4 The limits of industrial organisation

4.1 Individualism in consumer behaviour

Individualism in consumer behaviour becomes increasingly important as wealth continues to increase.

4.1.1 In a 1996 report to the Dutch government, the WRR (scientific council for government policy) stated that it is becoming increasingly difficult to identify meaningful categories in society. The predictability and makeability of society, made possible by the clarity of the traditional categories, give way to an unpredictability of individuals. While these individuals are still embedded in many larger and smaller structures, they act increasingly independent of these structures.

4.1.2 This observation for society at large applies also to the consumer behaviour in these societies. In all highly developed societies an increasing individualisation in consumer behaviour can be observed. This individualisation is due to a complexity of causes, which fall largely outside the scope of this thesis. It manifests itself in consumers' buying behaviour, which is becoming increasingly erratic and unpredictable. Companies in the advanced Western European and US markets will have to take this situation seriously, otherwise they will be forced to adjust their cost structures to those of competitors from countries in e.g. Eastern Europe and South-East Asia that have a relatively lower standard of living[i].

4.1.3 Sociological research has shown that there is a roughly proportional relation between the degree of individuality in a society and its material wealth (see Figure 4-1).

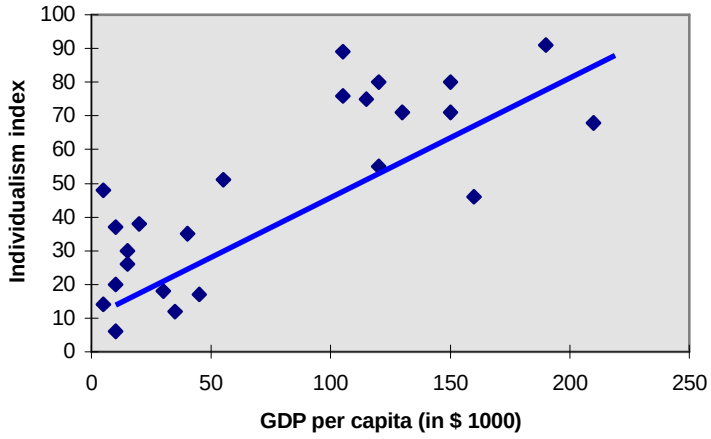

Figure 4-1: Individualism develops with wealth (source: Hofstede, 1991)

4.1.4 It should be noted that an increased individualism does not necessarily mean a loss of community sense. It only indicates that individuals will be more dynamic and diverse with respect to the groups they decide to belong to. This is not dissimilar with Porter's observation in his book 'The Competitive Advantages of Nations' (1990), in which he describes a relation between competitive success in the world market and the ability to exploit highly demanding clients in local markets with sophisticated products and services.

4.1.5 What performance are clients looking for in their increased individualism. Here, we see a striking parallel with Maslow's well known need-hierarchy (see Figure 4-2).

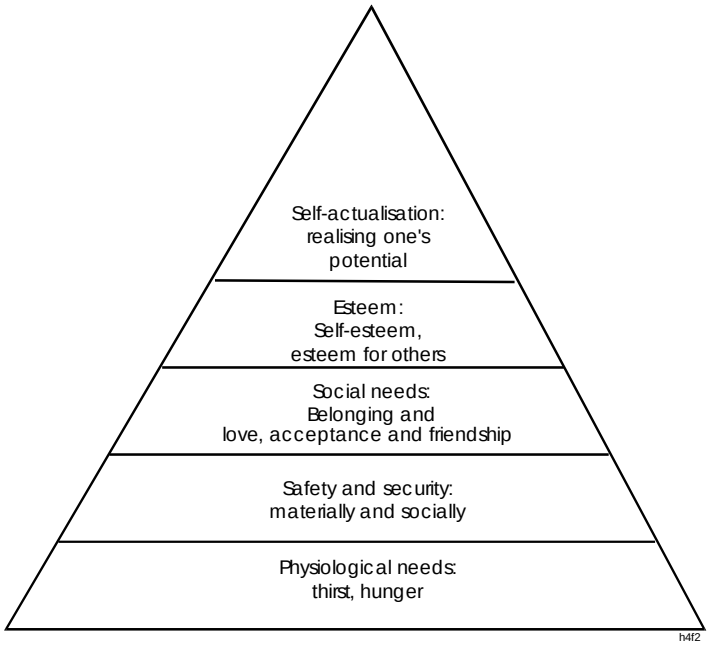

Figure 4-2: Maslows need hierarchy

4.1.6 Although Maslow's theory is quite old by now, it still appears to one of the best descriptions of human behaviour in relation to needs satisfaction. Seeley (1988) writes:

> *"Maslow's theory of motivation evolved over a period of many years in response to clinical applications and scientific research. Nevertheless, the most important tenets of the theory have remained consistent with Maslow's original exposition in 1943."*

4.1.7 Seeley integrates the standard economic theory of consumer behaviour as founded by Menger, Jevons and Marshall, with the general psychological theory of human motivation proposed by Maslow. His basic assumption is that:

> *"the desires to consume are in their ultimate basis the same as the desires for love, companionship, recognition, or any of the other emotional or physical requirement that we accept as human needs."*

4.1.8 In doing this, he uses the linear attribute model of goods as a basis. This model proposes that goods are not valued by themselves, but by the attributes they contain. It is these attributes that provide utility, not the goods themselves. Seeley assumes, however, that utility is not only provided by economic

attributes, but also by non-economic attributes such as trademarks, brand-names, and styles that distinguish goods. The consumer is assumed to choose the alternative (= good) that provides the highest utility. With these assumptions, combined with Maslow's need hierarchy, Seeley builds his 'hierarchical consumption theory'. Its utility function is as follows:

$$U = F_5(A_5) + F_4(A_4) + F_3(A_3) + F_2(A_2) + F_1(A_1)$$

4.1.9 In this function the preference objects correspond to Maslow's five basic types of needs:

- A_1 = physiological needs
- A_2 = security needs
- A_3 = belongingness needs
- A_4 = esteem needs
- A_5 = self-actualisation.

4.1.10 Conditions are that fulfilment of needs is valued positively, and satisfaction of a higher need can only provide utility if lower needs are satisfied (as in Maslow's theory). This approach to consumer behaviour is completely in line with our utility argument in Chapter 2.3-2.4.

4.1.11 Seeley's extensive empirical research, considering a large number of different goods, leads to the following conclusion:

> *"A change in purchasing power via change in income or prices leads to a change in consumption patterns based on a fixed requirement for the lower order attribute and a relative increased appetite for the higher level attribute. [...] Rising purchasing power translates into increasing consumption of the higher level good while declining purchasing power increases the consumption of the lower level good."*

These findings support our reasoning that individualism in consumer behaviour, as induced by the need for self-actualisation, becomes more important with growing wealth.

4.2 Differences carry the value

Value creation in companies therefore is increasingly a matter of turning differences between clients into value, rather than exploiting similarities (which are the key to industrial value creation).

4.2.1 In their article on value innovation, Kim and Mauborgne (1997), having compared conventional strategic logic with value innovation logic, claim that value innovation leads to high growth. This is reached by shaping industry conditions, pursuing quantum leaps, thinking beyond current assets and liabilities, thinking in total customer solutions and targeting the mass of the buyers.

4.2.2 This last point is in fact the negation of mass-customisation. Kim and Mauborgne's arguments are:

> *"Instead of focusing on the differences among customers, value innovators build on the powerful commonalties in the features that customers value."*

and:

> *"Value innovators believe that most people will put their differences aside if they are offered a considerable increase in value. Those companies shoot for the core of the market, even if it means that they lose some of their customers."*

4.2.3 These arguments are true but nevertheless misleading. It is conceivable that consumers will compromise their true requirements if the price is low enough. Yet potential is lost as value potential for the company. Such reasoning will ultimately drive the company to cost-leadership, which will leave more and more differentiation value un-exploited in the marketplace.

4.2.4 If we want to structurally enhance the financial value we obtain from a client, the only way in which we can do this is by raising the utility as perceived by them. And raising the utility, according to Seeley, introduces increasing individualism in consumer behaviour. If we keep extracting more money from our clients without raising the utility, then at some point a client will say, 'No, I am no longer interested.' Improving the utility without obtaining the equivalent in money from clients is suicidal for the company. Bearing in mind the investment costs to raise the utility (see Figure 4-3). The outrageous aim is improving both 'equivalencies' simultaneously.

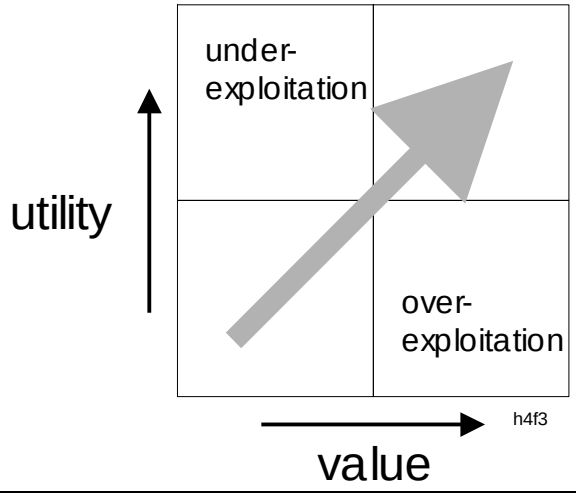

Figure 4-3: Balancing utility and value

4.2.5 Leszinski & Marn (1997) treat this subject from the customer's point of view and formulate similar thoughts. In a graph like Figure 4-3 they set out utility (which they call benefits) against value extracted from the customer (price). Customer value is, in their perspective, equal to customer-perceived benefits minus customer-perceived price [ii]. They reason that marketeers in practice frequently err along these two dimensions of value management, both in static as in dynamic positioning.

4.2.6 Static positioning should normally be along the value equivalence line, i.e. the line where benefits and price match as perceived by the customers. Positioning above or below this value equivalence line leads to value disadvantages and value advantages, respectively. While a position above the value equivalence line obviously means a disadvantageous proposition to the customer, resulting in loss of market share, a position below the line is not desirable either.

4.2.7 They illustrate this by the example of Mazda's Miata (MX 5) sports car:

> *"Introduced to the US market in 1990 at a manufacturers suggested retain price of $13,800, the Mazda Miata, was a retro-sports roadster that captured the imaginations of ageing baby boomer car buffs who originally fell in love with the classic British roadsters of the 1960s and 1970s, made by MG and Triumph. As much fun as its British predecessors, but better built and more reliable, the Miata was an instant hit in the United States. Mazda underestimated the appeal and the high perceived benefits of the simple but unique Miata. The price was disproportionally low for the perceived benefit. Mazda dealers, however, recognised this price/benefit imbalance and claimed the surplus for themselves in the form of $2,000-3,000 'market price adjustments' that they added to the suggested retail price (and which customers gladly paid)."*

4.2.8 In dynamic value management, the dynamics of competitor reactions may negatively influence value-enhancing strategies that seem attractive on the surface. Leszinski and Marn give the example of a company - a premium supplier - that managed to add benefits justifying a 10% price increase. However, it raised its price by only 5%, moving off the value equivalence line in the hope of gaining market share. The company's competitors, as a consequence, were faced with falling sales. As they could not enhance their products' customer benefits, they chose to lower their prices in order to regain market share. This behaviour caused shifting of the value equivalence line to the right, leaving all producers with lower prices than before.

4.2.9 There is a fundamental difference between moving along the value equivalence line, which is likely to threaten only the direct neighbouring competitors, and moving off the value equivalence line, which often threatens all competitors because such moves usually define new and lowered value equivalence lines. In other words, this dynamic value management process will tend to a state where price reflects benefits for the customer, and thus customer value.

4.2.10 This point of view comes forth from the idea that the price the company commands in the market can be considered an outcome of the strategic market process, reflecting the value or benefits as perceived by the customer. Thus, the price as initially set by the company will not be necessarily a proper reflection of customer value. Assuming a dynamic price- and value management process, however, the price will eventually tend to the value equivalence line. When the company is above the line, it will react to loss of market share by increasing its benefits with equal price, reducing price with equal benefits, or a little bit of both, thus improving customer value. When the company is below the line, it will eventually recognise it can earn more by raising its price. Alternatively, its competitors will react, causing the value equivalence line to move to the right, meaning an increase in perceived customer value. Because of constant interaction between the different players on the market, this process will not result in stable equilibrium, but rather in constant iterations around the value equivalence line[iii].

Example

Cees van der Hoeven (Ahold): ADL presidents dinner 1997

"Most of us manage our company for the growth of shareholder value. Shareholder value as expressed in the ability to generate cash. Most of us are heavily dependent on growing this value from advanced, highly competitive and saturated or semi-saturated markets. In many cases market growth is insufficient as a base for our shareholder value ambitions. At Ahold for example, the 1,5-2,5% growth in GDP is nowhere near enough to create the 10%+ growth in net profit to which we aspire. Growth in volume is essential, but it is not enough, not for us, and not for (most of) you.

Apart from the fact that the marginal returns on creating economies-of-scale effects from take-overs prove to be ever more difficult to achieve, growth based on acquisition becomes increasingly expensive as stock prices soar. And in cases where acquisition-driven synergy is to be derived from other sources than economic scale effects, more failures than successes have to be reported over the recent decade. Beware, I am talking about our business in highly developed economies, not about the emerging markets in various places in the world. Hence, growth - be it organic or acquired - cannot be the only answer to our ambitions.

A major part of the growth in shareholder value has to come from either cost savings and/or higher price premiums. And yet we are facing increasing resistance in both areas. As marginal improvements in productivity of people and assets within our own companies are more and more difficult to achieve, the emphasis is now on chain productivity. In our own industry initiatives such as Effective or Efficient Customer Response will yield substantial benefits for the years to come. However, the scope is ultimately limited, both in volume as well as in time. In the meantime there will be a continuous upward cost pressure in employment, training and education, information technology, mobility, communications and environment, to mention just the most important ones. All of these are likely to be structural under conditions of continued moderate economic growth.

On the price front we are to be confronted with equally worrying signs. For a start the ability to predict client demand and plan our supply processes accordingly is diminishing. The increasingly erratic, moment-specific behaviour of clients does not only drive our marketing disciplines to desperation. It is unlikely that better technology will lead to better predictability, as more and more consumer behaviour will be incident-driven. In scientific terms: market behaviour becomes non-linear. In creating competitive distinction, product and service quality becomes more and more a prerequisite for being in business, rather than being distinctive elements. Bad cars don't sell, as bad supermarkets do not attract clients. The result is decreasing client loyalty and consequently pressures on the achievable price differential.

Summarising: a perspective of limited and expensive volume growth, structural pressure on costs and a limited price premium potential. "

4.2.11 Differences between clients become more important, and are particularly less dependent on traditional segmentation criteria such as income, family composition, etc. These clients display different needs every moment, which is why we call them erratic. In a 1997 interview in the Dutch newspaper NRC-Handelsblad, Jan Andreae, the President of Albert Heijn said*: "The modern consumer has less time and plans less ahead. His behaviour is moment-specific."* It is exactly these moment-specific differences, this unpredictability, which represents an important economic value potential for the suppliers.

4.2.12 Therefore, we must start taking this unpredictability seriously. The new consumer is only erratic because we do not understand him. His unpredictability may not be rational against a background of traditional, static (relatively static) criteria. However, in many cases it is a very rational process, although it has emotional components, much along Maslow's hierarchy. It is rational when seen against the background of dynamic interaction between the consumer, his living and working environment, his family, etc. It is this interaction which drives his decisions of moment-specific nature.

4.2.13 This explains why his needs can differ completely from one moment to another, although the segmentation characteristics remain exactly the same. Such differences cannot be predicted by traditional market research, or even very sophisticated database marketing systems; and if we are unable to predict, our industrial machine comes to a halt.

4.2.14 And this in a world of globalised sourcing and supply. A world in which IT enables the free movement of production and sourcing in geographic terms. A world in which new industrialised countries emerge, combining a relatively high level of education with a relatively low standard of living. In the past a non-existing combination. As a consequence the competitive advantage of established industrial countries is shrinking and this will confront such countries and companies ultimately with the choice between reduction of standards of living to a globally competitive level, or preferably, innovate the wealth creation process beyond the limits of the present game. In other words: not beat them on the existing rules, but fundamentally change the rules of the game.

4.3 The value potential of differences

The potential value-carrying differences between consumers seem unlimited.

4.3.1 If we accept that the increasing interactive characteristics of markets result in changes at the macro level (the underlying mechanisms will be explained in Chapters 5 and 9), and erratic, seemingly unpredictable behaviour at the individual level, the question becomes relevant whether this problem is worth resolving. In other words, is there sufficient value in differences.

4.3.2 Much literature refutes it. This is, for example, the case with the article about Value Innovation (Kim & Maughbourne, 1997) (see also par. 4.2.1). They however apply a typical American value definition: Value as the ability to bring the price down. The idea that people will give up on their differences when the price is low enough drives this way of thinking. If marketing means finding the real needs of the clients and the servicing of those needs, this way of determining value is in fact a force fit of clients into a situation which does not

represent their wishes. And in fact Kim & Maughbourne support the thought that there are differences. They argue though that the cost to accommodate these differences is too great to make economic sense. This says more about the relationship between the marginal price and the marginal cost than about the value of differences. Within an industrial supply structure the marginal cost consequences are in many cases greater than the added value which can be derived from these differences. In such situations it is more advantageous to bring the price down. It in fact reflects the inability of an industrial structure to support the client as can be seen in electronics, care and food products.

4.3.3 Similarly, one could argue that there are cases in which rationalising assortment, and reduction of variety does enhance the value generated from the business. An example in case is the drastic reduction of variety and business complexity as announced by Proctor & Gamble in 1997. In situations in which the variety and/or consequential costs have outgrown the willingness of the market to foot the bill, such change in policy does yield economic benefits. Again here, such example says more about the inability to serve differences in demand in a way appropriate to the clients concerned (both in terms of price as well as utility [iv]), than about the existence of value carrying differences. This aspect will be discussed in detail when addressing the supply chain consequences of unpredictable variety in Chapter 10.3.

Example

Personal pair Levis

The Personal Pair Business example illustrates a situation where there is a large gap between need and supply: women's jeans. While the sizing of men's jeans is rather straightforward, proper sizing of women's jeans is more complex. Customers incur a lot of sacrifices/costs in time trying to find a good-fitting pair, aggravation, and disappointment when they cannot find jeans that fit. This results in dissatisfaction with the product, the brand, and the retail store. A solution is provided by Custom Clothing Technology Corp. together with Levi's. They developed a collaborative design-and-selection system that addresses all of the problems. "Rather than trying on different pairs of jeans, the customer's measurements are taken by a salesperson in an in-store boutique and then fed into a computer. Within minutes, the customer can select from 14,280 fit variations for Levi's jeans, instead of the 52 choices available off the rack in traditional Levi's stores. Within two weeks, the customer receives a custom-cut pair of jeans for $15 more than off-the-rack alternatives."

4.3.4 The 'personal pair' example of Levi's shows that it is not the entire market, which is prepared to pay 30% more for personalised jeans. In fact the number of people who buy these jeans is relatively low. The turnover share of the personal pair is still relatively limited, (about 5% in the stores which offer them) because the price difference is 30%. If you would lower this price premium the share would most likely expand. For the buyer, it is always a question of, 'What do I get, and what do I want to pay for it?' or expressed differently, value versus utility. In the car industry the differences have become so great that it is no longer possible to press people in a force fit by lowering car prices. In consumer

electronics the over-differentiation has lead to endless cut-throat price competition. In both car sales as well as branded food products, the proportion of price-down articles is steadily increasing.

4.3.5 Our views support Hart's concept of consumer sacrifice. Hart (1996) introduces this to elucidate the need for mass customisation. Customer sacrifice is the gap between the ideal product-and-service benefits desired by the customers and what they are actually able to purchase. This is quite different to customer satisfaction:

> *"It is possible to have 'highly satisfied' customers simply because your company is the best option available."*

A gap remains, however, between the benefits the customer receives, and the benefits he or she would love to receive for little or no additional cost [v]. The solution, according to Hart, is in mass customisation:

> *"the use of flexible processes and organisational structures to produce varied and often individually customised products and services at the price of standardised, mass-produced alternatives."*

At least, when your customers need the variety. This is not always the case, as is proved by an example of Nissan, which offered such a large variety of steering wheels that customers became confused and irritated. In this case, the customer sacrifice gap is not present.

4.3.6 The generalised statement that large quantities of unexploited value are present in today's markets is difficult to prove. Yet many examples are around in to illustrate the market value from differentiation:

- The growth of so called 'designer goods' in household appliances, (e.g. Philips Alessi range), kitchen- and bathroom equipment, watches, personal accessories etc.;
- The explosion in product variety in supermarkets in the branded (premium priced) food sector;
- The accelerated growth of specialist, often exotic, holidays;
- Optional high-priced accessories in expensive automobiles, more sports cars and convertibles relative to total car sales;
- Designer fashion and clothing;
- Housing, more and more people buying (instead of renting) custom-built or partly customised houses.

4.3.7 Good examples are fountain pens. As the fountain pen lost the competitive struggle with the ballpoint in the 1960, the sector's first response was to lower prices of fountain pens. As this did not change the competitive situation, the fountain pen sector decided to change the nature of the product. By advertising fountain pens as a luxury article, made of expensive materials, and by stressing the personal and distinctive values, it proved possible to achieve an enormous increase in price without increasing functional value of the product. Today, fountain pens occupy a profitable market niche, as people are prepared to pay huge amounts of money in order to distinguish themselves from others. A similar example is visible in the revival of the cigar industry in recent years.

4.3.8 Another illustration is the share of GDP of the food sector in the OESO countries, which for a long time is slowly but steadily decreasing. In fact, buying power is becoming available, but the sector as a whole fails to provide apparently the services which would attract that value.

4.4 The limits of industrially organised processes

Industrially organised processes cannot provide a responsive heterogeneity at industrial cost-parity levels. If heterogeneity is increased in industrial processes, this causes prohibitive costs, long delivery times and/or inaccessible product.

4.4.1 It is conceivable that we are approaching the end of such an industrial heterogeneity. Many of our production processes are approaching the limit of their industrial efficiency, many companies operate in (almost) saturated markets. Differentiation is the only way out to higher levels of value creation. It is true that in the short run electronic data interchange, business process redesign and effective customer response provide some potential where costs are concerned. However, the shops are full and the effect of more wealth is not that people eat more, they eat differently. The same is true for consumer electronics, cars and many other mass products and services. The current volume growth of the market of 1-3% is in many cases not sufficient as a basis for growth in terms of financial results. The real basis from which to create more value can only emerge from a better connection with client needs, which entails a stronger orientation on the individuality of that client.

4.4.2 The essence of the industrial paradox is indicated schematically Figure 4-4. In this matrix, the vertical axis indicates the cost efficiency of the business processes; the horizontal axis indicates the ability to rapidly serve a heterogeneous and unpredictable demand from the market. It is hence a measure of for speed of response to customer demand (see also Chapter 10.8)

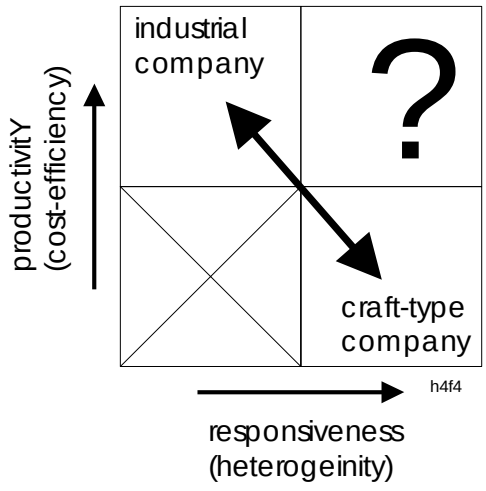

Figure 4-4: Productivity (efficiency) versus heterogeneity (responsiveness)

4.4.3 Two established ways of organising businesses can be linked to this diagram. The first one is the craft-type company. The simple structure in Mintzberg's (1983) terms. In craft-type companies the individual wish of the client is the starting point of activities and heterogeneity is therefore maximal. However, the supply chain is hardly a process, let alone a coherent one. Productivity and level of re-use of knowledge in investments are low and consequently the costs are high.

4.4.4 At the other extreme is the industrial company as we know it now. It is the exact opposite of the craft-type company, as it shows a very high level of coherence between processes, a very high productivity and re-use, and therefore low supply chain costs. The price we pay for this, however, is a loss of heterogeneity (to the point of full homogeneity in the case of T-Ford production). Technology has enabled us to move from this formerly full homogeneity to a much higher level of heterogeneity at affordable marginal cost, although the basic principle remains the same: specials are expensive, mass is cheap. Quite often for heterogeneity at affordable cost there is a price to be paid, in the form of e.g. longer delivery times.

4.4.5 In the phase of industrial evolution, especially driven by the growth of wealth after the World War II, gradually more heterogeneity emerged within the paradigms that aimed at maximal homogeneity. This increase was possible because of ever advancing technology, which enabled companies to supply increased heterogeneity without destroying the productivity of their initial organisations. Quite unlike the T-Ford (one model, one colour, one version), modern cars are introduced from the outset in hundreds of different combinations of model, colour and version. At the same time the car in general has not become much more expensive, if we adjust their prices for inflation. And to give another example: while twenty years ago supermarkets would offer only one tea flavour, the universal Pickwick tea, we can now choose from a multitude of flavours, at a fractionally higher price.

4.4.6 As needs and wishes of clients become less predictable, it becomes increasingly difficult to configure the supply chain in a planned and controlled way. The ultimate consequence of this development is that the initiation and control of the supply chain will reside in the hands of the client. He determines from moment to moment and from place to place which products and services he wants to buy and in which way.

4.4.7 It is necessary in this respect to distinguish between the terms ‘mass-customisation’ and ‘mass-individualisation’. Mass-customisation, a term which originated in the US, aims at customisation of products at the end of the supply chain, close to the client and his momentary needs. In their 1993 article on mass-customisation, Pine, Victor and Boynton argue that mass-customisation (delivering tailored products and services in response to what each individual customer wants) cannot work in traditional mechanistic organisations, nor in organisations governed by continuous efficiency and quality improvement. The main reason for this is that mass-customisation requires a dynamic network of relatively autonomous operating units, while the ‘routine tasks’-organisation, in contrast, focuses on tightening the links between processes.

4.4.8 Pine, Victor and Boynton add that not all markets are appropriate for mass-customisation. Customers of commodity products, for instance, do not demand differentiation. In other markets, like public utilities and government services, regulation often bars customisation. Continuous improvement of relatively standard processes will still be a good strategy for companies whose markets are relatively stable and predictable. But companies whose markets are highly turbulent because of changing customer needs, technological advances and diminishing product life cycles, are ripe for mass-customisation.

4.4.9 Lampel and Mintzberg (1996) describe the industrial phase transition process along the dimensions aggregation and individualisation. They argue that these dimensions are the poles of a continuum of strategies. Aggregation is based on exploiting the common characteristics of customers, which consequently leads to standardisation of design, production and distribution. At the start of the 20th

century this became the dominant industrial paradigm, replacing the traditional, individualised craft industries. Pure individualisation, with direct customer relationships, tailor-made products and product design, was marginalised. Lampel and Mintzberg argue that we are now witnessing the 'new age of customisation': an age in which new technologies, increased competition and more assertive customers are guiding firms toward customisation of their products. In this new phase of industry development, strategies which combine elements of aggregation and individualisation can be applied.

4.4.10 Gilmore and Pine (1997), too, describe the phase transition process:

> *"As mass production took hold [...] during the past century, the definition of a market shifted 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. Today, as markets dis-aggregate, the definition is changing again: customers can no longer be thought of as members of a homogeneous market grouping."*

4.4.11 According to Gilmore and Pine mass-customisation is a response to the notion of 'segments of one': the idea that every customer is his own market segment that has its own specific requirements. Instead of focusing on homogeneous markets, mass-customisers have identified the dimensions along which customers differ in their needs. Gilmore and Pine call this 'points of common uniqueness'. The traditional aggregation approach creates so-called 'customer sacrifice gaps': they are the difference between the standard company offering and what the customer really wants. Mass-customisers try to fill these gaps.

4.4.12 Gilmore and Pine look one step further ahead: not only is every customer his or her own market, but in every customer reside multiple markets, depending on different times and different places. In their opinion this brings back the original conception of a market as a place that brings customer and provider together to fulfil the customer's unique needs as they exist there and then.

4.4.13 Yet mass-customisation, although an important first step on the way to individualisation, is not where we want to be in the end. Mass-customisation is limited to those products and services which have their variability located in the final assembly, like PCs, fridges, pizzas, and car accessories. Some products/services do not just require re-configurability at the product composition level, but also at the supply chain process level. This issue, and the consequences of various types of customisation, will be addressed in Chapter 10.5.

4.4.14 The conditions of extreme heterogeneity and unpredictability, combined with the existing industrial supply and organisation structures, are unfit for cost-efficient operations. Maximisation of productivity in such chains is based on maximisation of re-use of knowledge and material assets. They reach maximal economic performance in a world in which consumer behaviour can be reliably predicted and large homogeneous batches of the same product can be made. The consequences of an increasing heterogeneity (as a result of individualisation) and decreasing predictability (as a consequence of erratic behaviour) can be counteracted by means of stock building (which keeps the batch size intact), longer delivery times (made to order: the ultimate predictability) and application of modern technology (lowering the marginal cost of heterogeneity). These measures however do not address the real issue (see Chapter 10.3).

4.4.15 Extreme unpredictability brings to mind what Verhaegen (19??) said about dealing with uncertainty:

> *"Uncertainty concerns the relation between a certain action and the result of this action […..]. In cases where it is impossible to establish a relation between action and result, in other words if one cannot know what the consequences of a certain action will be, we speak of 'unknown'. However, if a relation can be established between action and a series of possible results, but we cannot say when and why these results will occur, we speak of 'uncertainty'. If a causal relation can be established between action and a series of possible outcomes, and this relation can be quantitatively expressed, for example by means of probabilities, we speak of 'risk'. And finally, if there is a relation between action and only one result, we speak of 'certainty'."*

4.4.16 In fact there is a continuum: unknown - uncertain - risk - certain. Through 'subjective probabilities' the uncertainty of a probability distribution can be translated into risk. The risk is expressed in the variance of the probability distribution. The capital market in this way is a market for risks, and in this way on the capital market risk can be expressed in price. Uncertainty cannot be completely reduced to risk.

> *"In fact it proves that establishing a relation between investment activities and possible results, in other words the reduction of uncertainty, continuously leads to problems within the company. These problems increase the more complex the company is organised, and the more levels are involved in the process. Especially if they are concentrated around the translation of non-financial in financial terms".*

4.4.17 If we consider Verhaegen's (1984) argument, we find that what unpredictable heterogeneity introduces is 'uncertainty' rather than 'risk'. This difference has a profound effect when it comes to designing solutions.

4.5 The inadequacy of industrial order

The inadequacy of industrial paradigms essentially stems from the way in which order is created in bundling functions into meaningful processes.

4.5.1 Just imagine a new table for the new boardroom. The room, however, is not square, it has the form of a parallelogram. A table that has the same shape would fit very nicely. After a long search it appears not to be available as a standard product. Then you find out to your own amazement that a local craftsman is prepared to make such a table at a price which roughly corresponds to the square table that a well known supplier manufactured industrially. The quality is fully comparable, the delivery time is certainly not longer. This is not fiction, but reality. Where has the industrial productivity gain gone? Are specials really expensive, seen in this way?

4.5.2 Company X, a large player in the food retail world, has a large scale logistics operation which, according to all concerned in the sector, represents the state of the art. Goods flow at great frequency to a vast number of outlets and all planning and administration processes, which belong to such a sophisticated set-up function smoothly. This logistics operation was one of the keys in a large-scale strategic transformation project; therefore the structure of the existing process was of great importance. We were greatly surprised when the bottom

line of this sophisticated logistic system indicated that the company employed as many trucks as there were outlets.

4.5.3 The question whether a situation in which every outlet had its own truck could lead to an adequate supply of goods, caused great confusion amongst the staff concerned. After some calculations on the spot, this appeared to be quite possible. We were fascinated by this paradox in 'lost productivity gains' of such large-scale industrial organisation. Subsequently the total cost build-up in the underlying processes was analysed. The results of this analysis were rather shocking. The direct transport, transfer and storage costs were lower than those of the primitive version in which every location takes care of its own logistics. Yet the gain at this higher productivity level was completely eroded by the substantial indirect cost, worse even. Information technology, planning, administration, management and fault repair have, in this very complex process, rapidly took away the fruits of an initially good idea. Somewhere in the past and invisible for the people concerned, consequences of complexity have crossed the border of economic logic. The gains in industrial productivity have been eroded completely by the complexity of the supply chain processes, and, especially, supply chain process control.

4.5.4 And this is by no means an exception as there are many more examples to be found in the businesses, which surround us. As we have seen, it is nowadays for example often cheaper to have a kitchen made to order by a local craftsman, than to buy it from an established industrial supplier. And this is done without loss of quality or longer delivery times. Looking at the chain as a whole, the total of the initial productivity gain has evaporated.

4.5.5 Some other, to a certain extent arbitrary examples.

- At this moment a proper manufactured suit of a well-known brand will cost $500 - $600 in a high street shop. A comparable tailored suit made by a local tailor will cost two or three times as much, at least in The Netherlands. Recently it became possible in The Hague to have tailor-made suits manufactured by means of a computerised body measurement system, which is connected to a computerised cloth cutting system in Germany. The client gets a tailor-made suit at the same quality, at the price of a manufactured suit. And supply is a lot faster than at a local tailor;
- Yet another company has a state-of-the-art production system in the food industry. They are confronted with a fast growing assortment variety, decreasing batch size and heavy price competition. They have the volume, but are unable to get the utilisation above 60%, not even at full-time operation;
- A manufacturer of industrial specialities and final products has rationalised his European production over the last few years, concentrating this production in large dedicated factories. A sophisticated logistical operation was established, linked to these factories, to supply the variety of clients throughout the European countries. The erratic nature and unpredictability of demand are however so big, that every now and then there are large mismatches between supply and demand. These mismatches can only be resolved at great cost. The rationalisation of production has lead to substantial cost consequences downstream in the supply chain. These costs almost outweigh the initial gain of productivity from production centralisation.

4.5.6 All these examples do not concern exotic, poorly managed companies that suffer from a relative backlog in relevant knowledge and investment level. In almost all cases, they concern market leaders in their own segment. These

companies are (still) financially successful, because their direct competitors are certainly not doing any better (often they are faring even worse) and in many markets they can still charge their ineffectiveness to the client. Yet, such a cost structure makes these companies very vulnerable to competition. Furthermore, due to the ever increasing pressure of heterogeneity the problem can only grow until the costs of complexity become prohibitive as they can no longer be charged to the client.

4.5.7 What is going wrong? The mistake is not so much in the quality of the execution, but in the quality of the conception. A comparison between a cross-road with traffic lights and a roundabout may serve as an illustration. On a cross-road traffic flow can be controlled by the colour of the traffic lights: red means ‘stop’, green means ‘go’ (let's forget about orange, for convenience sake). To program these traffic lights, intensive study and measurement of the traffic which flows through the cross-roads is needed. In complicated situations the lights are combined with detectors below the tarmac, push buttons for pedestrians and cyclists, fail-safe protection against ‘all green’ etc.. In short, traffic lights are a small miracle of information processing and central planning and control.

4.5.8 Quite different the situation is at a roundabout. There are no traffic lights, but one simple interactive rule reigns: left-hand traffic has priority. (If right-hand traffic would have right of way, the roundabout would be smothered in congestion. This is true for continental Europe; obviously for the UK the situation is reversed.) Away with information systems, away with the traffic lights and away with the buttons. And the throughput is dramatically better than on the cross-roads, is ‘flow’ instead of ‘batch’, the irritation of having to wait has disappeared and safety has increased.

4.5.9 The difference between a cross-road and a roundabout is the way in which processes are controlled. In the cross-road example we keep adding control complexity in an attempt to adapt a basically unfit process to the complication of the heterogeneity and unpredictability. We build the complexity around the process, if you like. In the case of a roundabout the complexity is caught in the process itself. Because of the continuous interactivity the total complexity of the process is built from a collection of simple interactive small processes. In other words, this is complexity as ‘recursive simplicity’. This is the key to a breakthrough of the complexity as a consequence of heterogeneity and unpredictability in business processes.

4.6 Costs of complexity

The mismatch between the actual complexity of the business and the requirements of industrial processes causes frictions, which express themselves in emerging costs-of-complexity.

4.6.1 The inadequacy of industrial processes in performing under conditions of heterogeneity and unpredictability causes ‘friction losses’, which appear as complexity costs. Complexity costs are simply all additional costs that a company incurs to create heterogeneity of products and services, if one compares it to the situation in which the total volume is created in only one version. In other words, what would a Ford Scorpio cost if it were to be produced in one colour and one version only, like its predecessor the T-Ford, while the sales volume would be maintained. Admittedly, the above definition is

a bit extreme, which makes it difficult to use in an operational environment, as such a Scorpio would not command a high sales volume in the current market. But it can be used as a starting point in an abstract reasoning.

4.6.2 Complexity costs are not identical to failure costs, not to quality costs, not to overhead costs, not to under-utilisation cost or to inefficiencies. They are present in all business functions. From administration to production preparation, from management to shop floor, from purchasing to sales. And they are present in the cost of employment as well as in infrastructure and purchase of materials.

4.6.3 Figure 4-5 shows the typical relation between the cost per unit of product versus the batch size for a normal industrial supply chain process. Typically, such curves go up steeply, once they have passed a certain point: the complexity border.

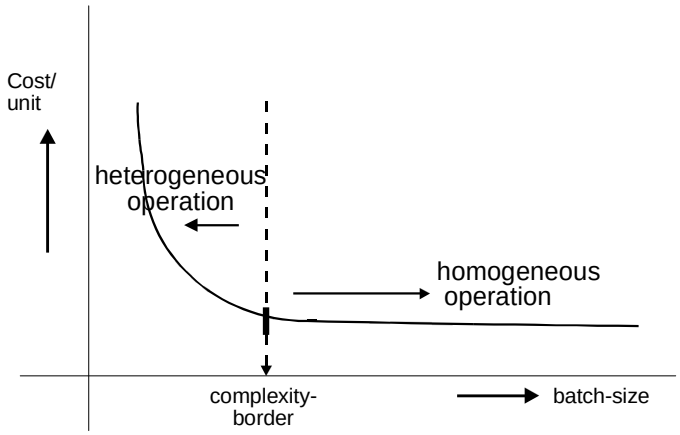

Figure 4-5: The industrial paradox: cost per unit versus batch size

4.6.4 The flat part of the curve represents the level of the manufacturing and supply costs for large homogenous batches. In highly competitive markets important players can not afford substantial cost disadvantages at this cost level, the so-called cost-parity level. This is the cost level where the cheapest (commodity) supplier in the market operates under the conditions of full competition. For batch sizes below the kink, the price per unit of product increases sharply. Further fragmentation of the sales volume pushes an increasing part of the volume below this kink and causes a rapid increase in costs, both directly as well as indirectly.

4.6.5 The most radical solution, which is routinely applied, is rationalising the assortment. If the parts of the assortment that are represented by the steep section of the curve are removed, the loss generating chunk of volume is generally eliminated, which improves the total profitability. Apart from the necessity to keep reviewing the variety in the assortment, this approach actually puts the world upside down. In a market where heterogeneity is the norm, one cannot resolve the complexity problem by merely eliminating such heterogeneity.

4.6.6 A second approach is to shift the complexity border (the kink) to the left. In that case smaller batches can be manufactured and supplied at cost-parity level. The car industry has been able to reduce the minimal batch size with at least a factor of 10 in ten years time. However, these shifts are mostly very technology- (and hence capital-) intensive and therefore also push the cost level in the flat

part of the curve. Not only do the costs for the bulk of the volume go up, it is only a matter of time before a new complexity border is reached and the problem emerges again.

4.6.7 That is why the only real solution can lie in changing the marginal cost consequences of complexity, while maintaining the cost-parity level. Ideally, the steep part of the curve needs to be flattened until the cost per unit of product becomes independent of the batch size. By then the curve becomes a straight line at cost-parity level.

4.7 Breakdown of communications

Underlying this inadequacy is the breakdown of the communication channels, as bandwidth and/or transmission speed of the corporate control mechanism is inadequate.

4.7.1 We can look at interaction and coherence in an organisation from two different points of view. The most common one is the structure of the organisation as indicated in most organisational diagrams. This structure in general displays a logical grouping of functions; it says little, however, of the way in which the various functions interact with each other to achieve the goal of the organisation. And without such interaction the organisation cannot function. The second point of view concerns the interrelations between the various company functions that aim at achieving the organisation's ambitions. In an industrial organisation these interactions build processes throughout the whole organisation, and the interaction is achieved by a top-down 'programming' of functions. The synergy in the organisation, in other words the meaning of these connections, is created through instructions passed down by the cascade of management.

4.7.2 In organisations that want to retain their industrial basic structure, but are facing increasing external unpredictable heterogeneity, a problem emerges with respect to the programmability of these interactions, which pass through the hierarchy as messages and finally arrive at the operational level. This dilemma is indicated in Figure 4-6[vi].

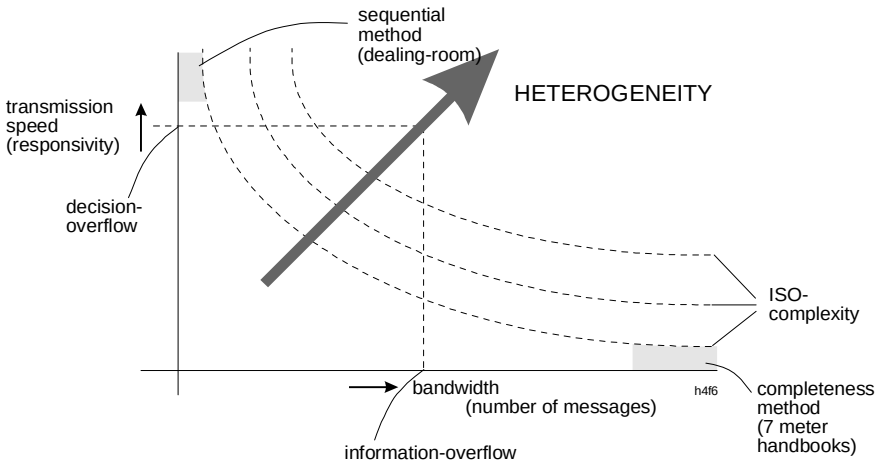

Figure 4-6: With increasing heterogeneity information requirements explode

4.7.3 In principle there are two possibilities to increase the flow of information through the hierarchy. The first one, which is indicated on the vertical axis, is to increase transmission speed, in other words to increase the speed at which decisions are taken and their results passed down into the organisation. The other possibility, indicated on the horizontal axis, is to increase the bandwidth of communication, i.e. to increase the number of messages that are simultaneously passed down the hierarchy. The type of decision-making that is based on high speed can be found, for example, in dealing rooms, where relatively simple decisions and instructions are formulated and then communicated very rapidly. At the other extreme, along the bandwidth axis, we encounter decision-making based on the shelves of handbooks that contain messages and instructions for every potential situation. This is the extreme form of creating 'slack' in an organisation: be prepared for every situation.

4.7.4 In large complex organisations there is, however, a limit to transmission speed and bandwidth that can be created. On the vertical axis the ultimate transmission speed is determined by the ability to pass information to the decision taker, i.e. to translate the information into actions and subsequently pass down the instructions. The speed of this process is finite: at a given moment it can no longer keep pace with the external variance. On the horizontal axis an over-wide bandwidth leads to information overflow at the receiver. Out of an avalanche of messages he can no longer find the one message that is of importance to him.

4.7.5 As heterogeneity increases, the limits are reached of programming business processes top-down. The problem cannot be resolved in terms of bandwidth or response speed, because neither the decision-maker nor the receivers are capable of translating the heterogeneity and dynamics of the environment into actions. At that point, the traditional way to interrelate business functions fails. It is this failure that is at the core of the need for different organisational models, which are more oriented towards self-organisation and less towards programmatic procedural control.

4.8 The end of the industrial revolution

Whereas the industrial revolution marks the shift from a craft economy to an industrial economy, individualism in consumer demands and behaviour now marks the end of the industrial era.

4.8.1 In this chapter it has been argued that the industrial way of linking business functions together into processes is reaching its limits under conditions of advancing heterogeneity and unpredictability. Trying to serve such markets with processes which are organised as a Taylorian procedural hierarchy, causes the creation of complexity cost, in some cases to a magnitude which erodes the complete industrial productivity gain achieved in parts of the chain.

4.8.2 During a evolution of successive incremental improvements, somewhere we seem to be passing the line were logic at a micro level creates absurdness at the macro level, as can be seen in some of the examples indicated in this chapter. The underlying problem is one of order, and with that of the communication structure governing the behaviour of functional entities in the process chains. The only way to increase heterogeneity under conditions of unpredictability, while retaining the cost-parity with industrial organised processes, is to change the fundamentals on which the interaction between

various steps in the process is achieved, and the way they respond to changes in the external environment.

4.8.3 The complexity border, seen in this way, therefore marks the end of the industrial revolution. The revolution which has brought us the wealth in modern societies, but is now no longer capable of sustaining a further growth of wealth, by addressing the differences in the market place, rather than the similarities on which industrial order has been built. Replacing the industrial paradigms by the paradigms, based on network behaviour and self organisation will likely create an impact, not just within companies but in society at large, which is comparable in terms of importance and scope to the changes from our traditional craft economy to an industrial economy. It is this aspect, the mere obsoleteness of the foundations of our industrial world, that has so far has been insufficiently recognised in management literature, whereas various related topics have been addressed more or less as unconnected and isolated symptoms of inadequacy.

4.8.4 We will start exploring the foundations of the new order, and its application to the business processes in the next sections, in an attempt to build a coherent and consistent picture of the post industrial company. As stated before, the reasoning towards such company at this stage is not, and cannot be, complete. On the other hand, sufficient know how and examples are around to draft the contours of such new companies, and aspects are and have been already implemented.

4.8.5 Creating such new companies is not just a challenge in securing the continuity of companies themselves. It might also prove to be of vital importance in combining growth of wealth and prosperity in advanced economies with development and perspective of economic prosperity in so far less developed parts of the world.

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[i] This local-global dilemma was sketched among others by Moss Kanter (1995):
"To avoid a clash between global economic interests and local political interests, businesses must know how to be responsive to the needs of the communities in which they operate even as they globalise."
In the industrial economy, place was an important factor for most companies because it ensured access to and control over means of production and because of the necessity to minimise transport cost. According to Moss Kanter, in the global information economy, power comes not from location, but from the ability to command one of the intangible assets that make customers loyal.

[ii] For different definitions of customer value, see Woodruff (1997).

[iii] This line could be seen as a 'strange attractor'. Attractors are the stability regions in a complex dynamic order (see Chapter 5.9.5)

[iv] As formulated by Heskett, Sasser and Schlesinger (1997) reducing variety might result in lower prices and customer access costs. See also 2.3.8.

[v] This notion of a gap between received utility and need is the basis for our consumer behaviour model in Chapter 9.4.

[vi] This figure displays a simplified view. In reality, a number of communication-disturbing factors may be present that are not indicated in the figure. Communication is a quite complex process, consisting of a chain of encoding, sending, decoding, perceiving, and providing feedback. Within each of the stages of this process noise can occur, decreasing communication effectiveness. Besides, factors as speed of message preparation, feedback