketing theory and tool-set. Our ambition is merely to demonstrate that:

- the growing heterogeneity (see Chapter 4.1) and increasing phenomenological unpredictability of customer demand and behaviour reduce the applicability of linear marketing theories when it comes to exploiting the value achieved by differences between customers;
- advanced markets indeed show strong signs of underlying (interactive, dynamic) order and should therefore not be considered random chaotic systems;
- this underlying order can be used to shape the interaction between supplier and customer into an interactive game of equivalence exchange and rule discovery;
- this new interaction has consequences for the practise of marketing.

9.2 The limits of conventional marketing

In Maslow's need hierarchy increases in wealth satisfy a person's needs at a certain level and make him aware of his needs at higher levels. When the needs move to luxury and self-expression, the underlying determinants for buying behaviour become increasingly emotional and subject to group-interaction. Consequently, differences and interactivity become the driving force for value creation. Conventional marketing thinking (based on segmentation of similar static characteristics) becomes less and less adequate when it comes to understanding customer behaviour. It also becomes inadequate as a basis for the interaction between the company and its customers.

9.2.1 In Chapter 4.1 the relation between increasing wealth, individualisation[i] and fragmenting customer behaviour was demonstrated

9.2.2 Gilmore and Pine (1997) state that when mass production emerged, the definition of a market changed from a gathering of people for the sale and purchase of goods at a fixed time and place to an unknown aggregation of potential customers. In today's dis-aggregating markets the definition is changing again: customers can no longer be thought of as members of a homogeneous market grouping.

> *"The rise of mass customisation in the 1990s has been both a response to and, with the pioneers' success, the impetus behind the now commonplace of segments of one: every customer is his or her own market segment with specific requirements that must be fulfilled. [...] In fact, the journey does not end with every customer being his or her own market. The next step, a widespread recognition that multiple markets reside within individual customers, will turn the entire notion of markets and customers completely inside out. [...] Indeed, acknowledging that individual customers constitute multiple markets gives new meaning to the term market that approximates its original conception: the bringing together of a customer and provider to fulfil that customer's unique needs as they are expressed the present time and under the current circumstances. Instead of focusing on homogeneous markets and average offerings, mass customizers have identified the dimensions along which customers differ in their needs. These points of common uniqueness reveal where every customer is not the same. It is at these points that traditional offerings, designed for average requirements, create customer sacrifice gaps: the difference between a company's offering and what each customer truly desires."*

9.2.3 These observations reveal the limits of our conventional marketing thinking. In the traditional craftsman-type history of most companies, marketing was almost absent, if only because natural demand outstripped supply. Marketing and selling were merely processes of spreading the company's message and then waiting for the customers to buy the products.

9.2.4 The next stage of the development of marketing was the industrial stage. Fuelled by Ansoff's strategic theories, that recognises the strategic importance of product/market segmentation, it became necessary to design instruments to meaningfully create customer groups, to define products or product variations for them, and to maximise the match between customers' demands and the products made. To a large extent these ideas shaped current marketing practices. Our current marketing thinking is essentially based on the thought that markets are predictable and can be segmented into target groups with distinctive needs. It used to be fairly simple: based on only a few criteria large target groups could be defined. But in time this has evolved to the use of a seemingly infinite number of criteria (like in Geo-Market profiles), with which we can operate highly refined segmentation in computer-controlled telemarketing and direct marketing activities[ii].

9.2.5 Regardless of the degree of refinement, the thought is still central that by means of collecting criteria, predictions can be made about future buying behaviour. Today, practical marketing still roughly boils down to putting red balls in red buckets and blue balls in blue buckets. The only difference is that there are now are more colours, but we still exploit the similarities within a certain group of colours.

9.2.6 Everything that does not fit the segment we tend to call erratic and irrational. In fact, we 'blame' the problem on the customer and judged by this traditional framework the customers are indeed erratic. Often they are unable to articulate their wishes or not prepared to do so. The predictive quality of market surveys seems to be ever decreasing. Without segmentation characteristics being changed, customers apparently buy completely different products, whether it is beer, consumer electronics or cosmetics. Moreover, it does not help to confront customers with an ever-increasing pallet of standard products through endless menu cards or consumer electronics with dazzling features. Rather than loading the problem onto the customer's shoulders, we will have to search for a deeper meaning, for an underlying hidden order. As will be explained, the customer is

not erratic; he displays more or less orderly behaviour, which perhaps cannot be explained, but can be observed and interpreted using the insights of complex dynamic systems.

9.2.7 As a consequence market research starts facing limitations. A simple analogy, already used in Chapter 7, will illustrate this (see par. 7.7.5). An American architect, who had been commissioned to build a block of offices, developed a number of towers with offices, which he presented to the board of directors. After the normal enthusiastic comments, someone said: 'But you forgot to design the pavements between the towers.' The architect responded: 'I did that deliberately, because in a new office environment it is simply not possible to predict with what frequency, at what time and how people will actually be walking from one building to another. So I have projected a lawn between the office blocks and we will have it for a year and then we can actually see where the pavement should be.'

9.2.8 Conventional marketing thinking would have led to interviewing all occupants of the various buildings, making segments of groups of people who had to move from one place to another, and asking them to make projections of their needs in situations which they could not even think of at that time. Then the most logical lay-out of the paths would have been worked out by clever computer algorithms and a company would have been ordered to lay the pavement. The lawn around the pavement would carry signs saying that it was forbidden to walk on the lawn. The people who would be marginally uncomfortable with the result of this engineering exercise would keep walking on the pavement in fear of bureaucratic control, and the company would be under the impression that every customer was happy.

9.2.9 The proposed solution of the architect is derived from a completely different perspective. There is no way to find out in advance how things will work out, so you have to offer every possibility and look at the footprint of reality to decide what is required. In this example people were encouraged to walk on the lawn rather than forbidden to do so. Rather than conditioning people in a behaviour contrary to their needs, which is not uncomfortable enough to start protesting, an evolution is allowed to occur. People's behaviour is analysed and paths are laid where they should be. In the traditional solution only letters of criticism to the management will ever get the paths moved. People who are accustomed to walking down those paths will never find out what the joys and benefits of walking down a different path could and would be. They are not encouraged to experiment.

9.2.10 So, the non-traditional approach creates a lawn and encourages people to walk on it. Once people are accustomed to walking on the lawn they will probably keep on doing so, no matter where paths are laid. If, after people have settled down and maybe some departments have shifted from one building to another, the paths prove to be the wrong ones, then at a spot where there is no pavement a new trace will start developing and right there a new pavement might be laid. At the same time those sections of pavement which are no longer used, could be removed.

9.2.11 In the same way, if the market is becoming dynamic and non-linear, then there is not much sense in traditional predictive market research. It will yield not the differences in the market, only the similarities. It will not give us any information on customer demand for new products, yet unknown to them. Consequently, Sara Lee, one of the champions of market research in new product introduction, has now abandoned market research altogether for some new products:

"Just try it, because the prediction of market research is no better than the gut feeling as a basis for trial and error."

9.2.12 The concept of a mass individualised company differs fundamentally from that of companies in the previous stages, when seen from the marketing angle. The mass-individualised company does not exploit similarities. In an individualised utility exchange process, it exploits differences as the basis for value creation. The customer as a representative of a group is disappearing. As each customer has different needs, her or his behaviour cannot simply be linked to traditional segmentation criteria as wealth, demographic signature, etc. Apart from functional aspects, emotional aspects also become important: in many products we already sell emotions rather than functions. Even for basic products and services such as clothes, transport and food there will be a relation between the function and the surrounding emotion. The differences between clients will lead to different functional and emotional requirements.

9.3 Markets as non-linear dynamic systems

Although on a phenomenological level customer behaviour is apparently increasingly chaotic, there is evidence that markets can be characterised in terms of interactive order mechanisms. We will explore three angles of evidence:

- **Occurrence of positive feedback phenomena;**
- **Limited entropy in experienced customer behaviour;**
- **Finite dimensionality of the supplier/customer solution topology.**

The first angle comes from published literature, the latter two are from experimental work as part of our research

9.3.1 Market behaviour becomes increasingly non-linear. The occurrence of this behaviour is not new. As early as in the 1960s and 1970s Ehrenberg (1972) wrote an impressive book on repeat buying theory, in which he described a relationship between market share and repeat-buy frequency; however, he could not extensively explain the underlying mechanism. More recently Brian Arthur was one of the authors who described positive feedback mechanisms, e.g. in contagion processes. Also market growth curves (adoption and diffusion, S-curves) have their origin in a non-linear propagation of information and standards. This in itself demonstrates already that non-linear behaviour is not identical to 'chaos'.

9.3.2 The repeat buying theory has had an enormous impact on the way we market consumer products. His basic statement was that the repetitive buying rate of a product, whether it be a toothbrush or a detergent, was directly proportional to the product's market share. This meant that once customers had bought the product, the higher the product's market share, the more likely they were to buy it again. This would result in an increase of market share. Therefore, once a manufacturer had a certain market share there would be a predictable number of repeat buys. A rapid building of market share is therefore of prime importance, as it generates a multiplier by means of repeat buys. This goes even if the first product is given free, provided the market share grows sufficiently. Consumer advertising has been strongly influenced by this view ever since. Ehrenberg's problem was that he could not explain the mechanism, because it cannot be explained from conventional linear marketing thinking.

Only now do we start discovering the underlying mechanism, resulting in positive feedback.

9.3.3 Fader and Schmittlein (1993) elaborated on the notion of repeat buying: the idea that brands with higher market shares tend to display market advantages over small-share brands. Building further on Ehrenberg's concept they proved that high market share brands have three distinct benefits, compared with small-share brands:

- They have more buyers or a higher market penetration;
- These buyers purchase their brand more often than the buyers of small brands or their purchase frequency is higher;
- They show higher level of repeat purchasing, or excess behavioural loyalty.

9.3.4 Distinguishing between these three effects leads to the prediction that high share brands tend to have even higher repurchase rates than one might predict on the basis of the common repeat purchasing model (used amongst others by Ehrenberg). Fader and Schmittlein show that this excess loyalty cannot reasonably be explained by differences in the emphasis placed by different brands on advertising, promotion or price, nor by the market responsiveness to these instruments (i.e. increasing or decreasing returns to scale). Nor can the notions of non-stationary choices, inertia and variety seeking by customers prove to account for this effect. Apparently, the positive feedback mechanisms of repeat buying possess an underlying logic that cannot be explained by conventional methods. An illustration of this is Fader and Schmittlein's empirical finding that the current predictive models for this phenomenon overestimate differences in brand preference between customers.

9.3.5 There are, however more people who have worked on non-linearity in markets. Hibbert and Wilkinson (1994) state that non-linearities are an important feature of marketing and economic systems [iii]. For example, Forrester's work on system dynamics shows that non-linear phenomena in the form of various kinds of feedback loops are central to behaviour in complex systems such as marketing systems. Traditionally, complex random-looking behaviour patterns have been explained in terms of random external shocks or inherent stochastic processes. In some cases, however, such behaviour may be partly caused by chaos that results from an underlying non-linear system. The problem is to distinguish between the elements of behaviour which appear chaotic and those which are the result of dynamic system behaviour (random shocks and stochastic processes).

9.3.6 Brian Arthur, who has been working on the subject of positive feedback mechanisms (or increasing returns) in the economy since the 1970's, stresses the growing importance of increasing returns in western economies. They have undergone a transformation from bulk-material manufacturing to more knowledge-based products [iv]. At the total market level, non-linearity expresses itself in the form of positive feedback mechanisms. It is not surprising that these effects appear to become more relevant at higher levels of sophistication. Brian Arthur:

> *"If the duplication costs are high with respect to the original, the document characteristic is decreasing returns."*

In other cases increasing returns becomes more important. In today's world, more and more the value of products and services is linked to immaterial and information components which inherently have the characteristic of low duplication cost**.**

9.3.7 Romer (1995) has analysed the influence of software: because of software's unique capacity for simultaneous use by an arbitrarily large number of people, an innovation in software can have an impact that is felt on a massive scale. Some of the most important transitions in human history arose from the discovery of new methods for copying, storing and transmitting software. Examples include the introduction of written language, printing with moveable type, telecommunications and digital information processing

9.3.8 Besides the efforts of Brian Arthur, also a former colleague of Prigogine, André De Palma, has applied some of the thermodynamic principles to economics [v]. De Palma has been mainly concerned with models of consumer choice (discrete choice, describing the behaviour of consumers faced with a variety of mutually exclusive choices, by means of probability functions), product differentiation (using among others the 'representative consumer' model), and variety competition (spatial and oligopolistic competition). De Palma's work, however, is much more embedded in neo-classical economics than the work of Arthur c.s. While the classical laws of decreasing returns, which lead to stability and equilibria, apply to the 'bulk' economy, knowledge-based economy is bound to the rules of increasing returns, which lead to instability and disequilibria.

9.3.9 Arthur (1996) argues that a major part of the economy - mainly the fast-growing high-technology part - is subject to increasing returns. According to Arthur (1988) there are four generic sources of increasing returns, or positive feedback in the economy:

- Large set-up or fixed costs (leading to falling unit cost as volume increases);
- Learning effects (product improvement and/or lower costs as sales volume increases);
- Co-ordination effects (agents 'going along' with other economic agents);
- Adaptive expectations (increased prevalence of the product leads to further prevalence).

9.3.10 Traditionally we have segmented markets, tried to predict buying behaviour, assumed that this buying behaviour is reflected in the choice that customers make, evaluated that choice and if we were wrong we have corrected our process until it was correct. It is like adjusting a central heating system at home: we continue adjusting until our theory fits reality. Something happens in the market that is different from what we are trying to achieve. Apparently, some of the things which we put into the market create a tension, transmit signals, become more powerful, and push and reinforce the buying behaviour as a positive feedback loop. Sometimes we do not seem to get the theory right. Philips and Sony not get it right in the videocassette recorder (VCR) business where, at least according to the experts, the best products have failed.

9.3.11 The history of the video recorder furnishes a simple example of positive feedback. The VCR market started out with two competing formats that sold at about the same price: VHS and Beta-max. Each format could realise increasing returns as its market share increased: large numbers of VHS-recorders would encourage video outlets to stock more pre-recorded tapes in VHS-format, thereby enhancing the value of owning a VHS-recorder and inducing more people to buy one. (The same would, of course, be true for Beta-format players.) In this way, a small gain in market share would improve the competitive position of one system and help it further increase its lead. Such a market is initially unstable. Both systems were introduced at about the same time and therefore began with market shares that were roughly equal; those shares fluctuated quite early because of external circumstances, 'luck' and

corporate manoeuvring. Increasing returns on early gains eventually tilted the competition towards VHS: it accumulated enough of an advantage to take virtually the entire VCR market. Yet it would have been impossible at the outset of the competition to say which system would win, which of the two possible equilibria would be selected. Furthermore, if the claim that Beta was technically superior, is true, then the market's choice did not represent the best economic outcome.

9.3.12 The same positive feedback loop explains why some kids only want jeans with a particular emblem, e.g. Levis 501. This is only a tiny attribute, but it has become very important as a symbol. There is no way to predict what the signs will be; some succeed and some fail. The fashion[vi] business is, in fact, based largely on such of mechanisms, because fashion itself is a matter of positive feedback (see also Chapter 8.7). Yet other people might consider that clothing is not a way of self-expression, and therefore adhere to their traditional clothing conventions. In such cases demand might prove very predictable.

9.3.13 Arthur states (1990):

> *"Besides these properties we might note other analogies with physical and biological systems. The market starts out even and symmetric, yet it ends up asymmetric. There is 'symmetry breaking'. An 'order' or pattern in market share 'emerges' through initial market 'fluctuations'. The two technologies compete to occupy one 'niche' and the one that gets ahead exercises 'competitive exclusion' on its rival. And if one technology is inherently superior and appeals to a larger proportion of purchasers, it is more likely to persist: it possesses 'selectional advantage'."*

9.3.14 Therefore, if there is stability in the network, there are probably attraction functions (attractors) that govern the behaviour, which actually prevents the structure from exploding. If there were no attractors, if there was no stability within the system, then phenomena such as fashion could not exist. Apart from positive feedback forces there must also be counteracting forces in order to create attractor-like nodes of dynamic stability.

9.3.15 Such attractors can be seen as peaks in the solutions topology (see Chapters 5.11 and 7.6-7.7). Through interaction between both customers and suppliers in the market place better and better solutions will be found in the near infinite solution landscape. The needs of the market are as it were attracted to the peaks in the solution landscape and in this sense increasing returns is closely related to the existence of such landscapes.

9.3.16 This is reflected in the characteristics which Brian Arthur (1988) himself mentions as characteristics of non-linear (increasing returns) economy:

- *Multiple equilibria*
  different asymptotic market share 'solutions' possible;
- *Possible inefficiencies*:
  the eventual 'solution' does not necessarily generate the best possible benefit;
- *Lock-in*
  once a 'solution' has been reached, it is difficult to exit from and difficult to break in for competing solutions;
- *Path-dependence*
  the early history of market share can determine which solution prevails.

All of these characteristics are completely in line with the existence of complex solutions-topologies as arising from Kauffmans' N/K landscapes (see Chapters 5.11 and 7.7).

9.3.17 The above observations indicate that customer behaviour cannot necessarily be explained by conventional demand segmentation based on customer-specific criteria. Interaction takes place underlying that behaviour (otherwise positive feedback could not occur).

9.3.18 In these cases order can be observed (but not explained) at the phenomenological level. However, there are customer behaviour phenomena which do not surface as apparent orderly behaviour, but neither are they chaotic. We will demonstrate this by observing customer behaviour in a supermarket, using the insights dynamic complexity and order as described in Chapters 5 through 7.

9.4 Market order

An equivalence-based interaction model, that enables supplier and customer to find solutions that yield benefits for both sides, has been developed for a supermarket situation. Application of this model in experimental research clearly shows that customer behaviour in this solution space is not random and shows clear signs of underlying (complex) order. The set of moment-specific paths, generated by a large group of (experienced) customers, is magnitudes smaller than the available options and the size of the customer population, and is relatively constant in time.

9.4.1 We applied the theoretical framework for interacting networked subsystems described in Chapters 5 through 7 to the interaction between 5 supermarkets (all belonging to the same retail-chain) and their respective local markets. With this objective a solution space was created that divided the shop in a number of distinctive steps in the buying process, each of them with a number of alternatives. These steps referred to categories of products (e.g. bread, meat, flowers, cheese, diary, but also included service aspects as method of payment). For each of these steps a number of alternatives was formulated, thought to represent a specific retail service characteristic (e.g. fresh or frozen; self-service, serviced or semi-serviced; ingredients, meal-components or meals). By classifying products in the matrix so defined (see Figure 9-1) analysing the baskets enabled to reconstruct the path of the customers through the matrix of options.

9.4.2 For each customer shopping run (the customers were anonymous) over a period of one week the behaviour represents a path through the matrix. If we consider the supermarket as a 'basket assembly operation', the path represents the footprint of the customers buying moment in a fractal supply chain.

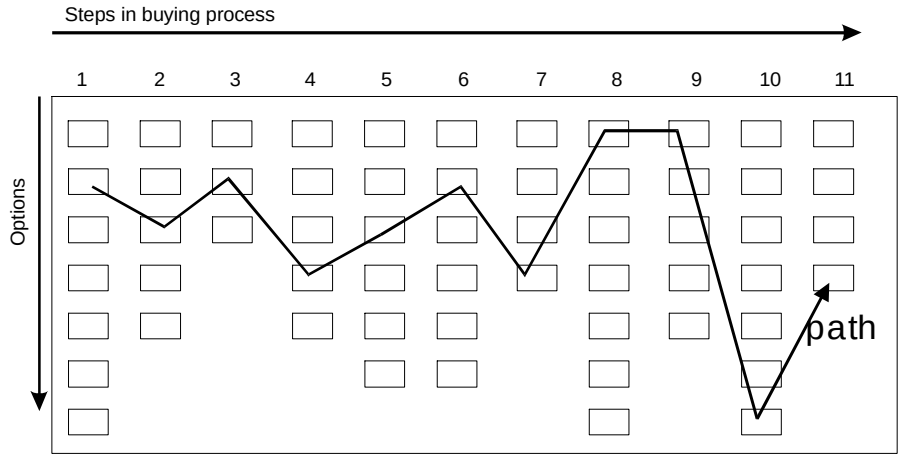

Figure 9-1 Solution space for retail clients

9.4.3 In order to understand these footprints, recognising that for most customers the actual path would present some sort of optimal solution arrived at through building experience in the use of the supermarket, we assumed that the choices marked by the path would represent the best available solution to the customer given the available choices. Hence the respective choices carry information about the buying moment.

9.4.4 The model used to describe the (experienced) choice process is drawn in Figure 9-2.

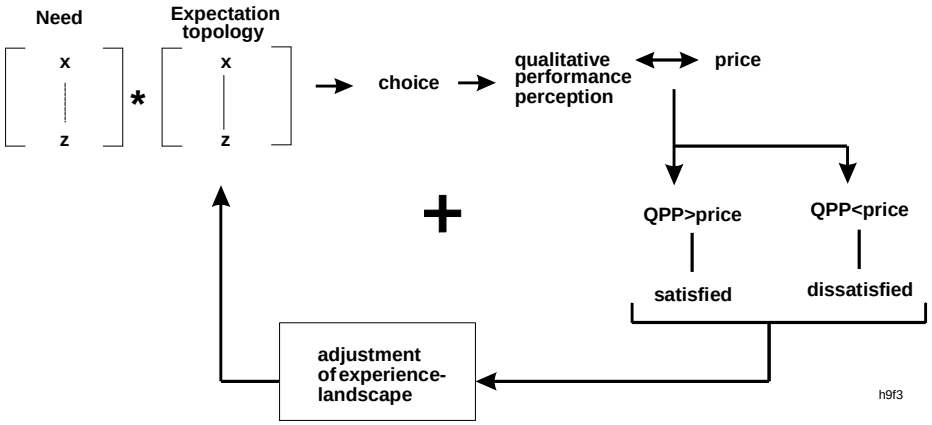

Figure 9-2: Customer choice model

9.4.5 In this model we presume that the customer has a multidimensional expression of utility (very much along the lines of the utility theorists, see Chapter 2.3). Using their accumulated experience they will make a choice from the available options as to which of the options will most closely match the utility requirement. Having made the choice, the satisfaction level at both satisfier as well as dissatisfier aspects (Herzberg, 1968) will subsequently adjust the expectations for the next shopping cycle. This way, over time, experience will build up an experience landscape for the respective buying moments, as is graphically indicated (for one specific buying moment) in Figure 9-3.

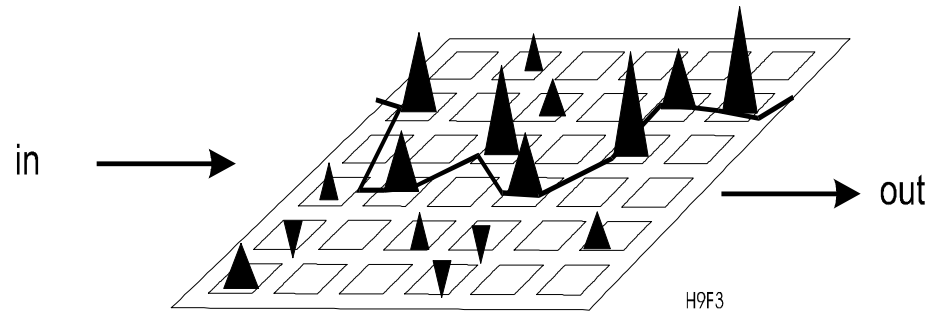

Figure 9-3: Customer experience landscape

9.4.6 This learning model is another way of representing the rule-discovery mechanism that lies beneath organisational learning processes, as demonstrated in Chapter 6.8. The moment-specific utility expression ('need') is confronted with the experience which has been accumulated and which suggests possible or attractive 'THEN''s matching the need ('IF'). From a 'blank start' with inexperienced customers, gradually a set of IF-THEN rules develops, which becomes more refined by continuous experimentation and evaluation. In this way a solution landscape is created that expresses the best available solution for various needs.

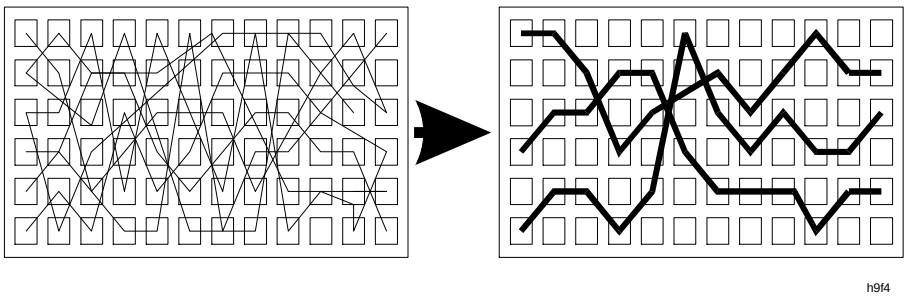

Figure 9-4 Self-ordering of paths

9.4.7 If we combine all customers over all moments, a rich pattern of paths will emerge. If learning (building experience) takes place, and customer-moments are not truly chaotic, an originally (if all customers are inexperienced) chaotic pattern of paths will order itself into a rich variety of paths, each representing the best available fit for the moment (see Figure 9-4). As the shopping moment is presumed to be constant in terms of required utility, these paths can be considered the footprint of the respective utility.

9.4.8 Using this method we analysed the paths of about 90.000 shopping visits over the 5 supermarkets in one week. As expected, the number of possible paths is vast; dependent on particular options per outlet (they ranged from large to small) it varies from about 800,000 to about 5.000.000 possible combinations. If there would be no structure underlying customer behaviour, one would expect all transactions to create a separate path, randomly using path space. In fact this does not happen.

9.4.9 Typically, the number of paths amounts to roughly 30% of the number of transactions, which suggests a richness in customer behaviour, but not randomly chaotic. This is further illustrated by the results per outlet in Figure 9-5.

	outlet A	outlet B	outlet C	outlet D	outlet E
potential paths	768.000	4.800.000	4.800.000	768.000	768.000
paths	3.422	5.327	5.846	1.707	1.503
transactions	11.016	19.411	17.951	5.820	5.283
path per transaction	0,31	0,28	0,33	0,29	0,29

h9f5

Figure 9-5: Path concentration patterns

9.4.10 The results are remarkably similar for all supermarkets in the experiment. Or expressed in terms of organisational entropy (the sum of path probabilities): a reasonably low entropy compared with chaotic behaviour. It also can be shown with cluster analysis that although order appears to be present, the behaviour cannot be meaningfully segmented at the transaction level. In other words: customer behaviour in these supermarkets is non-segmentable, but it is not chaotic.

9.4.11 The patterns have a high dynamic stability, while not being constant. In time, as could be verified in time-series of similar experiments, they change gradually. One can see new patterns developing and old ones disappearing, an evolutionary rate of change.

9.4.12 Hence, customer buying behaviour is not random, and there appears to be a hidden underlying order. In order to proof this hidden order, and arrive at an expression of the complexity of the market behaviour, we further analysed the data.

9.5 Finite dimensionality

Beneath apparent chaotic customer behaviour is a deeper (interactive) order. This hidden order can be proven by using complex mathematical tools. The attributes of experienced customers can be 'decoded' from their actual choices of sequential alternatives. It can be proven that these attributes can be described in a relative small dimensional space.

9.5.1 The set of paths generated by a large group of customers is much smaller than the number of available options. Characterising this behaviour as a complex dynamic system implies, according to Gell-Mann's definition of complexity, that there is a shorter code describing the phenomena than the description of the phenomena themselves. One of the ways to prove that such a shorter code must exist, although not revealing the code itself, is identifying the dimensional space in which all of the phenomena fit. If this dimensional space is

substantially smaller than that of the universe of possibilities, then this reduction of dimensions can be considered as a measure of complexity.

9.5.2 To illustrate this, consider a 3-dimensional cube of possible observed events (e.g. the position of an object in space). If we observe the position of the real objects, and find that in fact they are all positioned in one plane somewhere in the 3-dimensional space, their position, by translation and rotation of the cube, can be expressed in two, rather than three, dimensional numbers. Their position is apparently not random, some form of order exist, and there is a shorter description of the phenomena than the phenomena themselves.

9.5.3 In Chapter 9.4 we used a relative simple model in which the supermarket was represented as an interactive solution space with the customer. This space yields approximately 5.6 million possible solutions. If we however 'atomise' the same supermarket at the level of the individual product ('heavy customers' buy on average approx. 30 products out of the 10000 available products), the solution space has $10.000^{30} = 10^{120}$ possibilities, or 120 dimensions.

9.5.4 We analysed the behaviour of some 32.000 baskets in order to determine the customer paths. In order to calculate the dimensional space of the customers-needs topology, we presume that:

- all purchases in one basket represent on shopping moment (e.g. the customer utility profile during the moment is assumed to be constant);
- identical paths represent similar (not necessarily identical) utilities;
- the difference in utility is proportional to the differences in path (the number of purchases that are different between the paths).

9.5.5 Hence all information is hidden in the overlap of choices. The number of overlaps is an (inverse) measure for distance between the paths, and with that the distance between the utilities. If two paths have no overlaps, no information can be derived with respect to the distance between respective utilities.

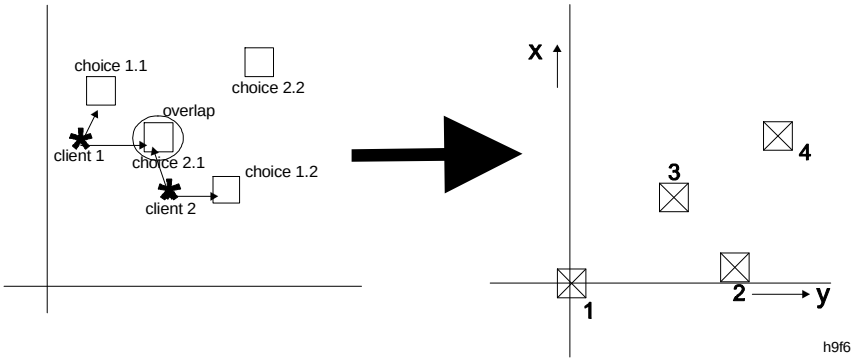

Figure 9-6: Distance in spatial dimensions

9.5.6 Customers who show identical moment-specific behaviour (as indicated by there path) are assumed to have zero distance between their utilities. In an abstract space this would create two identical points. Customers who show differences in their behaviour consequently are at some distance from each other. This distance is assumed to depend in a linear way on their difference in paths. A hundred percent identity represents a distance of 0,0. A 25% difference (or 0,75% identity) represents a distance 0,25 etc

9.5.7 We presume that customer utility requirements remain constant throughout one buying process. Different requirements will in step of our example lead to different choices: customer 1 chooses block 1.1 and customer 2 chooses block 1.2.. Different moment specific requirements might though lead to choosing the same option, as shown in step 2: customer 1 chooses block 2.1 and so does customer 2, because block 2.2 is too far away from his utility (see Figure 9-6).

9.5.8 Knowing the distances, and starting with the first path, we put this first in the origin of some sort of spatial representation. We know the distance from number 2 and we put that distance on the horizontal axis. For number 3, we know the distance from numbers 1 and 2, that is at the cross section of 2 circles with the respective distances as radius, and it might be either there or there. By default we choose the positive one. For customer number 4, we know the distance to 1, 2, and 3, so we can calculated their exact position, etc. By doing this you can map all of the customers, in this case in two dimensions. This analysis could be done in any number of dimensions.

9.5.9 If we look only at the overlaps in this simple two-dimensional expression, once we have positioned the first two points, we will be able to find all other points in relation to them. With respect to the original customers, this might be rotated, scales might vary, and it might be reversed or mirrored. But the relations between the points must be correct.

9.5.10 When customer-paths show no overlap, the distance cannot be determined. However, if we combine these customers with customers that do show a relation, the distances between all customers can be determined. For example, when A and B show only differences, but distances between A and C and B and C can be found, the distance between A and B can be determined anyway.

9.5.11 In this way we can reconstruct the spatial distribution of the original customer needs in two dimensions, apart from rotation, mirroring and skill factors. Since those customer needs have shifted, due to the attraction or detraction of the blocks and the choices the customers had, the customers will never have an ideal choice. They will not end up at one particular point, but will scattered around it.

9.5.12 For example, if we have ten possibilities to link point 4 to, and we start with point 1 and 2, then we can also make a comparison between 1 and 3, 1 and 5, 1 and 6, etc. There are 90 possibilities if we take two points out of the ten. So we could make 90 estimates for point 4. If all those estimates end up in roughly the same area, scattered around a certain point, then we probably have the right number of dimensions.

9.5.13 The scattering does not necessarily end up in roughly the same area. For example, part of the estimates may end up round where we originally positioned the point; another part may end up at a completely different place in the plot. In that case the number of dimensions of the problem is larger than the number of dimensions we are actually using to resolve it.

9.5.14 If we work with large numbers of customers, the distances cannot be plotted in a two-dimensional space. As there are too many contradictory estimates, the measurement error becomes too large. This measurement error can be reduced if we reduce the number of dimensions. At a certain number of dimensions all customers can be correctly positioned, and the distances between customers are optimal. The minimum number of dimensions under where this is the case is the dimensional space of the solution. In our solution method we therefor

gradually increase our number of dimensions until we find a clustering of the estimates of our customer positions that has a stable residual error.

9.5.15 The above describes the principles of the decoding method. In practice this is not quite so simple, as the noise in the positioning of points creates divergence rather than convergence when it comes to estimating the numerical dimensions. However, the problem can be resolved by applying more refined mathematical techniques, such as the Elastic Web Theory [vii]. The use of such methods (at first to estimate the dimensional space of the customer code) shows a steadily decreasing error. As the number of dimensions is stepped up, the error declines until a residual error remains which represents the residual noise factor. The bending point (see Figure 9-7) reflects the number of dimensions in which the customer code can be expressed accurately.

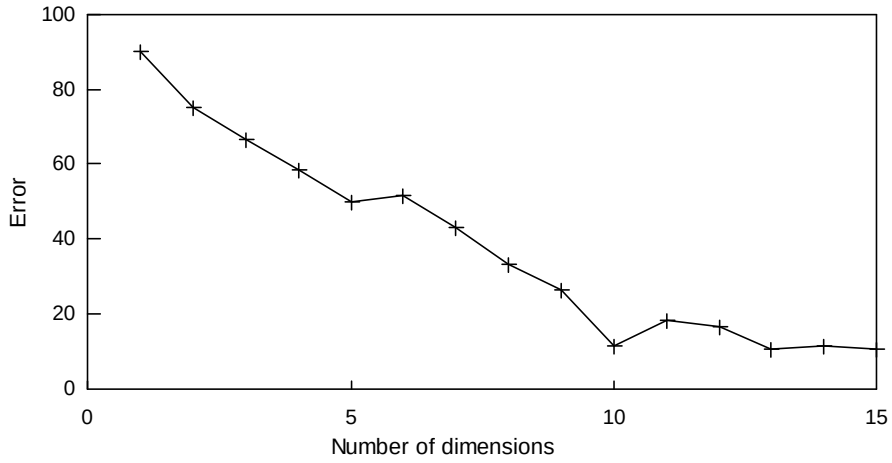

Figure 9-7: Error index versus number of dimensions

9.5.16 Applying this approach to the data from our approx. 32000 baskets, it appears to be possible to characterise assortment at article level (and customer requirements) in as little as 10 dimensions (see Figure 9-8). In fact, the 32000 baskets, representing a moment specific choice in a space of 10^{120} possible choices, and yielding only 6500 different paths, are condensed into an 10 digit expression. The reduction from 32000 baskets to only 6500 paths implies that order must be underlying the phenomenological behaviour. When experimenting with a next run of 32000 baskets, the distance relation between almost all of the products in the 10-dimensional space remained the same. Therefor it can be concluded that this 10 dimensional space is a minimum, but sufficient set to characterise customer-moments and related product-choices [viii].

9.5.17 Referring to Gell-Mann's definition of complexity: customers and customer behaviour are considerably more complex that we have grown to believe, but they are nowhere near as chaotic as might be observed from their apparent behaviour.

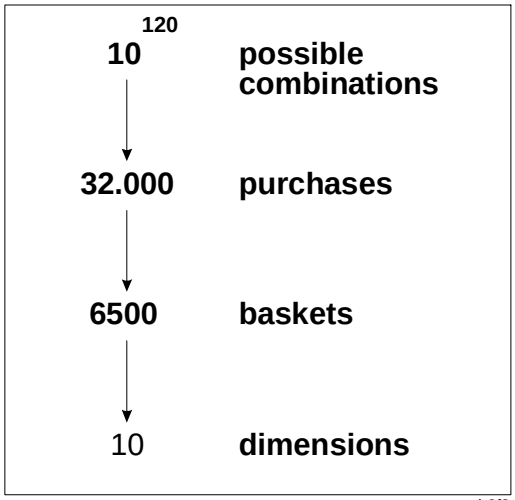

Figure 9-8: Dimensional reduction.

9.5.18 The fact that a vast (nearly infinite) solution/needs space can be expressed in an 10-digit number indicates that the actual complexity which governs the customer/supplier interaction is considerably lower than is maximally possible. In other words, the N/K connectivity (= how many options link with other options) is limited, making effective learning and use of such complex solution spaces possible.

9.6 Infinite choice

A common answer to unpredictability and heterogeneity is a vast increase in the diversity of output. However, confronting customers with an infinite choice leads to impossible search processes. The N/K complexity is creating a rugged solution landscape, which will require disproportional (to the need) search energy, and increase the risk of sub-optimal solutions.

9.6.1 Some industries, in an attempt to further exploit the technological capabilities to create variety, have already passed the point where variety still seems to serve a purpose for customers. This is not because there are too few specific customers for every manufactured version; the reason is that customers cannot find out how best to match their needs with the company's product or are not interested in this. We presented already examples from the insurance and consumer electronics industries, but the above is also true in the branded products industry. The idea of unlimited differentiation along the industrial axis seems to be coming to an end.

9.6.2 Fuerderer (1996) states:

> *"The 'you name it we build it' strategy is indeed a misunderstanding of mass customization practices and is also contrasted with actual purchase and option selection behaviour. Experience shows that demand is limited to a small fraction of all possible car variants which can theoretically be ordered by the customer."*

9.6.3 With regard to mass customization, one thing should be clear, according to Zeleny (1996):

> *"[...] consumers do not want extensive choice and selection, they do not want variety and endless options. Consumers want what they want. If I want ivory-grey paint then the mere fact that the retailer stocks 1.500 other paint colours is of no consolation. I am much better off having my colours mixed right there, preferably through self-service, according to producer-furnished mixing recipes and store-provided mixers."*

9.6.4 For instance, 186 TV-channels present users with an infinite choice. We could make it possible for them to create their own individual channel, which in fact already happens. If we look at the way children watch TV using the remote control device, they actually assemble their own television channel by zapping to the programme they want to watch at any given moment. What is more, they are able to watch five programmes simultaneously.

9.6.5 Now, suppose that someone, somewhere in the system, would know what programmes users are interested in by recognising their 'footprint' from their actual moment specific behaviour. In that case the zapping could take place automatically and they would get their own programme from the total offer of 186 channels.

9.7 Interacting landscapes and dialogue

In fact, the interaction between supplier and customer appears to be a landscape with limited N/K complexity [ix]. This enables them to interact and further to discover, memorise and proliferate knowledge with which both parties can improve their relationship in a way that is mutually beneficial. And by doing so they can create the basis for a coalition of interest which can evolve beyond the current borders of knowledge and opportunities.

9.7.1 As indicated, confronting customers with an infinite choice leads to nowhere. It is impossible to pass the consequences of infinity of differences between customers on to the same customers, whether in terms of delivery time, price or by offering them an infinite choice. It requires a different choice process, one which is based on interactivity with the customer. The search process becomes an interactive search for the fitness of interactive rules, as, for example, in genetic algorithms.

9.7.2 It is up to the supplier to understand on-line and real-time the individual needs and to translate them into a moment-specific, individual and productive performance. If we want to understand the customer, we will have to understand the logic of interaction.

9.7.3 Dialogue-based interaction can only be effective if the communication is expressed in the customer's perception of the world. This means in many cases the creation of a virtual, interactive environment, enabling the customer to 'experience' ('taste') the product/service. The translation into 'supplier' language and specification is an embedded background function, invisible to the customer.

9.7.4 Pine, Peppers and Rogers (1995) state:

> *"Customers [...] do not want more choices. They want exactly what they want - when, where, and how they want it [...]."*

According to them, managers must abandon their mass-marketing/mass-production view and assume a mass-customising/one-to-one marketing view. Information technology and flexible manufacturing systems enable mass customisation, whereas interactive media and database technology enable one-to-one marketing. This 'twin logic' ties producer and customer together in a learning relationship: an ongoing connection that becomes smarter as the two interact with each other.

9.7.5 In such a relationship, in time the customer 'teaches' the company more and more about his preferences and needs. The more the customer teaches the company, the better it becomes at supplying him exactly what he wants. Moreover, it will become more difficult for competitors to move in, because the switching costs for the customer (i.e. starting the teaching process all over again at the competing company) become higher as the relationship lasts longer. Or, in other words, this interactive learning process will generate greater customer loyalty.

9.7.6 Pine, Peppers and Rogers (1995) provide an example of an information services company. A new customer's preferences are taken by an 'editorial manager', who enters the customer's specific request into the information system. This system searches more than 12,000 articles on the customer's criteria every day. Those articles that most likely fit the customer's information needs, are delivered to him. From that moment, the company asks the customer every week whether the articles were 'not relevant', 'somewhat relevant' or 'very relevant'. The customer's responses are fed into the system, making it even smarter. Typically, in the first week, customers judge only 40% to 60% of the articles as somewhat relevant or very relevant. By the fourth or fifth week, the system has increased those ratings to a targeted 80% to 90%. Once that level has been achieved, the rating frequency is reduced to once a month.

9.7.7 As building such learning relationships is still very costly, it only pays to establish these relationships with the highest-value customers. The authors argue that in view of the advances in information technology these costs will go down and more businesses will start learning relationships with a wider range of customers. Industries that are already ripe for such a revolution include:

- complex products or services (i.e. with lots of options and features that confuse the customer in normal choice processes);
- 'big ticket' items (such as automobiles);
- digitisable products and services (*"anything that can be digitised can be customised*", such as software, music and telecommunication services);
- on-line services (normally offering an information overload, e.g. electronic shopping, entertainment, news services);
- luxury and speciality products (since their customers exhibit complex individual tastes, e.g. apparel, cosmetics);
- retailing services (as retailers have the advantage over manufacturers of being closer to the customers).

9.7.8 Even in the grocery business are there possibilities, as is shown by an example of Peapod grocery shopping and delivery service (Pine, Peppers and Rogers, 1995). This service's customers buy a $ 29,95 software application that enables them to access Peapod's database through an on-line computer service. They pay a fixed amount of $4,95 per month for the service and a fixed amount of $5

per order plus 5% of the order amount. Peapod's back office is connected to the mainframe databases of the supermarkets at which it shops for its customer, allowing it to provide the supermarkets assortment and shelf prices to its customers. Rather than automating the trip to a retail store, as other on-line providers do, Peapod uses interactive technology to change the shopping experience altogether. By using an advanced search programme it enables each customer to create the virtual supermarket that suits him or her best. Customers can request and arrange items by different criteria, they can create and save shopping lists, etc. Obvious advantages are that shopping can be done from home or from work. Apart from that, shopping also becomes more effective (e.g. comparison-shopping improves, there is less search time, etc.). Peapod has found that every interaction with a customer is an opportunity to learn. At the end of a shopping session it asks its customer to rate the performance on the previous order. The feedback induced the company to institute a variety of changes and options, such as providing nutritional information, offering an extra-fast delivery service (at extra cost), etc. Even when orders are delivered, an 'interaction record' is filled out to track the customer's preferences, which will further enhance the relationship.

9.7.9 It is interesting to look at the Java versus Windows proposition for software applications from the point of view of the complexity of the solutions landscape, and its consequences for effective interaction between product-solution-space and customer-needs. The following table compares the two from this perspective. From this comparison it becomes clear that Java, from the point of view of mass-individualisation is more promising than the Windows software concept.

MS windows	Java
Enormous monolithic solution space – too large for individual	Modular solution space
Large K	Moderate K
Working towards own solution requires bringing k down	Working towards own solution requires incremental growth of k
Inflexible, efficient	Very flexible, less efficient
Takes a lot of time to develop (time buffer)	Instantaneously available
Differences between 'closest to optimal' and optimal solution (taste buffer)	Taylor-made / customer design (= not optimal from an engineering point of view)
Many high but narrow peaks in solution landscape	Lower but smooth peaks in solution landscape: endless variety
Requires large investments, to be paid back by large numbers	Requires incremental investments, fit for small numbers
It can be very difficult to get from one peak to the other	Easy to have deviations from the peak (without the existing system collapsing)
Radical design	Incremental design

9.7.10 Gilmore and Pine (1997) distinguish collaborative, adaptive, cosmetic and transparent customisation (see also Chapter 10.4). In collaborative customisation, the customiser conducts a dialogue with individual customers to help them articulate their needs, to identify the precise offering that fulfils those needs, and to make customised products for them. The authors give an

example of the Japanese eyewear retailer Paris Miki. This company developed a special customising design system, with which the customer no longer has try an endless array of glasses. The system first takes a digital picture of each customer's face, analyses its attributes as well as a set of statements from the customer about the desired look, recommends a distinctive lens size and shape, and displays the lenses on the digital image of the customer's face. Next, customer and optician collaborate in adjusting the shape and size of the lenses until the customer is pleased with the look. In a similar way, customers can select the nose bridge, hinges and arms to complete the design. Then they receive a photo-quality picture of themselves with the proposed eyeglasses. Finally, a technician polishes and assembles the eyeglasses in only an hour. Other examples are available in the form of tailored bikes, cars, etc.

9.7.11 Going back to the building block system described in Chapter 9.4, we can state that the aim of this process is to provide options. These options provide the degrees of freedom, which the customer can exercise in his control of the supply chain.

9.7.12 While in these examples the interaction processes have been successfully modelled, a number of important limitations to most current practices remains:

- Lack of emotional equivalents in the interaction process;
- One-sided attitudes to the interaction process;
- The idea that information technology is a sufficient condition for the modelling of the interaction process.

9.8 Emotional interfaces

Many current experiments heavily concentrate on the technicalities of the interface with the customer, thereby neglecting the emotional equivalents.

9.8.1 An example of a search space in which virtually all emotional elements of emotion are absent is Internet-shopping. Going through Internet to look for information on products on sale differs radically from finding our way in a Nintendo game. Nintendo offers a world in which we can experience life in the emotional sense of the word. It creates ambition, danger, sensation, things that Internet-shopping at this moment hardly offers.

9.8.2 The real world carries emotion and emotions are a strong component in creating differentiated value. Unless we can find ways of building these emotional elements into the virtual world, these networks will remain sterile, meaningless, mechanical tools to create functions, whereas they should become tools which help to create the emotional satisfaction for which customers are looking.

9.8.3 Many of the first generation interfaces aim at a forced functionality. Electronic banking and the first generation of electronic shops reduce the customer to an administrator in a process, which is set up with the supplier's logic as a starting point. This will be confirmed by everyone who has ever tried to choose from a list of hundreds, even thousands of articles.

9.8.4 In general, interfaces are currently very weak and lack any form of interactivity, especially where emotions are concerned. There is much to be learned from the Nintendos and Segas who have managed to create an emotional experience out of electronic interfaces. Virtual reality is not so much a question of

complicated three-dimensional technology, but of interactive tension and experience. We only have to watch children storm the levels of Super Mario to understand this.

9.9 Broadcast mentality

In many cases real interaction (i.e. meaningful exchange) has not yet started due to a supplier's 'broadcast' mentality

9.9.1 In many industries integrating the final customer into the supply chain has not yet begun. As soon as we start doing that, we encounter a key problem area that we will call human interfacing. We ask people who have not been trained in the logic of our supply chain or are not even interested in it, to start exercising control over the supply chain. This will work out only if we succeed in projecting the possibilities of that supply chain onto the world as the customer knows and understands it, not in engineering terms but in terms of the performance which the customer is looking for.

9.9.2 The broadcast mentality builds brands by creating product awareness associations with the product. Customers are showered with broadcasting messages, which sometimes lead to a growing indifference or even dissatisfaction and anger among them. A good example is direct marketing, based on customer databases. While it makes it possible to focus the message on a specific customer, it still generates one-way messages only. Instead, the company should build a dialogue with the customer. Continuous connections with customers can provide information that classical market research cannot. Complementary to this, companies can also use information technology and direct interaction to respond to customers, by creating on-line service experiences for them. McKenna (1995):

> *"By closing the interactive loop, marketers can establish and maintain a dynamic brand in a noisy marketplace. [...]."*

The brand, in this case, is no longer the static image it was during the age of mass marketing. Instead, it becomes an ongoing dialogue, the interactive experience of buying and using the product. This involves:

- focusing on real-time customer satisfaction, providing the support, help, guidance, and information necessary to win customers' loyalty;
- companies can initiate the dialogue by opening themselves to customer access (i.e. by building interactive links to the marketplace); they sustain it by involving customers as partners in development and production;
- being willing to learn how information technology is changing both customer behaviour and marketing.

9.9.3 McKenna states:

> *"Information and communications technologies have turned homes into workplaces and both homes and offices into shopping centers or entertainment, education, financial, and medical centers."*

9.9.4 The space where companies and customers interact is no longer fixed and distinct. This has lasting consequences for everything we do in the area of marketing. Brand and the formula loyalty is no longer self-evident. Traditional segmentation criteria determine less and less their choices, they differ from one moment to the next. For image marketing it means that one cannot build on blind loyalty from the customer. The marketer must, on the one hand, connect

to the individual emotion and personal style of living, and on the other hand really inform the customer about the ambition of the company and nature and possibilities of their products and services. With that the individual customer needs to build an internal representation of the corporate image (Gerken, 1994), where interaction with his current needs adapts and evolves continuously. Such pictures need to be clean and distinguishable and recognisable under different circumstances. We could say that a brand has to transform from a statue into a living, interactive personality.

9.9.5 The initiative to derive information increasingly comes from the customers. The chain is reversed, not only in supply, but also in market communication. Customers are becoming fed up with the uncalled-for avalanche of information. The customer will increasingly start looking for information based on his needs, and the communicator thus has to make clear that his information is specifically aimed at individuals, rather than collectively supplied. In The Netherlands this development is visible in a television programme called ‘Coffee Time’, which offers the possibility to interactively obtain personalised information. It is a programme about domestic affairs and products. The viewer can dial a telephone number, which is shown on the screen, to obtain information on the displayed products and their supplier. As soon as is technically possible for the cable networks, a further step might be that the viewer can click with a mouse on, for example, the furniture in a soap series, and obtain information through hypertext-type applications or even link up to a background shopping application.

9.10 Information technology

Information technology is required to create mass-individualised interaction processes, although it is not necessarily the only, or nor the most important, carrier for supplier-customer interaction.

9.10.1 McKenna (1995) states that information technology can be used as a tool to cut through the market chaos and establish binding relationships with customers. These technologies, such as high-speed communications, computer networks and advanced software programmes, allow companies to start real-time dialogues with their customers and provide interactive services. He cites the example of Philips developing a new product in direct interaction with its customers:

> *“Providing these customers with the experience of participating in the design of a product wins their loyalty. Right now, most companies can provide such experiences directly to only a handful of customers. The challenge for marketers is to use information technology to create similarly binding experiences for hundreds of thousands of customers. By doing so, companies can speed up the time it takes for the marketplace to accept a new product - what I call the time to acceptance - thereby improving the chances for the product’s success.".*

9.10.2 We have though to create the virtual world from the customer's perspective, not from the supplier's perspective. That world must be accessible, not only for people who can use sophisticated, powerful pc's at home or in their dealer's shop, but also for people using other electronic means as telephones, fax machines, video, and cd-i. That virtual world must also be accessible in a physical way, because no supplier can dictate how customers will want to create their access to the supply system and exercise control over it.

9.11 Conclusion

9.11.1 In this Chapter we have demonstrated the limitations of a linear concept of the market, and demonstrated the existence of an underlying ordered structure in customer behaviour, in at least some contemporary consumer markets. These observations though do not make all current marketing theories and practices obsolete.

9.11.2 For a start, high-level segmentation in primary market segments will continue to underlie product-marketing decisions. It is inconceivable that static segmentation criteria will bear no relation at all to customer behaviour and, for example, that any relationship between luxury goods and income will prove non-existent. However, within these primary market segments, for companies that strive for ever finer segmentation, the influence of interactive order mechanisms on customer behaviour will become more and more important. This will reduce the predictability of customer demand based on agent-specific, (semi-)static characteristics.

9.11.3 Secondly, now that we have concluded that market behaviour is not chaotic, the detection of underlying order and its nature will enable us in time to respond to customer requirements, albeit at the moment of interaction. Once the demand code of the moment has been detected, we could well use this understanding to shape and guide our offerings to meet this demand, provided we can respond within the duration of the buying moment, while still applying conventional marketing principles.

9.11.4 Thirdly, in principle it is even possible to gain similar insights by interpreting customer behaviour at the phenomenological level, to the point that each customer moment is treated as a separate case. Thus, literally every individual buying moment is treated as a separate market segment. The possibility of decoding the underlying, ordered structure predominantly means that complexity is greatly reduced. More specifically: we can reduce a nearly infinite number of possibilities to a space of limited dimension and so exploit the hidden order. This enables us (as a supplier as well as a customer) to reduce the N/K complexity of the interaction surface to a level where we can effectively move towards global maxima on this solution landscape. Without such reduction of complexity we would be condemned to a marketing game which would lead to ever rougher solution landscapes. This would lead us most probably beyond the point where we can learn effective rules of co-operation, and we would end up in a random game of trial and error. It is here where most marketing literature ends. Whilst observing the phenomena described in this thesis, this literature fails to recognise the benefits of complexity reduction through use of underlying order. As a result there is a lack of exploitation of the learning mechanisms in terms of this discovery, and a lack of proliferation of successful rules.

9.11.5 Whereas we work on methods which can expose the underlying order by mathematical means, other approaches are used to achieve similar objectives, one being the use of expert systems aimed at capturing and coding the experience of those who have put the IF/THEN theory successfully into practice. This will enable less experienced staff to apply ‘expert’ rules in order to achieve a better performance. By default, these expert systems will only capture existing knowledge that is tacit though and not widely spread. Expert systems are more of a proliferation-, than of an exploration-system. Orchestrating a game beyond the boundaries of existing knowledge and thus creating a continuous evolution (a learning game), can only be supported by such an

approach if learning is concentrated among those same experts. We therefore believe that the view, as described in this thesis, indeed presents a breakthrough approach with regard to future marketing issues that companies which operate in heterogeneous and unpredictable markets, will be facing.

9.11.6 Finally, our aim in this thesis is not to develop an understanding of customer behaviour through determining the logic of his demands; we merely wish to observe actual customer behaviour. We don't want to do this at a phenomenological level; we aim to use the insights drawn from interactive dynamic order, to transcend the phenomena and study this behaviour on a much lower level of complexity.

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[i] There is a misunderstanding about the word individualism which is becoming increasingly en vogue. Common opinion is that the natural effect of individualism as a process is that a market or society will fall completely apart and will become divided into isolated individuals who only pursue their own goals. That is probably a misconception because we are not talking about separate individuals, but rather about individuals who interact and develop coalitions, maybe very unstable and short-lived coalitions, but these individuals influence each other in certain ways and at certain moments. The evolutions at Internet are a beautiful illustration of this. Brian Eno has published on the impact on culture and the fact that people actually assemble their own private culture from various bits and pieces. They are not isolating themselves but are communicating more with each other, as independent individuals, rather than being forced to communicate as part of a structure or established network

[ii] This failure becomes visible when taking a closer look at the most important exponents of contemporary marketing sophistication: database marketing. Building up giant databases enables us to build a picture of every customer in terms of information and if desired, make an individual market segment of every customer. This information is supposed to predict customer behaviour. We have created a customer with a very exotic colour plus a very exotic bucket, and we presume that that exotic colour goes into that very exotic bucket.

There is a lot of support for database marketing in current marketing literature. Blattberg and Deighton (1991) advocate database marketing as a means of interactive marketing. With database marketing, they reason, companies can keep track of customer preferences, and tailor advertising and promotions to those needs. It creates individual relationships, manages markets of one customer, and addresses each relationship in terms of its stage of development. They continue with stating that while addressable marketing is not new (mail and telephone have been very important marketing tools for a long time), the cost of managing the interaction has fallen dramatically through low-cost electronic tools. These make it possible not only to use customer data as a mailing list but as a 'memory' of the customer relationship: a record of every message and response between the firm and each address. According to Blattberg and Deighton, this makes it possible to:

- Calculate the lifetime value of a customer or prospect. This lifetime value would be valuable accounting information, and could also justify investments in database marketing and marketing campaigns. \
- Effectively build and manage dialogues with customers, which can make the marketing relationship far richer than one-way advertising can.
- Leverage the database for economies of scope. While economies of scale become less and less possible, the company can exploit the knowledge of customers through database marketing, using this knowledge in developing new products.
- Win power back from distribution channels: addressability permits the manufacturer to take over some functions now performed by the distribution channel.
- Integrate marketing campaigns, e.g. by using the customer response to a first stimulus (detected by the database) to launch a second stimulus, and so on.
- Improve marketing productivity, by linking expenditures to results for individual customers and by not missing opportunities in very small market niches.

They acknowledge that these new data sources, while empowering the marketer, seem to be intimidating and threatening o customers. They argue, however, that:

- Privacy comes at a price: better market data makes marketing more efficient. This efficiency can be passed on to the customer in the form of lower prices, or can lead to launching of products that would otherwise have never been brought to the market, or that would have been to expensive in a traditional marketing context.
- When a company can more precisely target its prime customers, it reduces rather than increases the number of unwanted commercial intrusions: it eliminates wasteful miscommunication.

Bessen (1993) uses this same argument, stating that while advertising channels become more and more saturated and customers more and more barraged with advertising messages, too little of this is relevant to any particular customer. Information technology and databases make it possible to target promotional and marketing activity to ever-smaller market segments, thus greatly enhancing the effectiveness of these activities. He further states that these customer information systems, though difficult and expensive to build, can generate a decisive competitive edge. The growing number of markets segments and simultaneous increase in available products make conventional marketing much harder. The new information systems provide marketers with the means to cut through this confusion and sort the most relevant data from the daily flood. “Precisely because the market demands targeted promotions and advertising campaigns, companies need extensive customer information systems. And just as large companies benefited from past economies of scale in production, today’s large marketers are at an advantage. After all, the airlines, tobacco companies and big retailers are the ones with the resources to invest in the right systems at the right time.” Bessen calls this “the new economies of scale that the best marketing information systems offer.” In accordance, Bessen sees increasing privacy considerations and regulations as an opportunity for large companies rather than a threat for two reasons:

- restrictions to collection and use of personal data will increase the cost of data (e.g. by having to offer incentives to customers for volunteering information), which will raise the level of investment needed, thereby setting small or midsize companies at a disadvantage relative to large companies, and
- restrictions on transfer and sharing of personal data will make it more difficult for small parties to rely on third-party data, which will lead to a sustainable competitive advantage for large companies with elaborate data systems.

Hagel, Bergsma and Dheer (1996) also state the advantages of database marketing. Commercial use of the internet makes it possible to integrate customer’s network usage data and construct rich profiles of users’ transactions and interests. These profiles can be use to target advertising campaigns and transaction services. By analysing usage patterns, the firm can identify and exploit opportunities for cross-selling and bundling products and services creatively to meet user needs. In this way, they argue, profiles can become a powerful catalyst of increasing returns. “When used to raise advertising and transaction revenues, they allow the company to reduce user fees. Lower fees in turn help to attract the next wave of users, and user profiles become broader and deeper. This virtuous circle generates dynamic growth.”

Database marketing recognises that the differences between individuals are larger and more meaningful than thought so far. It is though , based on the supposition that the characteristics of individuals can be determined in such a way, at the refined segmentation level, that it will provide adequate predictions of future buying behaviour. This is, in the long run, both practically and theoretically not a defensible statement:

- Theoretical: if non-linear effects become more important, addition of large numbers of segmentation variables cannot express anything meaningful about the future buying behaviour anymore. As a rough proxy the linear effects may be still applied, but at higher levels of refinement it is especially the non-linear effects which become more important. The question is at what point of refinement the criteria do not predict adequately anymore.
- Practically: research into predicting power of database marketing tends to yield very disappointing results. By way of example, one of the large home delivery companies in The Netherlands found no more adequate prediction parameters, which would predict buying behaviour at an individual level, than could be derived from previous much cruder methods. In another example, a retail bank has discovered that database informationis of substantially more value in support of the supply chain processes than predicting the needs of customers.

However, many successes claimed from database marketing do not in fact concern the marketing and sales benefits, but merely use the customer database to better service the customer and manage supply processes on an individual customer’s base. As an example, Spector in Belgium (mass developer of photographs) claims substantial success from database marketing. Their whole operation is personalised; millions of customers are kept on a database. However, by closer inspection, the information is predominantly used for customer support in the supply chain, not for predicting customer needs.

Because database marketing with its ever finer segmentation criteria does not provide an answer, we are now beginning to see developments in the direction of neural networks and genetic algorithms. This might be regarded as the ultimate despair. If we no longer understand behaviour, let's try to find relations in behaviour. It does not matter that we do not understand the relations, we assume that if there is a relation between various bits of information and the behaviour of a particular kind of customer, it will express that a similar kind of behaviour will happen again. Alas, if we start to exploit differences, there is no reason why that should be the case. Especially if the emotional and moment-specific aspects of interaction with other people or situations in the market are becoming very dominant in customer choice and buying behaviour, there is no way in which databases will predict those events and moments.

[iii] A nice example of bifurcations and appearance of chaos in economics is given by Hibbert and Wilkinson (1994). Consider a marketing model, in which one single brand can occupy 100% of the market. It can be represented by the following equation: $x_{t+1} = x_t + (B - x_t)\,\varepsilon x_t$
Notice it has basically the same shape as the formula of May's rabbit population (This can be proved mathematically, see Hibbert and Wilkinson, 1994)

The product of ε, being the reponsiveness of the marketing effort per period, and the total size of the market, B, drive the onset of chaos when $3.57 < 1 + B\varepsilon < 4.00$. For values below 2.00 it dies out, at 2.00 exactly a stable equilibrium emerges. As the values increase above 2.00 oscillations start to occur, however still diminishing over time, leading to an equilibrium. At a value of 3.00, the equilibrium becomes unstable, and a persistent oscillating pattern of behaviour emerges (i.e. bifurcation). As the value is further increased, oscillations double and quadruple (i.e. it bifurcates again and again), resulting in a pattern oscillating between 4, 8, 16 values, etc. At a value of 3.57, chaotic behaviour emerges, persisting until a value of 4.00, after which the system 'explodes'.

In this model, total market size determines the amount of profit and loss resulting at a given scale, and g indicates the degree of response of marketing effort for a given profit or loss. Overshooting and undershooting the equilibrium level of marketing effort can occur if marketing effort responds too much per period, resulting in complex dynamics. This means that, for a given degree of responsiveness of marketing effort (ε), growth in market size over time may result, ceteris paribus, in a shift from a smooth adjustment of marketing effort to the changing equilibrium to more complex dynamics and chaos. Alternatively, for a given market size (B), changes in responsiveness of components of marketing effort to changes in revenues and costs, resulting for example from changes in marketing strategy, may push a brand into or out of regimes of complex dynamics.

With traditional linear statistical techniques, such as time-series regression, it is not possible to distinguish between chaos and random. According to Hibbert and Wilkinson (1994), there are four basic types of methods to detect chaos: return maps, the correlation dimension, the Lyapunov exponent, and prediction error. A problem for most economic time series, however, is that these methods require long data series of high quality in order to reliably identify chaotic behaviour and non-linearity. This point of view is confirmed by Thiétart and Forgues (1997). In marketing, Hibbert and Wilkinson state, the advent of scanner data has resulted in rich and reliable time-series data, eminently suitable for this type of analysis.

[iv] Positive feedback effects are predominantly present in products with relatively low duplication costs. As value today becomes more and more linked to immaterial product aspects, or as products themselves become immaterial non-linear aspects become more important.

[v] See amongst others Anas, de Palma and Thisse (1993); Anderson and De Palma (1993); Anderson, De Palma and Nesterov (1995); Anderson, De Palma and Thisse (1988; 1992); De Palma, Lindsey, von Hohenbalken and West (1994).

[vi] Note all of the clothing business is 'fashion'. E.G the market for white shits is quite stable and predictable.

[vii] See for an introduction on elastic modeling
http://sepwww/stanford.edu/public/docs/sep72/carlos3/paper_html/node1.html

[viii] The same principles can be applied at assortment-group level to the data as used in Chapter 9.4. The results confirm the results at the article level, but are less impressive. The number of possible solutions in this case represents 10 dimensions, whereas the actual customer behaviour can be described in 8. Still however this represents a reduction of dimensionally (complexity) of 20%.

[ix] See also Chapter 7.7, McKelvey.