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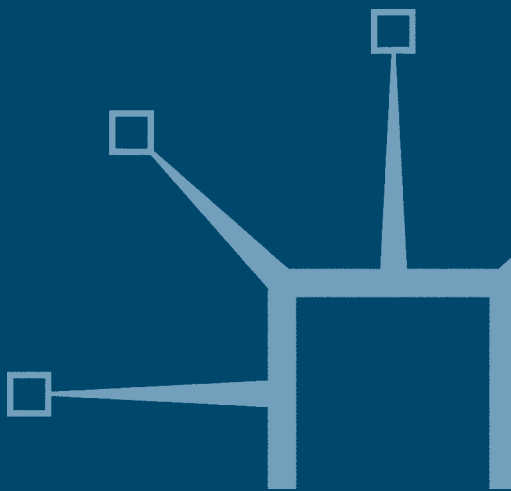
The Limits of Business Development and Economic Growth

Why business will need to invest less in the future

Mats Larsson



The Limits of Business Development and Economic Growth

Also by Mats Larsson

THE TRANSPARENT MARKET (*with David Lundberg*)

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'The composition of this book has been for the author a long struggle of escape, and so must the reading of it be for most readers if the author's assault upon them is to be successful, – a struggle of escape from habitual modes of thought and expression. The ideas which are here expressed so laboriously are extremely simple and should be obvious. The difficulty lies, not in the new ideas, but in escaping from the old ones, which ramify, for those brought up as most of us have been, into every corner of our minds.'

J.M. Keynes, *The General Theory of Employment, Interest and Money*, Prometheus Books, 1997

'Observation and experience can and must drastically restrict the range of admissible scientific belief, else there would be no science. But they cannot alone determine a particular body of such belief. An apparently arbitrary element, compounded of personal and historical accident, is always a formative ingredient of the beliefs espoused by a given scientific community at a given time.'

Thomas S. Kuhn, *The Structure of Scientific Revolutions*, University of Chicago Press, 1996

'Medicine has largely regarded the body as a mindless machine – a perspective elucidated by a brilliant twenty-four-year-old philosopher, René Descartes, more than four hundred years ago. Proposed as a temporary expedient to permit investigation of the human organism unencumbered by the dogma of the ruling Church, this separation of mind and body has dominated medical practice and thought.'

Robert Ornstein and David Sobel, *The Healing Brain*, Malor Books, 1987

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Introduction

In 2000 the economic boom of the late 1990s turned into stagnation or recession. The enormous optimism of the last years of the second millennium turned into surprise. The boom years had been characterized by a strong belief in new technology. The new buzzword was 'electronic business' and the Internet and related technologies were expected to become engines of sustainable economic growth. Start-up e-business companies attracted extreme levels of interest among investors and the general public. Mobile phone companies, broadband operators and IT systems suppliers were other companies that were in focus.

At the same time many people ushered in the concept of a 'new economy' that would be based on electronic business and communication. Companies in the 'old economy' would find it difficult to compete against companies in the 'new economy' that were able to operate at low cost through the use of electronic business tools. These companies would be able to serve a world market, almost from day one. The growth expectations that people had in such companies were shown by the rapid appreciation of the stock market value of these companies.

We now notice that the growth expectations for e-business start-ups were unrealistic. We also see that over time it has become increasingly difficult to start new companies that later become large global groups. A large share of the companies that are global companies today were founded around major inventions in the nineteenth century or in the early decades of the twentieth.

These global companies are now investing more and more money in research and development. Companies in the pharmaceutical industry, for example, invest twice as much money today in the development of new drugs compared with ten years ago. Yet, the FDA, the American

control authority for food and drugs, receive only half the number of applications for new drugs compared to then.

There seems to be a paradox in that people are better educated today than 100 years ago, companies invest more and more money in development and governments and central banks try to develop policies that will create higher growth, but, still, the results of these efforts are fewer new large companies and fewer important innovations than previously.

Many people in industry, government, authorities and business consulting seem to believe that any of a number of tried-and-tested remedies will solve the problem. Tax reforms, improved business strategies or better processes are suggested as solutions to the problem. If we turn our eyes to the changes that are going on inside companies, we find that tremendous change is going on which in different ways change the competitive landscape.

In a large number of industries, automation technologies make it possible for companies to increase production without adding more people to their organizations. This is for the first time becoming true in administration. Existing companies are not out-competed by companies from the 'new economy' at a rapid pace. Instead, these companies are installing integrated computer systems inside their organizations and applying integrated solutions for supply chain management that automate information flows and administrative routines in their own organizations and at companies throughout their supply chains. In production, distribution and logistics flows, processes are controlled by increasingly sophisticated automated production technologies. The power of such technologies to integrate a number of process steps in one completely automated manufacturing process has increased dramatically in the last decade.

One fundamental difference between the current situation and situations in the past is that automation has reached previously unseen levels. In most business situations companies now need dramatically fewer people to perform tasks compared with only a few years back. Presumably, this should make companies more profitable and increase their willingness to invest in the development of new products and services. It does not. Instead, there is competition between more and more equal competitors, and all are forced to reduce prices to get their goods sold. The advantages of leading companies are getting smaller and smaller and it is becoming ever more difficult to find areas where unique advantages can be developed. Competition has to a large extent become a chase, where companies pursue advantages in operational efficiency, and where the followers are gradually closing in on the leaders. Instead

of increasing profits, the tougher and tougher competition leads to thinner profit margins. The same is true for product advantages. Intel, Nokia and other leaders in hardware development find that their most recent innovations are copied only a short time after they arrive in the market.

Competition is good. It forces companies to improve and develop better products and more efficient processes. At least that is the way it has always been in the past. Do we need to reconsider this fundamental belief in the future? Do we need to deepen our understanding of business and economics and challenge some of our deepest held beliefs in these matters?

We need at least to study the new situation in detail. What happens when companies in all industries apply new resource-saving technologies? Fewer resources are needed. What happens when many companies at the same time apply similar technologies in a number of areas in their business? Differentiation is reduced and it becomes increasingly difficult for companies to turn a profit. What do we need to do in order to make up for the loss of jobs and the reduced profits in a large number of industries at the same time? We need to develop a lot of new profitable business that can make productive use of the resources that have been freed. Currently, this is not happening at the rate needed. Why? Because it is getting more and more difficult to find new and innovative business ideas. There may be limits to business development that we have not yet identified.

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A Grim View of Development: The End of Growth as We Know it?

The key argument in this book is based on a re-evaluation of economic development and the questioning of a key assumption of business and economics. The theories of economics are based on the assumption that an economy is a system that strives towards a balance between supply and demand in a number of markets. During a recession there is a temporary decline in the demand for labour, capital, real estate and other resources, but the people who control these resources are constantly looking for new ways to employ them. In that way new business is constantly created.

For the market to be able to regain balance any number of times into the future, the number of possible new business ideas, and new ventures to invest in, must be infinite. This is where this book starts, with the discovery of a new hypothesis – namely that the number of new business ideas that can be invented may not be infinite. What follows is an explanation of why this may be the case and how we at present may be racing towards the limits of economic development, at least in a substantial number of very important respects. Later, we look at how we may be able to create new business opportunities in areas that have not yet been fully recognized as areas of opportunity.

It may seem to be a risky project to try to challenge one of the pillars of economic science and business practice. But this book was written because of the tremendous importance that this insight would have for both theory and practice in business and economics. Our modern society is dependent on a small number of global systems. The market economy is one of those and if this system is more vulnerable or less expandable than we have had reason to believe so far, it is of the utmost importance to identify this before we learn it the hard way. The reasoning that is underpinning the hypothesis has been laboriously devel-

oped and it is presented here in the most accessible way possible. In this book common sense is used, coupled with a substantial amount of empirical evidence that is presented in the form of case studies.

The technological development in society in the past decades has been tremendous. We may think of the development in computing, in mobile telephony and entertainment and even in areas like transportation and logistics as feats of endless creativity. How can the human race possibly come up with so many novel ideas all the time?

Another way of viewing this is to realize that we have not really come up with very many novel ideas at all. This may sound utterly pessimistic, but at close scrutiny we do not seem to have done anything except gradually automate activities that human beings have been performing for a few hundred, and sometimes thousand, years already. The development of a large number of different technologies that help us to automate these tasks has driven economic development and business proliferation in the past. Now, technological progress is at the stage where a number of these technologies and products have been developed to a point where we cannot realistically expect them to develop much further. And, despite widespread belief of the opposite, we cannot be certain that there are enough new products or technologies left to be developed for companies to be able to make use of the resources that are going to be freed from existing industries. New technologies, products and trends in business develop at a very slow pace. Many of the big, resource-consuming trends of the near past are soon coming to an end in terms of their ability to attract investment and cover the cost of resources for development, production and implementation.

Before we dismiss this notion, we need to take a closer look. What did people do at the time when Jesus was born? The answer is that they grew crops, harvested, raised cattle, preserved food as best they could, cooked food, made products, invented new technologies (albeit slowly), transported raw materials and products, communicated by writing letters and sending them with couriers, waged wars and made friendships. In fact, few things that we have invented are genuinely new to the world.

True, airplanes are new, but they are a form of transportation, much more efficient than the ships, donkeys and carts that were used in the old days. Computers are new, but they are only used to do what companies or traders have done through the ages. They have taken orders, made production plans or purchasing plans, purchased goods, run production and made deliveries or replenished their stock or their shops, depending on which line of trade they have been in. This is exactly

what companies do today. Computers are also used to send e-mails, which is a faster way of communicating than the previous alternative of letters sent in the post. Long before countries had regular postal services people sent letters by couriers. E-mail is a form of letter that arrives to the receiver almost at the same time when it was sent. This is achieved at close to no cost. Even if purchasing in the past sometimes required an expedition to the Orient to be able to purchase spices or expensive textiles, it was still a form of purchasing. Bakers bought flour from farmers in the market, and smiths bought metal from metal traders.

This is not just a flippant way of describing the momentous discoveries in history in a denigrating way. The description serves to show that what we often have taken to be dramatic new innovations may be only very logical developments on a path towards a situation where we will be able to do most things in very little time at a cost that is gradually moving towards zero. When we have arrived at virtually no time and a cost of almost zero, we will be able to identify this as the final point of thousands of years of development in terms of time compression and cost reduction.

In terms of information flows, we will see, through examples from Dell and the automobile industry below, that we can now move information in close to no time. Pre-programmed transactions can break down an order for a computer or for a car into component parts, and transmit an order for each component to the proper supplier, almost immediately. At each supplier, the order for the part is automatically planned into production by the computer through a number of pre-programmed transactions. When production is ready the computer prints a number of appropriate documents that are dispatched to the customer together with the goods. If the goods are going through customs, papers may be automatically sent to customs as the goods leave the supplier.

The production and development of products and services cannot be done in no time, but we are gradually taking away the non-value-adding time from processes. This ensures that delivery times are as short as possible and that prices can be reduced as far as possible for the company to remain competitive. We have developed new materials for the reduction of cost and the improvement of performance and durability. Instead of carts made of wood, we have cars made of steel, aluminium and plastic. Instead of horse-drawn carriages for the wealthy we have buses, airplanes and ships that almost everybody can afford to use. Instead of manual production, we have machines and a large industry that makes machines for all kinds of purposes.

This does not prove that nothing new will be invented in the future and it does not mean that we have seen the end of development. Yet, I believe that this book will show, beyond reasonable doubt, that development opportunities may not be infinite. We will look closely at production processes, logistics systems, product development processes and a number of different types of products and see that we have now striven to reduce cost and decrease time close to zero in a number of ways, and when this situation has been reached, or when we are close to this definite limit, we cannot hope to reduce time or cost further. In that situation the need to invest in new machinery or the development of new technologies will be limited. When people hear this argument, they often react and say that there are only a few areas where the reduction of time and cost have been the main drivers of development. When looked at closely it is easy to argue that this is clearly wrong. The importance of time and cost as drivers of development will be shown in Tables 1.1 and 1.2 later in this chapter.

If we are approaching the limits of development in a number of areas, we also need to ponder the possibility that there may not be an infinite number of new product and service areas that can be invented. In the past it seems as if each new technology or basic idea has first been applied in a number of mass markets. Later, it has been applied in more and more narrow applications. Even if few people believe that there may be an end to the number of products and applications that can be invented, we may consider the possibility that business people and engineers have in fact spotted most of the main areas where people need and want support and already made substantial efforts to help in the automation of a large number of key tasks in our daily lives. Instead of inventing many new ways of adding value in our lives, a substantial share of business development in the last decade has been focused on reducing time and cost in existing processes and products. In the vein of the argument above, if we have already come a long way in our efforts to automate a number of key tasks, and if we are actually close to the limits of how much time and cost that can be saved in these areas, then it may become more and more difficult to invent new products, services and business concepts that can drive economic growth and employ resources in the future.

When the steam engine was invented, the first areas where it was used were transportation and the production of high-volume goods. We soon had steam locomotives, steam ships and ‘Spinning Jennies’ and other steam-powered machines. When the combustion engine was invented, we had cars, buses and trucks. After the invention of electricity we soon

had electric light, electric stoves, fridges, freezers and electric heating. In all areas it seems as if a new technology is first applied in a number of mass markets, where the technology can be used by many people, and where large industries can thrive on the development. Later, smaller segments are served, or segments that can only be served when the technology has reached a certain level of maturity or a lower cost level.

Cars have become faster, safer, more comfortable and luxurious, but the opportunities for creating new vehicles based on the combustion engine seem to have been exhausted with the car, motorcycle, truck, bus and airplane, which have already existed for a long time.

It is possible that we now have most mass market products that can be invented using our imagination, and what remains to be invented are more niche-oriented products and services. Since many niches are already occupied, it is conceivable that the number of unoccupied niches is also getting smaller and smaller.

Examples of situations where we are close to the limits and where there are diminishing returns to further reduction of time and cost

Technical development has been impressive during the past decade, but it has not been entirely absent before that either. In area upon area we can see how we have improved products and production technologies so that we can now do many things in close to no time. Recently, improvements in computer technology and the development of powerful administrative tools, such as computer systems and e-business, has created the power to reduce information flows to nearly zero time and cost as well. New computerised production technologies have done the same for material flows. It is also easy to show, through simple calculations, that the opportunities to further reduce time and cost are much smaller than they have been in the past. Researchers sometimes divide business processes into two main types of flows: material flows and information flows. We will use this division when we analyse the limits of development and we will notice the differences between such flows and the interrelationships between them.

Material flows

In a number of areas modern production technologies have helped us to reduce time to a minimum and through this development cost is now much closer to zero than it used to be:

Knitwear production

The process of industrial production of knitwear used to involve a number of steps. A knitting machine was set up with yarn of the right colour and quality. This machine produced garments in five pieces. There was a front piece and a back piece, two sleeves and a collar. After the knitting, the pieces, except for the collar, had to be steamed to flatten them out before they were cut to the right size. After this, the pieces were sewed together to form a jumper. In some cases this process involved transportation of pieces between different companies that did the knitting, steaming, cutting and sewing, and sometimes the knitting was done in Western Europe and the sewing was done in the Baltic States, Asia or other countries that previously belonged to the eastern bloc. In total, the process, except for transportation, required ten minutes of the time of a knitting machine and twenty minutes of manual time. With a cost per hour of 30 dollars, the manual time cost 10 dollars.

Modern knitting machines that have been introduced in the past decade knit the whole jumper in one piece. There is no longer a need for steaming, cutting and sewing. This also increases the perceived quality of the garment, because there are no longer any seams that can break and the garment literally looks as if it was made in one piece. It takes ten minutes of the time of a knitting machine, a slightly more expensive one than before, which costs between 100,000 and 150,000 dollars. The higher cost of these machines is, however, largely off-set because one person in a knitting factory can take care of more machines than before. With 10 per cent capital cost and five years' depreciation, the annual cost of this type of knitting machine is 45,000 dollars. If this machine is running at full capacity day and night it may produce 45,000 garments in a year, which makes the machine cost of a garment 1 dollar. This may not be done in most cases, but even if it only produces 15,000 garments in a year, the machine cost is 3 dollars per garment. Another advantage of these machines is the lower yarn consumption. Since there are no parts that need to be cut away and scrapped, the yarn cost is reduced by 15–20 per cent, which may save 0.5 dollar per garment. Compared to the previous situation when the production cost of a garment used to be 10 dollars + machine cost + yarn, we now have a situation where the cost of the manual labour has been taken away, the machine cost is roughly

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the same as before, because the cost of running the machines is lower, and the yarn cost has been reduced slightly from the previous situation when an expensive yarn for a jumper may cost 4–5 dollars.

Total cost has been reduced from 14–16 dollars to between 7 and 8 and this now consists of machine cost and yarn cost. The substantial saving that has been made possible during the last decade, because of the new technology that took away the sewing, steaming and cutting, will not be repeated in the future. Even if a new technology appeared that would reduce the cost of the yarn or increase the capacity of knitting machines in the near future, the possibility to further improve is gradually declining. We know that no technology will ever make it possible to reduce time or cost to less than zero and that the value of a further reduction will be smaller the closer to zero we get. These are all aspects that have an impact on the need and willingness to invest in new machinery or in the development of new knitting technology.

Plastics

Plastics are now used in many areas where we used to use metal or wood. When plastics were first introduced they came in a few standard qualities that were used to make toys and other simple products. Plastics were seen as an inferior material that could be used to make cheap things. Over time this has changed. Now a number of high performance plastics are used in areas that previously required other materials. The advantage of plastics is that most plastics are relatively inexpensive to buy and they can be formed very rapidly in an extremely simple one-step process that takes only a few seconds for small parts and slightly longer for larger parts. In the future, plastics are expected to take over a larger and larger share of the market for car bodies. The steel for a car body is produced in a number of steps, where the steel is first made from iron and coal and then it is formed into rolls in a steel plant. These rolls are then cut into pieces that are used to form the car body out of the flat piece of steel. In the same way as in the case of knitwear, the production of the body needed a number of steps in different companies to prepare the steel, roll it and form it into a body. When the body is formed it is painted, which in itself is a process that requires a number of steps before it is finished.

In the future, high-performance plastics will be used to reduce the time and cost of the process to a fraction of what it used to be.

Plastics are produced in a plastics plant and there it is usually made in the form of granules. These granules are delivered to the customer who moulds it into the products that the customer requires. The moulding process is the one that takes anything from a few seconds for small parts up to a few minutes for larger pieces. Through the use of plastics a number of advantages are achieved for the car owner. The plastics do not need to be painted, so the car body will be the same colour through and through. There will be less risk that the 'paint' will be damaged, because there will be no paint. The most impressive advantage for the owner of the car will be the reduction in price that is achieved through the simplified process. This reduction is estimated to be more than one thousand dollars, which is achieved both through a less expensive material and through fewer steps in the production process.

In many situations where metal and wood are replaced by plastics we find that the cost of production is reduced substantially. The plastic material may in some cases be relatively expensive, but the simplified production process with the elimination of a number of production steps, transportation between steps and manual and automated handling of products in these steps still reduces the total production cost. When plastics are used the process is compressed and a substantial share of the time that remains is value-added time.

Firearms

In the seventeenth century, during 'The Thirty Years War', a Swedish musketeer was able to fire his musket four times in an hour. It took substantial time to reload and when the musket was shot at a range of 200 metres, 90 per cent of the shots missed their target. Simply put, the average musketeer had to be in battle for two-and-a-half hours in order to fire one successful shot. Yet the Swedish army at this time was one of Europe's most modern, and the Swedish muskets were both lighter and quicker to reload than those of its European enemies.

Using modern weapons, even an average shot can shoot very rapidly and with high accuracy, provided that there is enough ammunition. At the range of 200 metres he or she will hit the target with every shot. There are aims that make it possible to shoot with great accuracy and speed even in the dark. This is another example

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where technological development has brought us to a situation where the opportunity to further improve speed is limited.

Information flows

When companies bought computers ten or fifteen years ago they contacted a sales person at the computer company. The sales person presented the range of mainframe computers available in the product range of the supplier and discussed the alternative configurations of the basic models that could be relevant for the customer, depending on factors such as capacity needs, the number of users, and speed. The customer went back to his company with a range of alternatives, prices and other necessary information. When a decision had been made the customer called the sales person up and placed the order. The sales person then entered the order into the order system. The order system generated a nightly batch transaction whereby the sales order and a number of other orders were transferred to the production planning system at a production site. Later, the production planners took all the sales orders and created a production plan. Many times this was a manual task done in Excel, which may have taken a few hours. This information was also used by purchasers in order to send purchase orders for the parts to suppliers. Each time parts had to be ordered the purchaser had to look up the parts list in his binder, manually write orders or phone them in to the suppliers in question. At each supplier somebody had to receive the order, write it on paper or enter it into the order system so that people in the stores or in production could fulfil the orders. This whole process may have involved hundreds or thousands of people.

When a computer is ordered from Dell today, the customer enters the web site of Dell and configures the computer on-line. Before placing the order he or she receives information about the delivery times of various alternatives. He or she then selects the alternative that is preferred, places the order and receives an order confirmation. The order automatically generates a production order and a number of orders for components from suppliers. A pick list for the stores is also automatically generated, so that the stores can pick the components that are already in stock at the appropriate moment. When all components have arrived in production, the computer is assembled, packaged and dispatched to the customer.

In the old situation, the whole process above involved a very large number of people. They performed a number of steps in this chain of sales, configuration, ordering of the final product, ordering of components from suppliers, reception of components, picking of components in the stores, production of the final product and delivery. Each of these tasks took a substantial amount of time, which had to be paid for, and it delayed the delivery of the final product and added cost to the products through the need for stocks, buffer stocks, capital and warehouses.

When we look at the modern process at Dell, we see that a number of process steps have been reduced to microseconds. Most parts of the process from configuration of the final product to the ordering of components from suppliers are reduced to computer operations that literally take microseconds. This chain of events is slowed down by the ability of the customer to decide which configuration he wants and to enter the data that needs to be entered manually. In cases where EDI (Electronic Data Interchange) is used and the data that specifies product quality and features is already in the machine that sends the EDI message, these moments that it takes to make decisions are eliminated from the process. When a computer at Dell does this, it literally performs thousands of transactions and it all takes a few seconds. In the automotive industry, automation of administrative tasks has come further than in any other industry. This industry has worked with the implementation of EDI for almost twenty years. In all such cases of advanced automation, computers perform the automatic transactions required to configure products, check delivery times of components, calculate delivery time and price, order components and receive order confirmations from the computers of suppliers in almost no time at all. The goal of automation is to compress time and take away manual tasks.

Fifteen years ago one car manufacturer sent monthly production forecasts for the next six months to 12,000 suppliers. These were sent as printouts from the manufacturer's production planning system. At each supplier it took a secretary between one and two weeks to type the forecast into the planning system of the supplier. Now, this same supplier has only 300–400 first-tier suppliers that supply complete modules of the cars. Each of these suppliers receives one six-month production forecast every day via EDI, which automatically updates the business system of the supplier.

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The process that previously took a few weeks to perform and which resulted in forecasts that were between two and three weeks old when they were available in the systems of the suppliers to work on, now takes a few seconds. The cost has decreased dramatically to a level where the transmission cost is close to zero. We know that nothing can be done in less than no time and at less than no cost, and thus the opportunities to further improve this process and to win competitive advantage from this will be very small.

In many cases information processing supports a production process, as in the case of the ordering of components for a vehicle via EDI or in the case of ordering a computer from Dell and the subsequent ordering of components for this computer. In Part III we will look at the development of broadband services and see that through these services customers can access film, music, games and literature, in addition to information from the Internet, in close to no time. The cost of distribution is then reduced from the cost of burning CDs and DVDs and distributing these to wholesalers and retailers to be sold to customers. Instead of the cost of manual routines in a number of companies that participate in a supply chain, the cost of distribution consists of the cost of servers and routers on a broadband network, which is only a fraction of the cost of physical distribution at present.

We still do not know exactly how close we are to the limits in an overall economic sense, but this simple review of a number of technologies and situations indicates that in many cases a repeat of the savings in time and cost that have been made in the past decade will not be possible in the next decade. Consequently, the need to invest in new technologies that save time and cost should be lower today than it was ten years ago.

Although there has been considerable creativity in the development of new resource-saving technologies, we have been poor at inventing genuinely new things to do. Even electronic games can be seen as electronic varieties of games that have existed for a long time. Children have always been playing games and the computer and microchip allows for substantial new creativity in the invention of new games. Entertainment like films and CD records are only electronic varieties of theatre and music that have been performed since time immemorial. Through electronic distribution of games the distribution cost is dramatically reduced compared to distributing games in the past. In a

global market the cost of development of a game can be shared by increasing numbers of people.

The market is a great invention and it has helped humanity to foster creativity, install impersonal financial incentives in the development process and invent ever more elaborate products and services. In order for the market to help us drive economic development into the distant future, we have to assume that the opportunities to develop new products and services are infinite. How else could we be certain that there will always be enough concepts left that can be invented? In order for the market to be able to perform well in the future, there must not only remain enough opportunities to drive development during the next decade, but the next decade thereafter, and so on.

I think that we are already looking at a reality where it is becoming more and more difficult to develop new competitive advantages and new products and services in the future, at least along the lines that we have mainly followed in the past. By this I mean that it will become more difficult to find new products and services that many people demand, invent new features for existing products and services or create operational advantages or superior strategic methods that could make companies excellent and differentiate them from competitors.

Much fun has been poked at the remark made by an official at the US Patent Office more than one hundred years ago, to the effect that everything had already, by that time, been invented. In this book I say nothing of the sort. There may be millions of things left to invent, but there are, at least in most respects, limits to what can be invented and to how far processes and products can be improved.

If there are limits to the development of new products and competitive advantages we have a problem. The economy cannot expand forever, and just like the physicists who research the future of our universe to find out how long it will be able to expand, economists and business people need to research the economy from the same point of view. In the case of our universe, it is about fifteen billion years old and it still has a number of billion years of expansion ahead. We and our children can go on living on this planet for our whole lives, without having to worry about the age of our universe. From an expansion point of view the universe still seems to be in mid-life and there is no question that the expansion will continue for a long time still.

We now may have reason to ask whether there are limits to economic expansion that may be closer than a few billion years away. We may even have to worry about reaching important limits within the next

Table 1.1 Time compression through history in a number of situations

Zero time: the limit of development	*Time to complete*				
	Months	*Weeks*	*Days*	*Hours*	*Seconds*
The sending of messages		Long-distance letter by courier.		Letter by modern postal service. Overnight delivery.	E-mail.
Complete information flows in industrial supply chain		Exchange of B2B information via mail and manual routines.			Information exchange via electronic messaging and computerized creation of messages.
Forming of materials			Forming of wood, metal and other materials by hand.		Moulding of plastics parts in seconds.
Photography		Development of photographs when films were sent to lab by mail.			Pictures viewed on camera window and computer screen.

Delivery of complex industrial products such as computers, trucks, machines, etc.	Pre time-compression in 1980s. Time from order to delivery was often four months.	Time compressed processes in early 1990s. Two to three weeks.	Supply chain management and production using computerized information flows like EDI and the Internet. Seven to ten working days.	
Making the first copy of a book	Medieval hand-copying of books by monks.	Setting up by hand of printing plates after Gutenberg's invention.	Mechanized setting up of a book in the 1960s.	Printing the first copy of a book in a digital printing press.
Delivery of a book	Delivery of a hand-copied book to a king or nobleman in medieval times.		Delivery of a book by a bookshop, which ordered it from the publisher in the 1960s or by Amazon.com today.	Delivering and downloading a book over the Internet or a broadband network.

Table 1.2 The limits of important inventions

Innovation	*Logic*	*Limits of development*
Computing	Instant access to high-speed calculation, information processing and process management tools.	When the process is not held up by the time it takes for the computer to perform its tasks, there will be no need to improve speed.
Communication networks	Instant access to services, information, and entertainment. This includes access to literature, music, films, games, stored television and radio programmes and other types of information and entertainment.	When a communication network makes all information available in the world accessible in no time at virtually no cost, such networks do not need to be developed further.
Production technologies	Rapid production technologies, materials that are easy and inexpensive to form small, but sufficiently strong products.	When desired products can be produced in almost no time at almost no cost there will be little need to continue development. When products and components are so small and light that they take up almost no space in production and so easy to assemble that this takes almost no time, there will not be much more room for improvement.
Packaging technologies	Solutions and technologies for consumer packaging, bulk packaging, palletising, etc.	When packages cost almost nothing, take up almost no space and allow for the safe packaging of products to suit the needs of each particular situation, there is little room for further development.

Transportation technologies for goods	Solutions and technologies for in-plant, local and long-distance transportation, including loading and unloading, etc. The category includes also technologies for parcel tracking, sorting, etc. that may reduce the time and cost of transportation.	When transportation does not hold up production processes a definite limit has been reached. In practice, long-distance transportation needs to take at least as much time as it takes to drive between points A and B at the maximum allowed speed. In case the cost of air freight decreases dramatically the limit will be set by the time it takes to fly between A and B + the time it takes to drive the goods to the airport at A and from the airport at B to the customer.
Transportation technologies for people	Cars, buses, trains and airplanes. These technologies reduce the time and cost of transportation. In some cases they also increase flexibility.	In some situations the goal is to increase the speed of transportation and reduce the time it takes to brake and accelerate a vehicle. In other cases the cost of transportation is targeted by increasing the capacity or lowering the cost of vehicles as in current development of high capacity airplanes.
Drugs, medical technology and medical consumables	Reduce the duration of illness, the time needed to operate and the time needed for convalescence.	The absolute limit would be to prevent all illness altogether and thus reduce the time needed to cure illness to zero. In the presence of illness the limit would be if a certain illness could be cured in no time or almost no time. In the situation when an illness cannot be cured, as in the case of asthma, the limit is to reduce the symptoms to a level where they cause no loss of productivity in the person affected.

Table 1.2 Continued

Innovation	*Logic*	*Limits of development*
Telephony	Instant communication at relatively low cost compared to travelling to a meeting.	When a phone may be used at any location to handle communication of sound, pictures and text + digital radio, television, games and MP3 files, the technology is close to the limits of its development.
Consumer goods	Anything used or consumed by consumers, such as food, detergent, cars, personal computers and washing machines.	In most cases there is a practical limit to how much of a product a consumer will need. In many cases companies in consumer goods industries have identified this limit already. Detergent is relative to how many clothes people use; one or two dishwashers per home are needed, but not all people can afford one. There is a limit to the amount of calories, sugar and salt that people can take in. The amount of furniture, computers and other goods people can buy may vary, but the total amount is limited by space and income. In practice, it is relatively well known at what rate these grow and how people change their patterns of consumption under different circumstances Among limiting factors are financial factors, space at home, the maximum of 24 hours per day and person to consume, etc.

decade and in some cases we may already have reached them. Yet, I believe that we have not yet exploited all growth opportunities of the existing economic system and we may even be able to develop new economic systems, within which we can create new growth.

The structure of this book

In Part I we discuss some basic traits in the development of business and of competition in the past century, with a focus primarily on the development in the last decades. This is meant to form a basis for an understanding of the areas where companies have been focusing their search for competitive advantage in the near past. Until the 1980s the focus in American and European companies used to be on the development of superior products and services through the application of superior business strategies and management tools. In the 1980s, the tremendous success of Japanese companies changed the focus of management from a product and service focus to a dual focus on operational efficiency and product and service qualities. The Japanese built their strength on operational efficiency and their advantage in this respect was so great that western companies needed to rapidly catch up with their Japanese competitors. Now, this has happened and new comptetitive philosophies have been implemented by leading companies.

After we have established how companies have been competing in the past decades, we need to analyse if there are limits to the development of competitive advantage. Part II is focused on seeking these limits in a number of fields, such as product and service features and quality, operational efficiency and strategic agility.

Part III describes the current development of business processes in detail. In order to arrive at a basis of understanding what is actually happening in the economy at present and how this differs from what has happened in the past we cannot rely on general principles and brief case-studies. We need to go into the detail of change and see how companies at present apply new technology and new management tools to change their businesses towards higher efficiency in a permanent way. The activities that were initiated two or three years ago start to show effects today and activities that are initiated today will take effect in the near future. If we understand what companies are doing today to improve their business, we can make assumptions about the effects that this will have in the future. This part adds detail to the reasoning in Part II.

Part IV is concerned with growth opportunities that are underexploited. Companies and society could benefit in a number of ways from systematically developing and marketing new value that has previously been neglected. This may be especially important if there are limits to the competitive advantages that companies have pursued up until now.

Part V deals with opportunities to implement new economic mechanisms in our economic system and widen the scope of the market economy to encompass new forms of transactions. The ideas in Part IV and in Part V are based on substantial amounts of empirical evidence. Previously, we have not been forced to look closely at this evidence, because there have been ample growth opportunities in traditional areas, but this could change in the near future. We may have to seek new growth opportunities, and it is important that people understand where this new growth may come from.

Throughout the book there are boxes that contain reasoning that has been broken out of the flow of the main argument. These are there to clarify important points or add details to an argument. They can be read where they are found or they could be skipped until later, if the reader prefers to do this.

Five main themes

In this book there are five main themes, or hypotheses:

1. Companies and organizations are in many areas of their businesses coming closer and closer to definite limits of business development. Nothing can be done in less than no time and at less than no cost and in many cases companies are closing in on these limits. It also becomes more and more difficult for companies to find new growth products and concepts.
2. Automation and time and cost reduction is going on in all areas of society at the same time. There are no obvious industries that are likely to need more resources in the future. We will look at numerous examples in all areas of society where there are now on-going efforts to automate processes and reduce the need for resources.
3. Through automation process steps are integrated and companies become less unique. It becomes more and more difficult to develop unique and sustainable competitive advantages. Competitors become more and more equal and profit margins decrease.

4. If resource savings are accelerated, we need to accelerate our search for new business activities that can make long-term use of resources. We cannot build a future economy on the idea that nobody is going to work or that fewer and fewer people are going to work. In that case companies will have fewer and fewer customers. It becomes possible to produce more with less resources, but profitability in companies is decreasing and wage levels move in the same direction, so the people who work cannot support a growing number of unemployed through taxes or other financial transfer systems. We need to find new areas where people can earn money long-term.
5. The market cannot be expected to automatically create new business. In society we need to start research activities to identify possible growth areas. Two ideas for such growth areas are presented.

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Part I
The Historic Development of Competitive Advantage

'Astronomers breathed a huge collective sigh of relief in the spring of 1992, when the most important prediction they had ever made was proved correct at the eleventh hour. The dramatic discovery of ripples in the structure of the Universe dating back almost 15 thousand million years has set the seal on twentieth-century science's greatest achievement – the Big Bang theory which explains the origin of the Universe and everything in it, including ourselves. Slotting in this missing piece of the cosmic jigsaw puzzle confirms that the Universe really was born out of a tiny, hot fireball all that time ago, and has been expanding ever since.'

John Gribbin[1]

2
Product Proliferation, Quality and Price

Since people began to trade, the main objective of trade and business has been the satisfaction of different types of needs. Needs and demand have changed as new products and services have been developed. Peasants traded crops, and trade and war expeditions visited faraway places to bring home costly products that could not be produced at home, like spices, porcelain and expensive fabrics. Centuries ago the focus was on the product and of the function of the product. In some areas there were forms of primitive 'branding'. Wine areas like Burgundy took on an early form of brand recognition, and particular goldsmiths or makers of musical instruments became well known for their skills and developed names for themselves, similar to the brands that we know of today. For the bulk of goods the only thing that most customers could afford was to try to satisfy their most basic needs with products that were generic.

In many product areas we still buy generic products, and soon after a leading brand has developed a new and improved product there are companies that copy innovations and sell them at a lower price under a brand name that doesn't enjoy the prestige of the most innovative companies.

In some cases there are genuine differences between the products with the most prestigious brands and the cheaper alternatives with names that are less well known. Sometimes the branded products taste better, look better or are more durable than their less expensive counterparts. In other cases, there is little difference and the price difference is mainly justified by the fact that a well-known brand has achieved a superior image in the minds of customers. In some cases well-known brands have built a stronger distribution network or a leading brand is often the first to introduce a new product. We will look into these situations one by one to make ourselves more familiar with each of them. The reason for

this discussion is that we need to establish a general platform of understanding from which we can look at the possible limits of the development of competitive advantage.

Products with a genuine difference

There are products that simply cannot be copied or those that are very difficult to copy. All over the world wine makers improve the quality of their wines so that they can compete with the products from the prestigious wine makers of France and other producers of quality wine. Even though great progress has been made in wine-making technology and new areas establish themselves as areas of quality wine production, these are never exact copies of the originals. The soil, the climate and other conditions in a particular part of the world are unique and these unique conditions contribute to the creation of unique wines. American and Australian wineries can compete with the French in the production of quality wines, but so far they have not managed to make exact copies of French wines and France is still the country where the largest volumes of quality wines in the world are produced.

In other product areas the ownership of particular recipes or the access to the skills of a particularly skilled product development team can make a company consistently produce products of a quality that is difficult or impossible to copy. Consumers of coffee, tea, chocolate and seasoning sauces often have their favourite brands, and the brand preference may not only be founded on a preference for a product that is in reality quite similar to its alternatives. There are often genuine differences that can be identified in blind tests of the different products. It is even possible to describe tastes and identify differences in objectively measurable or qualitative respects, like degree of sweetness, acidity, bitterness or softness of texture.

Even if in practice it is possible to come very close to copying a taste, the products of a particular company may have become known, through advertising or otherwise, to possess certain qualities that are maintained in the products over decades. This often makes it difficult for competitors to erase the impresson in people's minds that there is a genuine difference in a certain product. Coca-Cola is a typical example of this type of product. This company still enjoys a leading position in the soft-drinks industry, because many people think that there are unique qualities to the product.

It is, however, important to note that this situation is not uncontested. In many product areas companies try to develop less expensive

alternatives to leading brands and it becomes more and more difficult for consumers to taste or see the difference between products. In the book *Fast Food Nation*, that describes how the fast food industry has changed a number of aspects of American life, the author Eric Schlosser describes how global flavouring companies develop flavours that are used to flavour food products and make them taste and smell in a particular way.[2] Even though McDonald's fry their french fries in vegetable oil, they still flavour them through the use of chemical flavours so that they taste and smell as if they had been fried in animal fat, which is what customers expect from McDonald's fries. There often are no strawberries in a strawberry shake any more. All flavours and smells can be copied and food companies increasingly use artificial flavours to make their products taste and smell in a particular way. Since fruit is more expensive than artificial flavours, competition forces companies to try to find ways of reducing price to make products more affordable for customers.

In the same way, production technology has been developed to a level where any company can buy production equipment that makes it possible to produce high-quality products, even if the company has a relatively low level of previous industry experience. This is another factor that contributes to the relative ease of producing high-quality products today. If we take an example from an industry that is completely different from the food industry, we may see that the situation is similar. When the Beatles were going to record their famous 'Sergeant Pepper's' album in the 1960s there were only four-channel mixers available in the studio. The Beatles' manager Brian Epstein had to 'invent' new technology himself to make it possible to use eight recording channels. He connected two four-channel mixers to each other in such a way that he got an eight-channel system.

Nowadays anyone who wants to record music in a professional manner can inexpensively buy recording equipment that is much more advanced than the equipment used by The Beatles in the 1960s. Without any technical knowledge people can record their music and distribute it over the Internet without even having a recording contract. This does not mean that there is no difference between the recordings of an inexperienced teenager and the professional recordings done by a record company. But the difference is far less than in the days when the only way that music could be recorded in a satisfactory manner was through a studio recording, and in order to do this you had to have a contract with a record company or hire the studio at your own expense. Small bands and unknown musicians can record their music, publish it

on the Internet and gradually improve their skills from a beginner's level.

Leading companies have previously become leaders by being superior in the ways that they have applied new technology, combined technologies and developed product formulas and production processes in combination. Leading food companies have had particular in-house expertise in food technology, because they've had to buy certain machines from one supplier, other machines from another supplier, packaging machinery from a third and sterilization equipment from a fourth and they have needed the competence themselves to integrate the process. Today, companies can buy integrated turnkey solutions, where a supplier delivers a whole system of products and takes responsibility for the functioning of the whole system. Tetra Pak is a global company that started in the packaging industry, but acquired Alfa Laval in food technology in the early 1990s. Now Tetra Pak offers turnkey dairy solutions including both food processing and packaging equipment, where a substantial part of the production knowledge that previously had to be held by the dairy company, is built into the production system. With this type of system, production is controlled by computers, which also monitor and control important quality variables like temperature, product flow and downtime of the system. The same situation exists in many areas of the food industry, where single companies take responsibility for the delivery of a complete production line.

In the same way, a person without an experience in brewing can buy the equipment for a microbrewery and start to brew perfectly decent beer, and gradually improve his or her skills from a much higher beginner's level than was possible ten or twenty years ago. Although the complete skills of a professional have not been built into equipment, the gap between leading companies and newcomers has lessened. The development of equipment where a substantial part of the industry skills are built in has increased the level of competition in many industries. The quality of many generic products is nowadays not as different from the quality of the market leaders as it used to be.

Innovation as a temporary advantage

We have seen how market leaders in some industries find that their industries are gradually becoming more competitive. In many technology-based industries, leading companies now expect to see their products being copied by fast followers only a few months after

the original was developed. When Sony introduced its Walkman portable cassette player, it took a few years until competitors came up with a comparable product and for a very long time the Sony Walkman was the premium priced product in the market. The Sony Walkman was introduced in 1979 and when I worked in a hifi store in 1985 the Sony product still sold at a price that was three times higher than the best competitors, because the Sony product clearly provided superior value for money in this specific niche. Based on this success Sony developed expertise in miniaturization. Now, there is a large number of companies that are competent in this field and miniaturized components are now standard components.

Nokia is the development leader in the mobile phone industry and their competitors come up with products that are similar to those of Nokia only a few months after the leader. In the computer processor industry Intel develops a new generation of computer processors at an ever-increasing pace. The manager of this company, Andrew Grove, has written a book with the title *Only the Paranoid Survive*,[3] where he describes the need to constantly be moving forward in order to stay ahead and be competitive in this industry. Only if Intel is constantly looking out for competitors that try to catch up with them, can they maintain their lead. This is not only about developing the next generation of faster processors. It is also about looking out for new technologies that may replace the need for fast processors and trying to invent new solutions that deal with such threats.

One example of such an event was the development of the network computer. By moving computing power from the computer to the network, the need to have computing power in each PC is reduced. A network computer is linked to a local network, where the computing power is located. There is no storage capacity, no diskette drive and no CD-rom drive in each network computer. All programmes, documents and everything else is located on the network. This is a cost reduction to many companies and organizations that install 'thin clients' or network computers instead of fully-fledged PCs. Presumably, the thin clients will never need to be upgraded, and since they do not include any moving parts they should not wear out very rapidly. Upgrades in terms of capacity are only needed for the servers on the network. This reduces the cost of computing long-term. It was this trend that was spotted by Intel at an early stage and Intel rapidly moved to introduce their own network computer. Intel could not stop the market from introducing a new type of inexpensive computing technology, even if this threatened their processor market, but they could at least make sure

that they became a strong player in the emerging market. The speed of product development and the development of new concepts is constantly increasing and companies need to improve speed in order to stay ahead. The time during which the leaders can enjoy the opportunity to earn money on leading products is getting shorter. In some industries, leaders must make their own products obsolete before somebody else does. This is the meaning of the expression 'only the paranoid survive', which is used at Intel.

This means that companies need to become more and more efficient in their development processes, because the period when they can earn a premium from a new product is getting shorter and shorter. They also need to operate more and more efficiently, so that the profit margin becomes as wide as possible.

Undifferentiated products and services

In some cases products and services from different companies are not distinguishable from each other. All competitors offer the same or very similar products, and despite efforts to hide this, we can see that the basic offering is the same. In many industries products are rarely being developed further because it seems as if they have reached a certain limit, or a maturity. Maturity can be experienced in different industries. One example is a car-load of gravel, which cannot be made very different. A related service is that of digging a hole in the ground with an excavator. The distinguishing point of these services would primarily be the price, possibly the delivery time. In the case of a savings account in a bank, the differences between banks are minimal. There is food that is generic in the same way. At least the consumer gets no information about any distinguishing points of a certain type of generic product that could justify a higher price. This is the case of crushed tomatoes, shrimps, most vegetables, milk, eggs and a number of other products. In the case of such products the opportunities to compete with product features are limited. Only price remains as a competitive weapon.

Branded products

In many product categories some companies either have a well-known brand name or a new company may have the ambition to imprint its name particularly strongly in the minds of customers. As we saw above, many companies have built strong brand names in times when competition was less fierce than it is today, and managed to maintain a

certain strength in this name even today as competition has become tougher. This is the case of Coca-Cola. The products of this company have become less unique as more and more colas of high quality have come on the market, but there is still a mystique around the product that makes many people think that Coke is 'The Real Thing'.

In the case of Nike, this company had a strong position in sports shoes, which it has managed to strengthen through successful product development and branding. Now Nike products come in the form of football shoes, sports clothing and, more recently, golf products. Nike has managed to successfully move from one market to a number of markets where it can successfully use its skills in product development and international marketing of sports products.

In order to build and maintain a strong brand, companies need to spend large amounts of money on advertising. In addition to this, the products and services that they provide must be first-class. The idea of branding is to build an image of a company that offers superior products or services that it is worth paying a price premium for. The cost of building and maintaining a strong global brand is sometimes tens of millions of dollars on an annual basis, which means that a company needs to have a substantial sales volume to build a global brand. National brands can be built and maintained on much smaller budgets. A smallish consumer products company, like the Swedish confectionery company Marabou, which is owned by Kraft General Foods, can only afford to market one international brand, namely Daim, even though it has a large number of national products in the Swedish market, where it is the leader.

Strong brands exist in many industries and everywhere it is a sign of brand strength when the products command a premium price. Mercedes, BMW, IKEA, Gillette, Nokia, Walt Disney and Philadelphia Cream Cheese are all examples of strong brand names, and though it costs a substantial amount of money to maintain them every year, they provide a significant profit, largely from the fact that customers recognize these names as high-quality brands. This recognition contributes to the price premium and to the constant flow of customer purchases of the products.

Many companies find that it is now increasingly difficult to maintain a premium price in the face of tougher and tougher competition. In cases where customers no longer perceive that a particular brand has something special to offer, they tend to choose alternatives that are less expensive, thereby forcing leading brands to reduce prices. Marlboro is one of the few companies that have admitted this publicly ten years ago

by announcing that they intended to decrease the price premium of the product overnight. In the face of strong competition from generic cigarettes, they slashed the price of Marlboro, and the share price of Philip Morris, the company that owns Marlboro, plummeted. Was this failure, and the failure of other companies to hold their turf against fierce generic competitors, a case of bad management of the products in question, or should we interpret this as a genuine difficulty to maintain competitive advantage?

Product quality and features are being produced by machinery that is available as standard machines that can be bought by anybody. We can expect that many products will be produced by competitors that all use similar types of processes. To a large extent strong brands are still based on differences between products. Even if there are no differences, companies may claim that there are, but fewer and fewer customers seem to believe this and choose generic alternatives. In addition to the fact that more and more processes are similar in different companies, many products are also increasingly similar in quality and features. When profits are made from being different, this is a worrying development.

The importance of strategy

Since the Second World War the concept of business strategy has become more and more important. It has been recognized that companies who enter and exit product and service markets based on an understanding of their relative strengths and weaknesses are generally more successful than companies who do this in a more random fashion. Those that have gradually developed an understanding of how their strengths and weaknesses match the particular needs in a certain industry, are generally more successful than companies that have a weak idea of what their customers prefer. In short, the development of our knowledge about strategy has been based on the study of successful companies and the strategies they develop and how these differ from the strategies or lack of strategies applied by less successful companies.

A strategy should always be based on the unique strength of a company, a strength often gained through a long process of trial and error. Gradually, companies have begun to understand the preferences of their customers and develop the skills needed to develop and produce products and services that cater to those needs. This period of trial and error could be very long and learning sometimes comes through painful mistakes.

Walt Disney understood that new generations of children create new demand for films and theme parks, and the company have gradually improved their skills to produce films, create parks and market ancillary products and services that tie in with their core products. During this process they have learned when to launch films and how to produce them in a cost-effective manner in a relatively short space of time. In addition to this they have also developed skills in how to use new technology to make production more efficient and to create special effects that make films and parks more interesting, and so on. One of the big early mistakes made by Walt Disney was to sell the rights to a large number of early Mickey Mouse films to another film company in the belief that the audience had seen enough of those. Now Walt Disney has recognized that feature films and short Mickey Mouse films are in demand by generation after generation and that parents who saw these films in their childhood want their children to enjoy them too.

Car companies have also developed their skills in satisfying the needs of their customers. Since the days when the automobile was a novel means of transportation, some companies have been more successful than others, by developing different features of their products or particularly strong aspects of marketing, distribution or production. Ford managed to make their products more affordable by introducing mass production, offering them in a standardized colour (black) and in one model only. Later, GM developed the strategy of having one car for every purse. Their range of brands started at the low end with Chevrolet and ended at the high end with Cadillac. Between these were Buick and Oldsmobile. These are only aspects of the strategies of these companies, but they are important examples of how companies have striven to develop unique advantages. Today, global auto groups have different ways of focusing their efforts. Volkswagen run a modern type of the General Motors strategy with two brands in the sports car market (Seat and Audi) and two brands in the family car market (Skoda and Volkswagen). In each of these markets they manage their two brands as one low end (Skoda and Seat) and one high end (Volkswagen and Audi) brand.

Throughout their history companies develop a number of unique skills that are sometimes perfectly attuned to serving customers in a particular market. When they find that they have exhausted the opportunities to grow in their core market, they need to find new markets where they can utilize the same basic skills that they have developed in their core market. The first step taken by many companies was to go outside of their national market and become a multinational or a global

company. For companies with small home markets, internationalization started very early. Already at the end of the nineteenth century the Swedish producer of ball-bearings, SKF, had their own sales subsidiaries in all countries in South America. Many American, British and German companies that potentially could sell their products globally have started much later with their internationalization.

The globalization of a company has a number of consequences. Firstly, it opens up new markets where a company can earn new revenue. Secondly, the added volumes create advantages of scale that help in reducing development, production and distribution cost, so that a company becomes more competitive from a price perspective and achieves higher profit margins. Thirdly, it helps a company to advance on the 'experience curve', which makes it increasingly difficult for competitors to catch up with leading firms.

A number of well-known American companies have become household names in their industries and have been this for a number of decades. Coca-Cola, Kellogg's, McDonald's and Walt Disney are examples of such companies. In the early phases of their internationalization these companies found that their products were absent in the new markets and that the world represented a huge field of unexploited opportunities. Gradually, more and more markets became saturated with their products or they showed signs of saturation or maturity. They had to look for new products and services that they could exploit to continue their growth. In these cases they looked for markets of products with high growth potential where their core skills could be utilized.

Coca-Cola identified their core strength in the building of strong global brands in the beverage industry, and they also tried their luck in the fast-food industry, which is an important outlet for beverages. Nike has gone from running shoes and sports clothes to football shoes and golf products, and the strong Nike brand can be utilized as a way of rapidly building consumer recognition for their products and they have a quality image that can be transferred from one sector to the other.

In the case of IKEA and a number of other companies the geographic coverage of their concept is still not complete. IKEA has a substantial coverage in Europe and in parts of Russia and it has started to settle in the US, mainly on the east coast, and in parts of Asia, but there is still ample opportunity to spread its concept to more geographic markets. The same is true for Marks & Spencer, Wal-Mart and other food retail chains. Many of these companies have, however, found it difficult to become profitable with their concept in foreign markets. This is maybe because consumers in each market already have strong preferences of

how they want to be served on a daily basis by food retailers. The same preferences may not be as strong in the furniture industry, where IKEA can offer a unique concept that can challenge traditional furniture retailers in all markets. This may be because of their substantial advantage in terms of price and immediate delivery for those who are prepared to do some of the work themselves.

When a company invents a new product or service, which is not available in the market already, there is sometimes an opportunity to grow this concept globally. This is true for consumer products as well as new industrial technologies like the development of new plastics, plastic moulding technologies, printing technologies, ball-bearings and a large number of other technologies, features and products. When the market for a certain product becomes saturated and the product or service is seen to mature, leading companies try to apply their skills in other industries where the same or a similar set of skills is needed. This is done on the assumption that there are still growth markets where companies are less skilled, in a number of ways, than the new entrant. In the case of the entry of Nike into the golf products industry, this company calculated that its strong brand would be an advantage. But Nike also had skills in product development, marketing and operations management that they believed would be superior to the skills of the market leaders in the golf equipment industry, Titleist and Spalding.

In order to expand, companies constantly need to find new markets where they can utilize their skills and assets to grow demand, improve service to customers or find ways to produce at a lower cost, which results in a lower price to their customers. It has been taken as a given that the opportunities to do this cannot be exhausted. There are always new skills that can be developed and new customer needs that can be satisfied. When people are looking for new opportunities they apply their imagination in ways that make it inevitable that new growth opportunities will be identified.

One example of a field of opportunity that was previously underexploited by western companies is the area of operational efficiency. We need to turn to this area in order to understand how companies systematically have pursued the development of competitive advantages in this area in the last two decades.

3
Time as a Competitive Advantage

For reasons that we will soon understand, one of the most important tools used to improve competitive advantage in the 1990s has been the concept of 'time compression' and a number of related concepts that could be seen as elaborations and extensions of the basic theme. Even if the pursuit of operational efficiency has been going on since the beginning of industrialization, it was previously not focused on to the same extent. In the early 1990s western industry realized that a number of Japanese companies had created substantial advantages in terms of efficiency.

It wasn't that the area of operational efficiency had been neglected by companies before that. The whole field of organization theory has for a long time been looking at optimal ways of organizing a business, and a number of significant breakthroughs have been achieved in practice, such as the invention of mass production by Henry Ford, and a number of other radical innovations. This area of development, however, lacked a simple tool that could be used in all situations without compromising relevance and clarity.

In 1988 the consultant George Stalk published an article in *Harvard Business Review*. The title was 'Time – The Next Source of Competitive Advantage'. In this article, and later in a book that was co-written with Thomas M. Hout, Stalk introduced to a wider audience the idea that time is closely related to cost and customer satisfaction. By reducing the time it takes for companies to complete a cycle from order to production and delivery, the cost of production and administration is reduced at the same time. He also described how the concept of time compression could be applied in product development. To show the power of time compression in product development, the article included an analysis of how Honda won a 'war' against Yamaha in the motorcycle

market, by being able to develop products at a speed that was significantly higher than that of Yamaha. Honda won this war at great expense, but it showed Yamaha that its speed in product development was so much higher that Yamaha could not hope to win a war against Honda through advantages in product development or operational efficiency, because these were on Honda's side. Stalk describes how Honda in 18 months, starting in 1981, introduced or replaced 113 models and turned over its product line twice. While both Honda and Yamaha had 60 models at the start of the 'war', Yamaha was only able to change 37 models in its product line during the 18 months. By being able to develop products more rapidly and at lower cost, using fewer resources, Honda could maintain and strengthen its leadership in the motorcycle industry. At the end of the 'war' the Yamaha motorcycles looked outdated compared with those of Honda and customers perceived Honda as the more innovative and exciting of the two companies.

In 1990 a team of researchers from Massachusetts Institute of Technology, MIT, published a report of a three-year research project about the advantages of Japanese companies in the auto industry. The title of the book was *The Machine That Changed the World* and the authors James P. Womack, Daniel T. Jones and Daniel Roos contributed to changing the business world.

The results of their study corroborated the findings of Stalk and other authors by concluding that the Japanese created significant competitive advantage by applying superior management practices in a number of operational fields. These fields comprised product development, production management, sales and supply chain management: Japanese car manufacturers, and primarily Toyota, were able to develop and produce cars much faster and at a lower cost than their American and European counterparts. This gave the Japanese manufacturers a substantial advantage over western companies. They could use their capital more efficiently, satisfy their customers by producing and delivering exactly what they wanted and when, and develop products that are modern when they arrive in the market.

With development cycles of six or seven years western car manufacturers sometimes produced cars for yesterday's market demands. When development cycles were reduced to between three and four years, as in the Japanese case, the time that elapsed from market study to finished product was much shorter, with a higher probability that the market was still interested. The Japanese also organized development projects in such a way that development teams received constant input from the market. This wasn't normally the case at American and European com-

panies, at least not to the same degree, and the Japanese way ensured that changes were made that were in line with market demand and not against it.

Stalk, Womack, Jones and Roos and a number of authors before and after them have shown that the reduction of time in business processes has a dramatic impact on cost, capital tied up in the business and a number of other factors that have a direct influence on profitability and customer satisfaction. It is no longer enough to have a good strategy and be in the right market or markets: companies also need to be superior in their way of running their operations, and time compression has become the generalized tool to become a leader in this respect.

Stalk argued that products in production were only added value for 5 per cent of the time in production. Later researchers have found that many companies score in the area of one per cent in this respect. This means that companies tie up capital in production, use valuable storage space, and move products from work station to work station, and in the midst of all these activities, value-adding activities only take up one per cent of the total cycle time.

In companies that introduced structured efforts to reduce non-value-added time, the results were often dramatic. In a study of a time compression project at the company Copeland in Hartselle, which produces compressors, between 1991 and 1993 the following results were measured by the researchers Mel Adams and Bernard J. Schroer of the University of Alabama and Steve K. Stewart from Copeland Corporation.[4] The project was initiated because of a number of market-driven factors. The market requirements were changing from the situation in 1992 when there were a small number of customers (<100), who placed relatively large orders (>1,000 units) of a small number of models (<30). The situation after the project in 1996 was a dramatic difference. The number of customers had increased more than fourfold (>400), the average order size had decreased to 1/25 of the previous size (<40) and the number of models in demand had proliferated and had been muliplied by a factor of 33 (>1,000). The production philosophy had changed from long-run batches to very short continuous run batches in 1996 and the consequences for a number of key performance indicators were substantial.

The throughput time in production was reduced from over sixteen hours to below seven. The so-called 'TAKT-time' (defined in terms of 'available work time per day divided by daily required demand in units per day' – a key performance variable) was reduced from eighteen

seconds to less than ten. The most impressive example of time reduction was the lead time for product delivery, which was reduced from sixteen weeks to less than one week. Before the change project, the downtime for changeover was in hours, and, after the project, changeovers are so fast that it is included in TAKT-time. The number of units produced per labour hour increased from 1.1 to more than 1.5 and the time lost due to accidents was halved.

The gains in key performance variables from these time-related improvements were impressive. The daily assembly capacity increased from 6,000 to more than 10,000. The cost of conversion was reduced by 30 per cent and the space requirement per unit was reduced by 33 per cent. The value of inventory was reduced from more than 15 million dollars to less than 9, which had a substantial impact on the annual cost of capital in the business, and the average number of units in finished goods inventory was reduced from 90,000 to less than 20,000.

Similar results have been reported from a number of companies in different industries, and in general the researcher John Parnaby has identified the following correlations between time and a number of other variables.[5] When lead-times are reduced by 75 per cent, the manufacturing cost is reduced by the same amount. This type of project typically reduces the number of material movements by 90 per cent and the volume of inventories goes down by 75 per cent. The volume of work in progress is also reduced by 75 per cent and adherence to schedule is improved by 30 per cent. All the activities involved in the project improve the feeling of product 'ownership' substantially.

As we can see, the advantages of time compression are substantial. As time is compressed, cost decreases to the same degree, and a similar reduction of the inventory levels frees capital that can be invested in other parts of the business. Improved adherence to schedule increases customer satisfaction, because of fewer delayed deliveries. This, in combination with shorter lead times, can be translated into higher prices, because customers are often late with their planning and it is an advantage to be the only company that can deliver at short notice. If suppliers offer shorter delivery times, customers can wait to order until a late stage and still receive deliveries when they are needed.

The major finding is that cost is reduced as time is compressed. There are several reasons for this. Time compression efforts have the goal of creating an even flow in production or in other areas of the business where the tool is used. Instead of trying to get people in production to work at their maximum pace, the idea is that every step in the process should run at the same pace. This is known as 'balancing production'.

Instead of taking batches in and out of intermediary storage and working on different batches in different areas of the factory, each product flows through the facility at an even pace until it is finished. This reduces work-in-progress, which in turn reduces the amount of capital that is tied up in inventory. It also lessens material movements dramatically and the cost of such movement is reduced to the same degree. This cost does not add value to products. Due to the even flow, resources are utilized more efficiently and this lessens the total manufacturing cost. Through the even flow, production becomes more predictable. If there are problems, these need to be solved immediately and the cost of downtime and re-work decreases.

This was shown in particular by the case of the company Atlas Door, related by Stalk. This company implemented a production process that was unique in the American door industry. The industry standard delivery time was four months. Most industry doors are made to order and companies are often late in placing their orders. The flexible production system at Atlas Door made it possible for this company to deliver doors in $2^1/_2$ weeks. Only ten years after the company was started Atlas became the leading door suppliers with 80 per cent of the distributors in the United States.

Business process re-engineering

It is now fifteen years since Stalk published his article and the idea of time compression has advanced from a simple focus on time to the more elaborate concepts of 'business process reengineering' (BPR) and 'supply chain management' (SCM). BPR was introduced by Michael Hammer at about the same time as Stalk published his article, but it didn't become really popular until the early 1990s, in particular through a book by Michael Hammer and James Champy called *Reengineering the Corporation*.[6] In re-engineering projects companies also focus on time, but time is reduced by viewing everything that goes on in a company as 'processes'. Instead of the traditional way of looking at a company, as a set of separate departments, Hammer and Champy suggested that we should view them as a number of front-to-end processes. One example of a process would be the 'order-to-payment' process, which starts with the taking of a customer order and ends with the reception of payment from the customer after the product has been delivered. Hammer and Champy advocated that we should break down the walls between departments and speed up processes in ways that had been impossible when a company was seen as a number of departments.

The basic idea of BPR is to start with a blank sheet of paper and forget how things were done by the old organization and change the company into the most efficient process-based organization conceivable. This often includes changing the rules of how work is organized, how tasks are distributed between different people in the organization and creating new roles. It also often includes training people to become generalists who can handle a number of tasks, where companies had previously employed a number of specialists, who had to pass work between them to complete it.

BPR was not a new idea in principle. All radical innovations have had an element of radical process change in them and time has often been a component in the change. The radically new innovation made through BPR is the systematic approach to the identification of process change opportunities. We may look at two historical examples of process change through innovations that brings home the point. The invention of the printing press by Gutenberg is one example of an invention that radically changed the time required to make a number of copies of a book, compared to manual copying by monks that was previously used.

Another randomly chosen example could be taken from seventeenth-century warfare. The Swedish king Gustav II Adolf was feared in large parts of Germany because of his success in the battlefield. The Germans called him 'The Lion From the North' and it was told that people had seen clouds form as lions that warned of the approach of the Swedish troops. Between 1618 and 1648 Sweden fought the 'Thirty Years War' in Europe on the protestant side. One of the reasons behind the success of Gustav II Adolf was the mobility of his troops, both during transportation between battles and on the battlefield. Before his time cannons had limited the mobility of troops. Because of the size of cannons and the slow speed at which they could be moved, armies could only transport themselves and regroup on the battlefield at a very slow pace. Existing cannons weighed 1,500 kg. Gustav II Adolf came up with the idea of using lighter and more mobile artillery and commissioned the development of 150 kg cannons, which fired grenades loaded with scrap metal. These smaller cannons could be handled by a smaller number of people and horses than the old ones and they no longer delayed an army on march. Through this invention the Swedish army could turn up after quick marches in unexpected places and it became possible to regroup very quickly in the battlefield. The information about the positions of the Swedish forces, as they were reconnoitred by reconnaissance officers, was often no longer relevant when the enemy

engaged them in battle. This created a significant strategic advantage for the Swedes. This example has all the ingredients of a BPR project: a deep understanding of the situation and the most important success factors. The king took away the bottleneck made up of the slow-moving artillery and he changed the roles of the gunners so that two men could handle a cannon. He also communicated the change, so the whole army could take advantage of it.

Material flows and information flows

In all time compression projects, whether they are called time compression, BPR or SCM, there are two types of flows that need to be taken into account, namely material flows and information flows. While material flows need to take time, information flows no longer need to take time. As was shown in the example of the ordering process of Dell in the introduction, the information flows that result from the interaction between the customer and the order system at Dell take very little time. The same is true for the exchange of electronic information between companies in the automobile industry. Car companies use EDI for their communication and this interaction between computers is completely automated. The exchange of messages every day is such that it would have been impossible to exchange such amounts of information if it had been done manually. The example of the ordering of parts for each car is a case in point. Today 70 per cent of the value of parts are ordered when the car body goes up on the assembly line. Suppliers have been notified in forecasts sent daily from the assembler to its suppliers, but when the body enters the assembly line they get the first real order. At this point, fifty suppliers of major modules receive their orders instantly. This would have been impossible, to achieve if the ordering of parts had been done manually. Everything from production scheduling over the daily prognoses that are sent to a few hundred suppliers, to the final orders that are sent at as late a time as possible, is automated. The information flows can be instant, but it takes some time to move materials, produce the parts and assemble the car. Yet the complete compression of information flows contributes substantially to the ability to compress material flows as well. The car industry is far ahead of most other industries in the degree of automation of supply chain interaction.

The automobile industry started to implement EDI communication almost twenty years ago and have gradually calibrated their systems and the routines that are needed to achieve the precision that has been

arrived at today. Companies that have not spent the same amount of time working on their routines may still need to spend a decade or more on improvement before they arrive at the same situation as car manufacturers are in today. The reason why other companies have not come as far is that they have more complicated systems structures, non-cooperative supplier relationships or other obstacles that have to be removed before processes can be perfectly tuned. In many cases companies have not worked as diligently with process improvement as the companies in the car industry have done. We will look in more detail into why this is the case in Part V, where we will discuss a number of detailed examples of process change.

In their book, Hammer and Champy recognized the importance of working with information flows and use modern information technology as a part of a re-engineering effort. They give a number of examples of how new information systems could be used to break old rules and change work-flows to increase efficiency:

- Shared databases make it possible for information to appear simultaneously in as many places as needed.
- Expert systems make it possible for a generalist to do the work of an expert, or in some cases one generalist can do the work of many experts.
- Telecommunications networks help businesses to reap the benefits of both centralization and decentralization.
- Decision support tools like databases and modelling software could make decision-making a part of everyone's job.
- Wireless data communication and portable computers help field personnel to send and receive information wherever they are.
- Interactive videodiscs help customers configure and select products without the support of sales people or sales engineers. (Since 1993, when Hammer and Champy wrote their book, interactive videodiscs have been replaced by interactive Internet sites.)
- Automatic identification and tracking technology tracks goods and tells people where things are in a logistics system or a supply chain.
- High-performance computing makes it possible to revise plans instantaneously, as has been described in the cases of the auto industry and of Dell.

These are good and interesting early examples of how companies in the late 1980s and the early 1990s used information technology to implement new routines. Today, the development of the Internet and elec-

tronic business has made it possible to go much further in terms of speeding up information flows and making efficient interaction between humans and computers. As we will see later, the development of electronic business has shown that opportunities to compress time may be limited by the simple fact that nothing can be done in less than no time.

Supply chain management

The same tools that have been used internally in companies to improve processes are also used in the improvement of complete supply chains. It is no longer enough to be an excellent company in isolation – each company must be part of a superior supply chain to stay competitive. To achieve this, companies work together with their suppliers and customers to make all members of a supply chain more efficient. In general, the same rules apply for supply chain management as in other examples of time compression. If the time it takes for components or raw materials to move from the beginning of the supply chain to when the end-user pays for the final product is reduced, the cost of the final product is reduced and the satisfaction of the end-user is increased. It doesn't matter to the competitiveness of the final product where in the supply chain an improvement takes place. Therefore, it is in the interest of every company in a supply chain to participate in improvement activities. The more customers that buy the final product, the more the suppliers down the line can supply in terms of materials and components.

There are a number of sources of delays in a supply chain, such as delays in the flow of information between companies, which in its turn delays material flows. Another source of cost is delays in information flows about end-user demand for the final product in the chain. Uncertainty about future demand increases the need for safety stock through the system, and the resulting excess safety stock costs money that needs to be added to the price of the final product. There are often delays caused by inefficient and time-consuming internal routines in particular companies in a supply chain. No chain is stronger than its weakest link and it is important that the same standards of quality, reliability and efficiency are adhered to by all members of a supply chain. This is well known in industries such as the car industry and the computer industry that have worked more with these things than most other industries. Supply chains in many other industries still have far to go until they are world class in this respect.

One aspect of information flows that is a cost driver throughout the supply chain is the access to accurate demand information for all companies in the supply chain. Even commodity suppliers at the end of the chain can benefit and reduce cost in the form of inventory if they get immediate access to accurate order information and sales forecasts. Traditionally, many companies have tried to distort information about customer purchases and future demand in order to strengthen a bargaining position against suppliers. Experts agree today that the main consequence of this is that it drives cost through the supply system.

Without accurate information, companies down the chain need to build excess inventory because of the increased uncertainty. Any benefits in terms of a better bargaining position because of an information advantage for the front end company is offset many times over by the additional cost of inventory that builds in the system. This cost of inventory has to be paid for by the final customer as a mark-up, which makes the end product lose competitive advantage against competing offerings. The most beneficial strategy for all members of a supply chain is to distort information as little as possible. Companies also need to reduce the delays in information transmission and material flow as much as possible. For the company that has first-hand access to information about the buying patterns of end-customers, and which also has information about how these change, the best strategy is to pass this information as far down the line of suppliers as possible. In order for this to be effective they also need to make sure that the suppliers down the chain have the ability to interpret the information in a correct way and take appropriate action based on the information. Sometimes it requires more work to ascertain that suppliers are able to act correctly on information and interpret it, than to pass the information down the chain. Increased flexibility requires process change in the companies and this requires a conscious effort, a change project.

The advantage of having updated information about customer demand is the reason why car manufacturers send a six-month sales forecast every day to first-tier suppliers via EDI. In the future the same information may also be sent with the same frequency to second, third and fourth-tier suppliers, but it requires working together with these companies to improve and fine-tune their processes so that the information can be used to reduce inventory and improve lead times. Companies with less complex supply chains than car manufacturers sometimes transmit sales forecasts further down the supply chain. This may be especially important in industries with frequent model changes, as in the fashion industry, because otherwise fabrics suppliers and sup-

pliers of raw materials for fabrics may end up with large excess stocks at the end of season that cannot be made use of in the next season.

In an article in *Harvard Business Review* in 1996, called 'What is Strategy?', Professor Michael E. Porter of Harvard states that both superior operational effectiveness and a superior strategic position are needed to earn superior profits. He claims that operational effectiveness is easy to copy and that this, therefore, is not a source of sustainable competitive advantage. Strategic positioning is a source of sustainable competitive advantage, because a unique strategic position is difficult for competitors to copy. He also claims that 'the productivity frontier' is constantly moving 'outward' as new management approaches and technologies are developed. The argument in the present book is that it will be difficult for companies to achieve superior operational effectiveness in the future, because the productivity frontier is not shifting 'outward' toward an indefinite outer space, but 'inward' toward very definite limits that could be easily identified. Nothing can be done in less than no time or at less than no cost. When a company has arrived in a situation where a process can be performed in almost no time and at a very low cost, this company can no longer improve this process further. All it can do is to wait for its competitiors to continue their work of improving their processes until they arrive in a similar position.

Even if material flows and product development processes may never come close to zero we may already be close to the limits of some of these. The transportation of a load of goods from Madrid to Frankfurt will never be done in a few seconds. Regardless of this, the limit of what can be achieved could easily be found out by calculating the transportation time for a truck that moves at normal speed along the motorways of Spain, France and Germany. This time can never be taken away or reduced, unless air-freight is used. What can be reduced is the waiting time before the goods are loaded and the time it takes to reload at distribution centres along the way. When we do such a calculation we may find that this is already close to the limit of what can be achieved and that the improvements to the process that have been made in the past are far greater than the improvement opportunity that remains. As we will see, this is a major issue for competition and for future economic growth.

4

Agility as a Source of Competitive Advantage

Competition in all industries has become tougher. Companies are not only more adept at strategic planning, they are also gradually improving their operations. When Sony developed the Walkman this company became expert at miniaturization and no other company could contest its expertise in this area for a long time. Today, there are often a number of companies that compete even in cutting-edge technologies and if the leader makes a wrong move this company may lose its leading position. The growing management consulting market and the growing market for IT consulting services testify to the fact that companies spend more and more money on the improvement of their business. The improved skills in strategy and operations in many companies usually do not show as improved profits. They show as tougher and tougher competition between more and more equal competitors. In his 1996 article 'What is Strategy?' in the *Harvard Business Review*, Porter complains that companies are focusing too much on operational efficiency, which is easy to copy, and focusing too little on the development of unique strategies. It may be that companies focus on operational improvement because they realize that it is difficult to find 'uninhabited' areas in markets where they can develop a sustainable uniqueness or unique business processes.

Some companies have managed to develop competencies that they can profit from and grow in. Many of these companies are in the rapidly growing electronics and communications sectors, or in related software industries, like Dell, Intel, Nokia, Oracle and SAP. In other cases the rapidly growing companies are in growth areas like entertainment or sports goods/leisurewear, such as Nike. There are also a number of examples from the airline industry, where low-cost/no-frills airlines with innovative concepts compete against incumbents. Southwest

Airlines, Ryanair and Hapag-Lloyd Express are examples of these new entrants that often fly between secondary airports and offer a smaller network of routes compared to existing airlines. There are also companies like GE and Westinghouse that have managed to completely reinvent themselves by getting out of declining or stagnating industries and into new growth sectors.

Twenty years ago, when Tom Peters and Robert H. Waterman wrote their classic management book *In Search of Excellence*,[7] they used Digital Equipment Corporation, Frito Lay, Caterpillar, Procter & Gamble and Delta Airlines as examples of excellent companies. These companies are no longer examples of excellence and prosperity. DEC has been acquired and the company no longer exists. The runners-up in the airline industry are the low-cost airlines. Delta and the other traditional full service airlines are having problems. Caterpillar has received tough competition from Japanese producers of excavators, and snacks and other consumer goods are no longer the growth industries that they used to be. P&G are used as an example by the business professor Gary Hamel of a company that has 'growth problems'.[8] Still, a few companies used as examples by Peters and Waterman have managed to remain competitive by developing new skills or by completely reinventing themselves. HP is still a strong competitor in the electronics industry, IBM has moved to become one of the world's leading consulting companies and Marriott is one of the world leaders in the hotel industry.

One of the new concepts that are supposed to drive business success is to become an 'agile competitor'. Agile companies are able to enter and exit industries with great determination and speed, build new partnerships with other companies with strong and complementary sets of skills and manage change almost 'at the speed of light'. We have mentioned a few examples of companies that seem to be able to manage this in a superior way. Nike is one of them, Disney another and Nokia, Intel and Dell are yet others.

We may note that some of the skills of these companies that are described as 'strategic skills' by a number of authors of management books, seem to be based on a fair amount of operational efficiency, of the type that we looked at above. We may even hypothesize that some of the excellent companies have operational efficiency at the core of their strategy, even if strategy authors try to mystify these skills and call them strategic. The economist Oliver Williamson concluded in an article from 1991 that 'economizing is the best strategy', because 'In the long run, however, the best strategy is to organize and operate efficiently'.[9] It is clear that the companies mentioned above base an

important part of their strategies on their operational superiority. It is difficult to determine how much would be left of their strategies if the operational superiority had been taken away.

It is important to investigate the relationship between strategy and operational efficiency, because in the article from 1996, mentioned above, Porter argues that strategy and operational effectiveness are two different things and that strategy could lead to sustainable competitive advantage, but operational advantages are easily copied. If strategies contain an amount of operational effectiveness, which is 'concealed' as a part of the strategy, this part would be as easy to copy as any 'non-strategic' operational efficiency. In the cases discussed by Porter there are examples of companies, such as low-cost airlines and IKEA, that have a low-cost position as their strategic position. In these cases, operational effectiveness must be part of the strategic positioning. In the low-fares airlines industry it seems to be difficult to justify the claim that a low-cost strategic position is unique and sustainable from the point of view of competition.

It is difficult to see how we could easily distinguish between strategy and operational effectiveness. It may be possible to assess the uniqueness of a company's strategic position and estimate how much this contributes to profitability in relationship to operational effectiveness, but this would require a wealth of data that writers about strategy rarely provide. In real life analysis, this type of exercise could be performed, and it could be argued that it is necessary to try to do it, because it is important for economic growth that we have profitable companies. In case an increasing number of companies find it difficult to develop unique strategies, this should be interpreted as vital information that has important implications for business development and economic growth.

In their book *Competing on the Edge*,[10] consultant Shona L. Brown and business professor Kathleen M. Eisenhardt praise Nike for its ability to compete efficiently in its core business and drive innovation there and in a number of other sports-related businesses. 'Nike also attacks strong niche players such as Speedo (swimwear) and Adidas (soccer shoes) with novel products. Not only does Nike out-innovate its competitors, the company also has a well-deserved reputation for acting flexibly and decisively to take advantage of unexpected occasions to build brand image. Nike's very public support for the golf phenomenon Tiger Woods is one example.' Through the description in the book it appears as if sound analysis of market opportunities and growth, together with an understanding of its own core skills compared with those of competi-

tors (Speedo in swimwear and Adidas in soccer shoes), are aspects of Nike's strength. But there is also a substantial element of the same type of operational efficiency in development that made Honda win the motorcycle war against Yamaha, and such skills, Porter argues, do not make up a sustainable competitive advantage. The same authors describe how Disney has won its leading position in the animated film industry by being able to produce a number of excellent films each year and create demand for these films continuously, and how Intel competes through 'time pacing' of its processor development. Intel develops new processors not as a reaction to the onslaughts of competitors, but at a predefined pace that is set so as to make it possible for this company to maintain the lead in its industry. Through these examples, I try to show that operational efficiency is at the core of many successful strategies. It is important for strategy analysts to try to find out to what extent a strategic position is built on unique features that are difficult to copy and how much of it is based on operational skills that could easily be copied. In addition to the issue of copyability, we have the question of limits of improvement. As we will see in the next part, there is a limit to how far development processes can be improved and processes that are already advanced will contain only small room for improvement. If it is increasingly difficult for companies to find unique strategic positions and if their current advantages cannot be improved further, even the most successful companies may lose more and more of their competitive edge during the next decade. Therefore, it must be realized by strategy professors and practitioners alike, so that we can help companies develop new competitive advantages in previously unexploited areas (see Part IV).

As we will see below, the economy needs companies that earn good profits, and in order to do this, companies need to be able to develop skills that lead to sustainable competitive advantage. The reason for this is that profitable companies are the ones that drive investments and economic growth in the economy, which is a very important role indeed. If average profitability declines, because it is becoming more and more difficult to develop sustainable competitive advantages, we will find that investments will decline, which would endanger future economic growth.

The aim of this book is not to take the mark of excellence away from companies like Nike, Walt Disney and Intel. Instead we are going to investigate if there are limits to the number of growth strategies that can be identified by companies and if there are real limits to the opportunities to find successful strategies in the future. Maybe the growth

problems of P&G, Coca-Cola and other companies are not created by these companies' lack of managerial skills in identifying new opportunities. Maybe there are simply fewer and fewer industries remaining where companies can distinguish themselves compared to competitors. Maybe there is not only a limit in terms of how fast things can go or how cheap things can become, but there may also be practical or absolute limits to the number of new large industries that can be created.

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Part II
Strategic and Operational Limits of Competitive Advantages

'The scientific way of thinking is at once imaginative and disciplined. This is central to its success. Science invites us to let the facts in, even when they don't conform to our preconceptions. It counsels us to carry alternative hypotheses in our heads and see which best fit the facts. It urges on us a delicate balance between no-holds-barred openness to new ideas, however heretical, and the most rigorous skeptical scrutiny of everything – new ideas and established wisdom. This kind of thinking is also an essential tool for a democracy in an age of change.'

Carl Sagan[11]

'The notion that the Universe might be dying originated with the German physicist Hermann von Helmholtz, in 1854. He announced that the Universe was indeed doomed on the basis of the then nascent science of thermodynamics, in particular the second law, which proclaims the ultimate triumph of chaos over order. Helmholz envisaged a universe which began in a relatively well-ordered state, and then slid slowly and inexorably towards what was called a "heat-death", a situation of thermodynamic equilibrium in which all sources of useful energy are exhausted and nothing of further interest can occur.'

Paul Davies and John Gribbin[12]

5
Strategy and Operational Efficiency

The first area of limits that we are going to look at is the area of operational efficiency. We will see if there are limits to how efficient companies can become. We start with this because it is an area where we can identify very definite limits in terms of time and cost. Nothing can be done in less than no time and at less than no cost and we can look at a number of processes and identify the limits of those. It is also possible to analyse how close different companies may be to the limits of the various processes.

First, we need to recapitulate the primary distinction between information flows and material flows. When a process has the primary purpose of transferring information, the information transfer can often be completely computerized and automated and thus the time of the process can be compressed to very close to zero. This is regardless of whether it is a process that is internal in one company or a process that comprises several companies in a supply chain. Due to the speed of modern computers it is also possible to run a chain of processes, such as the order flow, production planning and ordering of parts in the auto industry in a few seconds. When a material flow is involved, or when the process is one of product or service development, there is no way to decrease the process time to zero. There may still be a limit that could be identified, and we could, at least for many processes, assess whether improvement in the past has left little room for further improvement in the future or if there is still ample opportunity to improve. The objective of the whole exercise in this chapter is to arrive at a better understanding of where the limits of improvement may be and how far companies in different situations are from these limits.

Industrial information flows

Twenty years ago the exchange of information required two persons who met or talked over the phone. Information could also be sent in letters, written in books, brochures or reports or sent via telex. One person had access to information, which needed to be shared, and another person received information. Sometimes information was exchanged in written form, but there was a need for personal interaction anyway. Earlier in this book a typical purchasing process for a computer was described. In many situations this type of process is typical. The object that was going to be purchased was not purchased on a regular and repetitive basis. I had to call a number of possible suppliers to ask for their offerings. In order to do this I had to describe my situation. Even if I tried to send a letter with some basic facts I still had to talk to the sales persons of the companies I sent my tender to. This would be because the more ambitious sales persons wanted to make sure that they had understood all the information correctly and to receive complementary information that I had forgotten to include. When I received letters with quotations from each company, I had to call them up to clarify things that were not explicitly stated in the letters. When I finally placed the order, it was taken over the phone and written on an order form. When the product was going to be manufactured, the order had to be broken down into orders for the various parts that were needed to produce the final product. These orders had to be written in a letter or on a telex and be sent from the computer company to its suppliers. At each supplier, the letter had to be opened and the order had to be entered into the order system by an order taker. The order had to be planned into production at each supplier by a production planner. After that had happened, parts were manufactured and sent to the computer company where the computer was assembled. In addition to these information and material flows, there were the exchange of order confirmations, invoices, sales forecasts and other information between different parties in the supply chain. This required resources and took time.

The difference between this situation and today's highly efficient process is that the computer has become a standard product. The customer can select from a small number of capacity-related features. Construction has been modularized so that each computer consists of a small number of modules, which are produced in highly automated processes. This is not something that is relevant only for computers. Modularization and the resource savings that come as a consequence of

this are used by companies in all industries in order to reduce the cost of products, speed up production and reduce delivery times. Tetra Pak have modularized their packaging machines and reduced delivery times by 80 per cent: suppliers of equipment for telephone networks or broadband service providers modularize this equipment and make it easy for customers to purchase systems. When there are repeat purchases, the first negotiations require detailed discussions, meetings between sales engineers and expert technicians from the customer. When a number of energy stations for a broadband network are purchased, each subsequent station can be configured by the customer on-line in the same way that Dell's customers configure computers on-line already. It takes some time for companies to develop the configuration tools and other support tools to make this possible, but it can be done in most product and system areas where there are repeat purchases and where customers have substantial competence themselves.

Today, this type of exchange of information from a customer to a supplier and on to a number of suppliers of parts and modules, can be done in close to no time, and many companies are in the process of modularization and many are also installing systems for on-line configuration and supply chain management. A few seconds after the order for a computer or a car has been taken, the suppliers of parts receive orders for exactly the right parts for the model chosen. This requires thousands of automated computer transactions in sometimes hundreds of different computers that are involved in these exchanges.

In the past, the exchange of information held up other activities from the time when a customer issued an order until the producing unit received it in a workable form. The time it took to distribute information from one company to another and then between departments in a company meant that delivery times were often four months. Now, efficient information exchange and streamlined processes in all companies reduce the need to keep both finished products and components in stock and it still becomes possible to deliver highly complex products within a few weeks.

In an article that was published in *Harvard Business Review* by the title of 'Industral Dynamics: A Major Break-through for Decision Makers' in 1958, the MIT professor Jay Forrester, who pioneered the analysis of time, described an information and product flow that involved a factory, a factory warehouse, a distributor's inventory, and retailer's inventory.[13] The author called the flow 'the planning loop'. The example shows how the retailer took orders for three weeks before sending a batch of orders to the distributor. On their way the orders spent half a week in the mail,

accumulated at the distributor's for two weeks before they sent a pack of orders to the factory for production, and spent another half week in the mail before they arrived at the factory. There it took eight weeks to process the orders and deliver the goods from the warehouse and then the finished product was sent to the retailer. The cycle time was 19 weeks. As we have seen already, there are a number of advantages for companies that can decrease this time and Forrester mentioned the case of the door-company Atlas, which decreased the industry standard delivery time from four months to $2^1/_2$ weeks. Since this was done in the 1980s we know that this company did not have access to EDI communication or e-business tools to facilitate the information flow. We also know that the deployment of advanced EDI and e-business tools has improved delivery times and reduced cost in industries such as computers to less than $2^1/_2$ weeks. Now, the time it takes to exchange information is close to zero in these industries and the cost of information transfer consists only of the cost of computer interaction. Even if there are an unprecedented number of possible configurations of a car and a number of alternative configurations of a computer, the available alternatives are pre-configured in the computer and parts lists and all the necessary information to order the parts are triggered when a customer orders a product. In some very advanced cases production is no longer delayed by information flows which are instantaneous and products are automatically planned into production and parts are ordered or pre-ordered at the time when the order is placed.

In the case of Dell it only takes seven to ten workdays from order to delivery. A large proportion of this time is bound to be value-added time, since deliveries of components to the assembly plant, production of the computer, and the final delivery of the computer is included in this time. This makes it difficult to compress the time of this process further.

It has taken the automobile industry almost twenty years to improve its information systems and work procedures to the present level, where a company can rely on the fact that all the information that is in a computer system corresponds exactly to reality. When a car is ordered in the computer, all the correct parts are automatically ordered via EDI. Car manufacturers and suppliers of modules know that the numbers of each item that are registered as stock in the system correspond to the number of items on the shelf or in transportation. Researchers agree that a level of 99 per cent correct deliveries, which is the norm between car companies and their suppliers, is only a distant dream in most other industries, where companies still struggle to achieve 90 per cent.

Many companies are now starting to integrate business systems across the company in a way that has been a prerequisite for the dramatic improvements in terms of time compression in the car industry. Acquisitions of companies have led to a situation where many companies have ten or twenty production sites. Each site produces a part of the product line, and each plant has its own particular set of information systems. It sometimes takes a few years to arrive at a strategy to integrate the complex systems environment in the company itself. The integration of systems may be a long-winded process that involves the closing down of plants, and consolidation of production of product groups so that one plant produces each product group or a number of product groups. The consolidation process may also include the discontinuation of products or complete product lines. On top of this, there is the issue of integrating information systems and the task of aligning work processes to the information systems. It was realized long ago by the automobile industry that the implementation of an information system or the integration of a complex of systems, is only a small piece in the total jigsaw puzzle that is put in place in order to improve the efficiency of operations, but a necessary one. In many cases a systems implementation is one part of an effort to re-engineer processes internally in a company, or a part of a project to speed up supply chains.

Business-to-consumer information flows

Many examples of e-business that were used when business on the Internet was first discussed were much simpler, and the stories about these implementations sometimes obscured the complexity of e-business implementation. These early examples of e-business implementation were also examples of time compression, but in much less complex environments than are represented by industrial companies. In 1997 a customer of Amazon.com suddenly had access to all books that were available in the English language, something that even the largest bookshops could not come close to. The information about all books available in a language, the prices of these books and access to reviews and other information from customers who had already bought the book, could now be accessed in close to no time. This was a dramatic improvement compared with the previous situation, when especially reviews of books and other information from readers were difficult to come by. The same is true about the opportunity to access insurance offerings from a range of insurance companies and compare offerings in close to no time,

which was another early example of an e-business application. It was also an improvement, in terms of time, when it became possible to access job advertisements over the Internet from across the country at a very low cost in close to no time.

In the early days of the Internet, customers sometimes looked up reviews on the Internet and bought the books the day after in a traditional bookshop, or they looked up insurance policies on the Internet and ordered the insurance over the telephone because they did not dare to rely on electronic transmission of information.

Now, more and more companies charge extra for manual service alternatives and offer the best terms only to customers who use electronic channels of access. Authorities increasingly implement 24-hour Internet-based systems for routine services with the aim of improving the productivity of their staff and improving access for customers with routine questions. As companies manage to integrate their systems structures or implement completely new business systems packages, processes can be modelled in the same way as in the car industry, where a large number of tasks and routines are automated. This facilitates time compression and cost reduction, because manual labour is more expensive than computerized routines.

One thing seemingly unforeseen by analysts of the future labour market is that a substantial amount of administrative jobs will not be needed in the future as more and more manual tasks in all kinds of companies and authorities are taken away through automation. Also, economists who comment on current economic development reason as if companies will need to employ the same number of people in the future as they have done in the past. As the recession/stagnation of 2000–3 turns into economic growth in 2004, economists show surprise at the slower rate of growth in the labour market compared with similar situations in the past. A declining need for resources is only one of the dramatic consequences that we have to plan for as electronic interaction in various sectors of society takes an increasingly important role. The filling out of forms and the dispatching of orders is only a matter of exchanging information, and this type of exchange can often be completely automated.

Information flows in health care

Many people believe that health care is a sector in the economy that will not be influenced by electronic communication. Maybe this is

because health care has to do with interaction between doctors and patients and this is seen as inherently personal. Nevertheless there are a number of current developments where information flows are transformed by various types of electronic technologies. One of these is radiology. In many radiology clinics the routines are still manual. Á radiology picture is taken and this photograph has to be developed and pictures have to be made from the film. After that, the pictures are hung on the wall by nurses or secretaries so that doctors can analyse them. After this analysis the pictures are taken down and stored until the daily radiology round brings doctors from each ward to the radiology clinic to look at the pictures together with radiology doctors and discuss their analyses. When this is ready, the pictures have to be taken down again to be stored until they will be used the next time. This extensive handling is gradually taken away as hospitals invest in electronic systems. After a picture has been taken it can be looked at and analysed in the computer immediately. There is no need to hang pictures on the wall or spend time on storage. The doctor analyses pictures in front of his computer and he can dictate his analysis into the computer, which prints it out for him. After this he can correct the mistakes that have been made by the computer in the printing process and go on to the next picture. Pictures can be sent anywhere in the world to be analysed or in order to get a second opinion.

One other example of 'telemedicine' or 'e-health', as e-business is called in the health care sector, is the opportunity to communicate other types of information via electronic networks. I visited a primary care unit where people have installed a camera and a video link to a nearby hospital. At the hospital itself the doctor has access to a monitor and communication equipment, which makes it possible to discuss the patient with the primary care doctor while he is seeing the patient. In this case the facility has been set up for the analysis of skin cancer, and the primary care doctor can take pictures of the skin of the patient and discuss these pictures with the consultant at the hospital in real time. This increases the learning of the primary care doctor and the patient does not have to visit several doctors to get a diagnosis. This saves time and money for the patient and for society as well as the saving of cost for the health care system.

All in all there are a multitude of ways in which telemedicine can be applied to reduce cost and improve the quality of care, and the health care sector has only just started to explore these opportunities.

A need for systems integration

One prerequisite to achieve this is also the integration of information systems at authorities and companies. Often an employee at an authority or in a company needs to enter information into a number of information systems to complete a case, and often also send forms to other parts of the same organization. People who hold these jobs are trained for a number of days to be able to handle systems and to remember all the steps of a particular routine. When citizens are going to serve themselves in their interaction with tax or labour authorities, Internet services need to be self-instructing and highly simplified routines are needed. This requires investments in systems development and the development of new routines internally in the organization. But when this has been done, accessibility has been increased and the cost has been reduced to a minimum and the organization will never have to go back to manual routines again or repeat the job that was done when the systems were integrated. When self-service solutions have been implemented for customers, these can be used internally in the organization as well. By doing this, the old time-consuming routines can be scrapped altogether.

We have now dealt with a number of information processes in different sectors of society. Hopefully, the brief examples given will help the reader to identify other examples of information exchanges and see that in many such cases time is coming closer to zero, accessibility is gradually increased towards 24-hour access and the cost of information exchange can be reduced dramatically. When David Lundberg and I wrote *The Transparent Market* in 1997, we described a possible future when these changes might happen, but at that time the idea seemed very abstract to most people, and we were not taken seriously. Now, all kinds of organizations are investing in web-based interfaces and in projects to integrate computer systems in order to facilitate self-service solutions for customers and citizens, and the time when such solutions will be used on a large scale is not very far away.

The main argument in this section is simple and straightforward. In all situations where information flows are completely automated, there will never be a need to do more work on improvement of the same processes. The automation of information flows results in a situation where an information exchange takes a minimum of time and where there is no cost for manual tasks any more. The whole process is taken over by the customer himself or herself, and this customer interacts with one or a number of integrated computer systems that take care of the

whole process and leads the customer through it. This reduces the need for resources to a minimum. This does not disregard the fact that computerized processes usually do not work perfectly at the start. In most such cases there will be a period when the systems solutions are being improved and the usability of the system is tended to for various reasons. As the problems become fewer and fewer, the system will work on its own except for occasional maintenance.

Order-taking for spare parts of one automobile manufacturer was more than ten years ago changed from manual routines to orders via EDI. Spare parts distributors and repair shops all over Europe changed their routines from calling in orders via telephone to sending orders via EDI. At the spare parts company that belonged to the automobile manufacturer, they previously had thirty order-takers in each of two European distribution centres. Immediately after the change to EDI, 80 per cent of all orders were taken via this medium. This reduced the need for order-takers by the same number. Today, this company has a handful of 'parts assistants', who deal only with the most difficult orders and all spare parts are handled in one partially automated distribution centre. Delivery throughout Europe is normally done within 24 hours. These structural savings were made possible through EDI and the savings in terms of money are substantial. In addition to the reduced number of people who work with order-taking, the cost of inventory has been reduced through faster turnover and the delivery time to customers has been reduced from a week to virtually overnight delivery.

6
Production Processes

Material flows are different from information flows. It will always take time to move materials and assemble components into products. This time has already been dramatically reduced in many instances and in many cases it can be further reduced in the future, but clearly we cannot take away more than the time that remains in a process. In the case of the schematic example taken from Forrester above, the whole process took 19 weeks. When the whole process now takes only $2^1/_2$ weeks it is obvious that material flows and information flows have been speeded up and that the improvement of a total of $16^1/_2$ weeks cannot be repeated. The maximum improvement that is now possible is $2^1/_2$ weeks, out of which a substantial part is now value-added time. Thus, the opportunity to improve the process further is smaller and it gradually becomes more difficult to decrease total cycle time because there is less time left. It might still be possible to reduce unproductive time and the amount of time needed in production and in the supply chain. This can be done by designing products in a smarter way so that they become easier and less expensive to produce, or by using fewer suppliers, who can be located close to the assembly plant. However, the value of these improvements will be less than those made when the process took 19 weeks.

There is no way to determine exactly how complex a particular product needs to be, which would determine how many steps and which steps are needed in a production process. The modularization of products and the application of more standard parts has been going on for a number of years in many companies, but there are also still many that have barely started with this. Where it has been applied, modularization has greatly reduced the time needed for the final assembly of cars and computers, and this type of development gradually reduces

complexity. The reduction of complexity is happening through modularization, integration of several production steps into one automated production process, and standardization of components, and by lessening the total number of suppliers. This reduction of complexity, in turn, reduces the need for planning and management of production and logistics and reduces the number of ways that a particular production process can be organized. In total, the reduction of complexity increases the similarity between competitors and between competing products.

In some cases production has already been automated. In other cases manual tasks will most likely remain for a long time. In effect, the most reliable general assessment of the limits of improvement of a production process is that it cannot be reduced further than to zero time. The production cost can never become lower than zero. At any given moment, with a given level of modularization, the production time and the production cost of a module can never be decreased further than to zero time at the cost of no money. We do not need to get into a lengthy debate about how much of the time and cost that remains can also be taken away. The cost saving that is equivalent to $16^1/_2$ weeks is substantial and can justify a relatively massive investment. The cost saving that would result from a reduction of another week is much smaller and it would not justify another investment of the same size. As we have seen in the data above, the cost saving is relative to the time saving and when most of the non-value-added time has already been taken away, most of the non-value-added cost has been taken away as well.

Even if we have no opportunity to immediately reduce the process time and cost close to zero, we know that we can never go further than this. When a number of steps in a production process have been automated and these are at a level where the marginal advantage of a further improvement is very small, we need to focus on improving processes that still can be improved further. This is a work method that is normally applied by companies. Companies work to improve the processes where the largest improvements seem to be possible. The problem is that still many people believe that there are no limits to how far improvement can go. Companies, however, have a limited number of processes and all of these can be improved up to a certain limit. As I try to show in this book, we now see how all kinds of processes have been improved for centuries and we can also see that in many cases the time remaining in existing processes is very small.

Companies perform activities in six general areas

The French management thinker Henri Fayol, early in the twentieth century, listed six basic kinds of functions that companies perform.[14] These were technical operations, commercial operations, financial operations, security operations, accountancy operations and administrative operations. Since Fayol wrote his book, there have not been any new areas added to this, even if operations are handled in different ways today than they were in the past. Start-up companies use the most modern information technology to automate as many processes and operations as possible. Existing companies are working hard towards the same goal. There is a definite limit to how far automation in companies can go. When everything is automated, no more automation is needed.

For companies where modularization and automation have not come as far as at Dell or other leading companies, there may still be room for improvement. Paradoxically, the companies that have been in focus in later years, because they have made large profits and contributed to economic growth, are among the companies that have come the farthest in terms of improvement and process time reduction. Mobile phone companies, computer companies and software companies are companies where the products in themselves ought to be close to the limits of what can be achieved in terms of speed, size and cost. These products perform tasks in close to no time; they now take up very little space and the cost of production and consequently the price has been plummeting towards zero. The production of such products is largely automated and the design has been simplified for a long time to minimize the number of production steps. Thus, some of the pillars of our economy in later years seem to be close to the limits of what can be achieved within their industries.

In the case of companies that are still further away from the limits of development, these companies often cannot afford to improve their processes at the speed used by the leading companies in computers and mobile phones. Companies that supply components for cars, trucks, computers and other products as second or third-tier suppliers, often do not have the margins that make it possible for them to lift their processes to modern standards. In most cases the low profitability of such companies make them lag further and further behind in terms of technical development. Despite the substantial room for improvement,

these companies will not be able to boost revenue for consulting companies and suppliers of advanced IT technology by starting large projects.

So far we have been dealing with examples from the electronics industry and other high-tech industries. In order to show that time compression is used in all kinds of environments and that different types of 'high-tech' solutions are applied by companies in traditional 'low-tech' industries, we will now look at an example from the food sector. In cheese production a substantial part of the time needed to produce a cheese consists of storage for maturation. It takes only a few hours to initially produce the cheese and then cheeses need to be stored for between six days and five months to develop the taste that the customer expects. This time will never be reduced, because it is intrinsic to cheese production. What can be reduced is the time it takes to handle products manually in the warehouse. The leading cheese manufacturer in Sweden operates a completely automated storage facility, almost thirty metres high and the size of a football field, where they store cheese for maturation.

The plant in Götene in southern Sweden is the single most important plant in cheese and fats production, storage and logistics in Sweden. More than 50 per cent of all cheese produced in Sweden is stored there and a high percentage is also produced there. The same is true for fats, margarine and low-fat margarine.

When a new business system was implemented at this company in 1996–7 the team that implemented the system were given the explicit orders to prepare all solutions in the ERP (Enterprise Resource Planning) system for the requirements of a new storage facility. (Cheese is stored to mature between 6 days (mild) and 147 days (strong) for normal Swedish qualities. There are specialty cheeses that are stored for longer periods, but not in Götene.)

This giant storage house is a fully automated facility where the Movex ERP system takes care of everything without any human intervention from the phase where cheese is palleted after production. It is at that time entered into the Movex system and given an article number. To this article number is attached information about which temperature zones it needs to be stored in to mature in the right way and all other necessary information. Most cheeses need to be moved between temperature zones during the maturation process, which is managed automatically by the system.

When it is entered into the system as freshly produced cheese of a certain type, the pallet is placed on a giant 340-metre conveyor system

from the different production areas into the storage house. From this point the Movex system takes over and allocates a storage space to the pallet, based on the rules set up in the system. The system then automatically moves pallets between temperature zones until the cheese is fully mature. The system also changes article numbers automatically as cheeses change from mild to medium. Periodically, waxed cheese needs to be rewaxed. Then the cheese to be waxed is automatically taken out and run through the automatic waxing routine.

Customer orders automatically create a delivery order to the delivery vehicle. Based on the departure time of this vehicle, picking of the cheese in the automatic storage house is automatically scheduled. The picking is done automatically by the system and the cheese is delivered into the department where it is cut and packaged just in time for delivery. The same goes for sliced and grated cheese. It is not until the cutting, slicing and grating that the cheese is touched by human hands for the first time since its production, sometimes 5 months earlier. After this process the pallets with packaged, sliced and grated cheese are joined with the pallets with whole cheeses and stored in the dispatch area where they wait for the trucks to pick them up. Fourteen truckloads can be held at the same time and seven trucks can load at a time. Every day 100 trucks leave with cheese to the customers and the same amount of cheese is either produced in Götene or received from other production facilities across Sweden.

This storage house was opened in 2001. It replaced five other storage facilities across the south of Sweden. The storage house is called Alexander, because the Macedonian king Alexander the Great solved the Gordic Knot. The Gordic Knot at this company was the logistics system that consumed far too many resources, and sometimes one customer would receive seven different deliveries on the same day from different logistics centres, using seven different trucks. Now each customer only gets one delivery with everything in it.

In each of these stores people were employed moving cheese with trucks, waxing and planning the storage, manually moving cheeses physically and in the computer system. As large companies consolidate production, storage, logistics and delivery there are often huge sums to be saved by installing the same type of automated facilities as in Götene.

In the case above, the storage time will always remain the same for a particular type of cheese. The time compression aspect in this case has nothing to do with an ambition to reduce the time it takes for cheeses to mature. Instead the example shows us how the company saved large sums of money by reducing the non-value-adding time that the cus-

tomers had to pay for when they purchased cheese. This is the time it took in the old structure for manual movements of cheese from production into storage, between temperature zones in the storage area and the movement from storage to waxing and back into storage. The extra cost of having a number of different trucks deliver cheese to each customer in one day, added no value to the delivery. Now a substantial cost component has been removed and this has decreased the product cost and increased customer satisfaction, because the shops that are the immediate customers receive everything in one delivery. Since all non-value-added time has been taken away from the process, the savings made by implementing the new storage facility can never be repeated. There will never be a reason to once more invest in a new storage system.

In Norway, the second largest library is located in the small town of Mo i Rana. This library mainly lends books to other libraries throughout Norway. A few years ago an automated system was installed, which automatically picks books and puts them back on the shelves. This has eliminated the need for librarians who manually perform these tasks. It has also eliminated the mistakes that people make when they put books back in the wrong places.

In Denmark the company Danish Crown is investing in a new highly automated slaughterhouse for pigs. In this slaughterhouse 75,000 pigs will be slaughtered every week and many tasks are completely automated. In automated processes for cutting away bones the computerized machines cut more closely than slaughterers have ever been able to do and this reduces the waste and increases the quality of the meat, which increases the price in the market. This new slaughterhouse will only require 70 per cent of the manual labour compared with previous slaughterhouses.

One thing is for sure: administrators who lose their jobs in the automation of administrative processes should not count on the food industry, libraries or industrial production to employ them. It is difficult to identify any industries that will need to employ more people in the future. It is now possible to apply different types of automation in more and more areas. Automated production, storage and picking isn't only confined to a few very advanced companies.

7

Transportation Processes and Vehicle Maintenance

In cases where transport is needed it is difficult to reduce time to zero. Moving goods takes time. An approach that has been successfully used in a number of industries is moving suppliers closer to the producer of the end product in order to reduce time and transport costs. In the auto industry 70 per cent of the value of a car is delivered by suppliers who receive their orders for modules at the moment when the body of a car goes up on the assembly line. It is obvious that the suppliers cannot be located in another part of the world in this situation. They need to be close to the assembly plant, so that the delivery does not unnecessarily add time to the process. In the beverage industry suppliers of PET bottles often produce bottles in a plant beside the bottling plant and deliver them through 'a hole in the wall' into the bottling plant.

In many industries customers are spread all over the world and this makes the above arrangement impossible. Many types of products will need to be transported in the future as well. Transportation consists of a number of steps. First, there is loading, then there is transportation, reloading at distribution centres or connection points along the route, and delivery to the final customer. These steps all need to take some time. Only the waiting times in the process can be reduced.

Wal-Mart gained an advantage over their competitors through their logistics process in the 1980s because of their innovative procedure of 'cross-docking'. This means that goods do not go into the warehouse of a distribution centre to wait for a need to arise in a store. Instead, most goods are shifted directly from one truck to the next and taken directly from the producer to the store. In an article from 1992, George Stalk and colleagues[15] argue that this was a unique advantage of Wal-Mart, because this is a process that is complex to handle, but today this is common practice among logistics and distribution companies. Every

practice that is invented and described in books and articles gets copied very quickly, and often it is well known in an industry what the next major product or process innovation will be. Today, the idea in the logistics industry is to do without stock. In the future, 'stock' will be the amount of goods that is currently in transportation on its way to the end customer, the store or the assembly plant. It is supposed there will be no goods in warehouses in the future, at least not in industries where this isn't necessary. The Finnish steel company Rautarukki has taken time compression in transportation to the extreme. After the steel has been produced it needs to cool down for a few days. Rautarukki reduces delivery time by allowing the steel to cool during transportation. When the steel leaves the factory in Finland it is still red hot. When it arrives at the customer it is cold.

The total reduction of the delivery time for steel has been several weeks during the last decade in the leading companies, because time compression, 'BPR' and supply chain management have taken away unnecessary process steps, improved production planning and reduced waiting times. In this and many other cases the time that remains is so small and the steps are so compressed that the opportunity to further reduce time to improve competitiveness is limited. Transportation, in some cases, needs to be a step in a process. A physical transportation and physical reloading of goods is needed and the opportunity to further reduce transportation time and transportation cost is limited compared with the savings that have already been made in many industries.

Despite the fact that we cannot reduce transportation time by increasing the speed of trucks, because they already run at the allowed speed along the roads of the world, it is interesting to ponder the fact that there is still substantial development going on in different vehicle industries. Trucks are only allowed to run at 90 km per hour or less, and regardless of the investments in vehicle development, these investments will not decrease the time it takes to transport goods. But truck companies spend substantial efforts in reducing time in other areas. The time needed for maintenance and repairs has been reduced to a minimum and this reduction still continues. By reducing this unproductive time, the time that the owner can utilize the vehicle is optimized and thus the revenue from each vehicle increased.

The main focus areas for development in the truck industry are driver comfort, production cost, adaptation to new environmental regulations, improved flexibility and improvement of vehicle economy. The improvement of vehicle economy comprises reduction of maintenance

time, improvement of reliability, improving ease of repairs and decreasing the cost of spare parts and replacement of spare parts for exchange modules. The aim of all this is to reduce the time needed for maintenance towards zero and to reduce the cost of repairs in the same direction.

Suppliers of the truck industry are involved in a number of projects that aim to reduce the cost of production, maintenance and the time needed to produce and maintain vehicles. These costs are directly linked to the cost of transportation. When the purchasing cost of a truck decreases, or the cost of maintenance or the maintenance time are reduced, then either the cost of transportation decreases if the market for transportation is very competitive, or the profits of carriers increase. Either way it is a very important competitive advantage for truck manufacturers if their trucks are less expensive in terms of purchase or in terms of maintenance for the carrier. A truck will never cost zero and it is unlikely that it will ever require no maintenance or that the maintenance cost will be zero. Regardless of this, this is the direction that truck manufacturers are working towards. Truck manufacturers want oil filters that tell the driver when they are clogged, so that he can change them before the truck breaks down. There are even discussions going on between truck companies and suppliers about filters that regularly clean themselves. Because of this relentless work to reduce maintenance time and cost, the possible running time of a truck gradually comes closer to 100 per cent. Even if this goal will never be reached, there have been dramatic improvements in the past, which should indicate that the value of further improvements will gradually decline.

This amounts to a situation where truck manufacturers are moving towards lower and lower purchasing price, maintenance cost, maintenance time and repair time and cost. These will never arrive at zero, but the value of further improvements will be smaller the closer to zero they come. Twenty years ago trucks needed frequent maintenance and a number of wear-parts and filters were changed each time. The situation today has made maintenance less frequent and less costly. When the truck breaks down, repair time and cost are reduced by an increasing number of exchange modules. The broken part is simply replaced by a new module and the broken module is repaired without keeping the truck waiting.

8
Product Speed and Capacity

In the past, economic growth has been driven by the need to develop new products with new features. In the last decade people and companies have demanded computers with more capacity and we have gradually been induced to upgrade mobile phones for better, smaller and cheaper phones. Companies have invested in new, faster and less expensive production and packaging technologies, and new information systems and related processes have been installed in order to speed up administration. Many people assume that there will be a continuing need for computers with more capacity, and for new production technologies and computer software with more features and more capacity. I have already argued that mobile phones may be close to the limits of what can be achieved in terms of functionality. In many areas, production technologies have arrived at a situation where several production steps are integrated and where so much non-value-added time and cost have been taken away that there is little time and cost remaining in the process. Few people seem to have paid any attention to the issue of whether capacity and features can be developed indefinitely or if there are limits to the need to develop these things.

It has often been assumed that the need for computing power in PCs will continue to increase. People have seen the capacity needs in their PCs constantly increase in the last decade through the release of new versions of the Microsoft Office package and other PC-based computer programs. Similarly, the need for computing power at home has continued to increase. The reason for this has been the release of ever more demanding games and other entertainment and useful software used at home. Already in 1998 David Lundberg and I, in our book *The Transparent Market*, were saying that in the future the demand for more powerful computers may decrease, because of network computing. We

claimed that it would be possible to do the computing on networks and locate capacity, software and applications on the network. The PC would then be used to get on-line and access the software, but the computing capacity and the software would be located on the network.

Today, in many organizations each user only has a 'thin client' and all computing is done on the network by necessity. It may also be that the same trend will affect the need for PC capacity at home. Through a broadband connection at home the PC could have constant access to computing power from a web-based supplier. This supplier could provide access to applications and to storage space. This may initially reduce the need for processor capacity and RAM memory, because computing can be done on a remote site. Even if people still want to store their files at home as well for security reasons, the above-mentioned aspects of PC capacity may be reduced. As trust for Internet service providers increases, people may decide to refrain from storage at home as well. Thus, we can see that the market for PCs with higher and higher capacity may decrease in the future. A thin client supports the need for speed and capacity in proprietary networks. An old PC may be connected to a broadband network from home and supply the computing power and storage capacity to go on-line and do the computing on a remote site. The cost of a broadband connection may be justified by the decreasing need to buy new computers as soon as the broadband connection qualifies as a worthy alternative of a stronger PC at home. This may already be the case for a large number of users.

The opportunity to use a broadband connection for network computing has not yet been widely advertised, since service providers have emphasized entertainment as the primary reason for people to connect to a broadband network. This is believed to be the most important source of income for these providers in the future. For entertainment applications a PC with high storage capacity may still be needed to download films and games, but this may change in the future as well, depending on the layout of broadband provisioning networks. When the capacity of a network has been increased to a level where even a film could be viewed without downloading it to a local PC, the need for storage capacity at home will be reduced. In a situation where more and more users do computing on a network instead of on the PC, the need to keep excess capacity for peak needs is moved from the user to the service provider. Capacity is less expensive for the service provider, who can rely on differing patterns of usage between customers to balance capacity needs in the network. While 200 users need to store the Office package 200 times if they use PCs, it only needs to be stored

once if computing is done on the network. Each user can be given a certain amount of storage space. The cost of this space is a fraction of the cost of the storage space needed on 200 PCs. This would reduce the size of the market for new PCs and increase the demand for server capacity. The need to upgrade PC capacity is not a given. It is dependent on how different types of capacity in a network are organized and market demand for different types of capacity is dependent on the availability and pricing of different types of capacity. The total demand for storage space would not grow as rapidly in the case of network computing as it has done for PCs in the past. The growth of the IT market would shift away, first from PCs to servers and broadband equipment, and when broadband networks have been completed the market would turn into primarily a replacement and extension market.

In addition to this, the need to further develop the Microsoft Office package in the future is limited. A number of years ago it was estimated that only a few hundred people in the world use the most advanced functionality in Microsoft Excel. I have been using all the Office programs for more than ten years and I haven't recognized any significant improvements in the last five years. Now, each program contains the important functions and they are integrated in such a way that it becomes easy to use them together. Further developments are likely to be relevant only for a very small number of users and it is unlikely that 'normal' users are willing to pay for constant upgrades of a tool that is already sufficient for their needs.

In the past decade the power of business systems has gradually been increased. Many systems were developed as systems for single departments or parts of the company and they have been developed to encompass larger and larger parts of the processes of a company. Now, ERP systems can be used to automate processes in all parts of a company and all parts are integrated with one another. Companies do not invent new tasks and routines all the time. Instead, the routines that they perform today have been performed in companies since business started. Companies have taken orders, purchased components or raw materials and employed people and delivered finished products. Now that these have been integrated in existing systems the number of functionalities that need to be developed in the future would decrease. This does not mean that systems will not be developed at all in the future, but each new functionality will find fewer and fewer users who need it. There are still special solutions that are needed in particular industries or by particular companies, but the functionality that is needed by most companies has already been developed. Most importantly, many com-

panies that have invested in business systems still have a substantial amount of work to do in order to take advantage of all the functionalities that are available in these systems. It will take years for most companies to arrive at a situation where they have exhausted the opportunities to increase efficiency through them.

These are only examples of situations where products that have contributed substantially to economic growth in the past now seem to have come close to the limits of what can be achieved by developers of these products. In the same way, we have seen how services are increasingly becoming available 24 hours per day via electronic networks. Services like banking, insurance, the booking of hotels and flights and increasingly also services from authorities are coming on-line. The same is true for the availability of music, films and computer games. We can access these services whenever we want, and since they are automated the cost of producing them is coming very close to zero. As a society we need to ask ourselves what we can productively do instead, if the opportunities to develop the products and services that have created growth in the past decade are soon going to be exhausted.

9
Research and Development Processes

Research and development is done in many different ways in different industries. In some cases R&D is approaching practical limits of time, cost and capacity, as in several of the situations mentioned above for mobile phones and PCs. In other situations development is done with the aim of improving products towards goals of beauty, style and fashion. These goals are often not quantifiable and the standards against which the result is measured may change. There may be no clear limits to how far the beauty of a car or the style of a dress can be developed.

Even in situations where there is a limit to what can be achieved, it is difficult to determine the limits of development of a research and development process. The ideal process would be if R&D people could come up with the ideal product or service solution at the first try, and then immediately draw this solution, make a prototype, write any instructions needed, communicate with developers of other modules and components and close their sub-projects. This is not possible. There need to be iterations and the consideration of alternatives. Drawings need to be redrawn, because not even the most qualified developer can hope to come up with the best solution at the first try, and the development of different subparts reflects on the development of others, and this causes rework.

First, we need to consider that some types of R&D may not need to be done in the future. If it is true that many products and services are coming close to the limits of what is possible or needed, R&D in these areas will become different or non-existent. Initially, the demand for more speed and capacity may decrease and the money that is invested in product development may also decrease. Later on, a definite limit may be reached, or the marginal benefit of a further improvement may be so small that technical development cannot be justified any more.

Until this has occurred, we have to reckon on a need to continue to develop products, which is what we will deal with below.

For R&D processes we can reason in the same vein as we did for production processes above. A process that takes three years cannot be reduced more than three years and it will be impossible to even come close to zero. Similarly, an improvement that has been made once will never need to be done once more. The American and European auto industries have halved the development time for new automobile models during the past decade and the resources needed have been reduced substantially as well through modularization and standardization, but we do not know exactly how far this development can go. In the pharmaceuticals industry ten years ago, it took ten to twelve years to develop a new drug. Now, this time has been compressed to between six and seven years and there are experts who claim that it could be done in three years. One of the reasons for this decrease is the increasing use of computer technology in different parts of the process. The initial screening of substances is only one area where work can be done more rapidly using a computer than previously when everything was done manually. In the case of the automobile industry, it may be possible to cut another year and a certain amount of resources from the average development project. In the pharmaceuticals industry the improvements that can still be made seem to be substantially larger, even if they may not be as large as what has already been achieved in the past.

The opportunity to reduce the time of a development project by three years justified a relatively large amount of activity and a substantial investment. The reduction of the remaining time will not justify the same amount of activity and investment and it will be harder and harder to justify the cost of further improvement projects the closer companies come to the limits of what can be done.

It is difficult and maybe impossible to calculate the definite limits of efficiency in development. We may leave it here for the moment. There is a definite limit to development speed and cost, but in many cases we are probably some distance from this limit. We also need to note that we are facing a wide range of different situations. In some industries companies are still up against development tasks in uncharted territory. Huge issues of unsolved basic research problems may require armies of developers and the cost and risk of a particular project may be difficult to foresee. In most cases the terrain is better charted and the problems facing developers are smaller and the cost and risk are lower.

10

E-Business and the Promise of Creativity and Economic Growth

When the Internet was developed it was hailed as a source of future economic growth. Companies and authorities would need to invest in new information systems, and consultants and internal people in companies would be needed in order to develop systems and implement them. This wave of investments created a surge in the labour market and many new companies were founded. Authors in their books argued that e-business created new value and that electronic solutions would engage people and other resources in new activities and that this would lead to economic growth. There was also a belief that even if e-business would save resources, the creative new business models that were developed on the Internet would make it possible for companies to earn more money than in the past, because of the lower cost of doing business on an electronic network. There were people who talked about e-business as a foundation of a 'new economy' in which traditional companies had no chance of competing against start-up e-business firms. These would be faster, cheaper and more profitable than companies from the 'old economy'.

Many authors of books described the rules of the new information economy that would be built around the Internet and other information networks. Consultants and business professors alike were fascinated by the prospects of the new economy. Companies that did business on the Internet were seen as creative and companies that did business in traditional ways were often less fascinating. In his book from 2000, *Leading the Revolution*,[16] Professor Gary Hamel lists eleven creative new business concepts. Nine out of these consist simply of taking existing products and services and selling them on the Internet. In none of the nine cases does Professor Hamel describe any unique features of these business ideas. Today, in all the businesses mentioned by Hamel there

are numerous competitors that offer almost exactly the same services as the ones he refers to as creative. Here are some examples mentioned by Hamel:

- He argued that the purchasing of insurance over the Internet is a different business model compared with buying insurance in the traditional way.

True, but many companies in each market are offering the same or very similar services. How do companies differ when they move to electronic business? Hamel does not help in identifying possible sources of uniqueness in on-line insurance sales.

- Internet telephony was seen by Hamel as a completely different business compared with 'dedicated voice networks'.

Equipment for Internet telephony services are available off-the-shelf from telecom equipment companies and pricing models can be taken from a number of textbooks on Internet pricing and economics. How do you create a unique Internet telephony service?

- Searching for a job at Monster.com was considered different from searching for a job in a local newspaper. At the time when Professor Hamel wrote his book, Monster.com posted 350,000 advertisements from the whole of the United States.

Now there are a number of worldwide job sites and in each country there are national sites that offer the same services. What distinguishes Monster.com from the others, and in what respect is this concept creative? Apparently, a large number of people around the world came up with the same idea at the same time. Creativity is usually understood as being able to come up with something unique that is difficult to copy.

The fact that Hamel mentions nine e-business concepts out of a total of eleven cases and that none of these concepts seem to bear any traits of uniqueness may only be a sign of bad luck on his part. Maybe there are loads of unique sites in other industries like steel trading, transportation marketplaces or other industry marketplaces. The sorry fact seems to be that in all these areas there are a number of competing services, but they all tend to look very similar to one another. A team of researchers studied transportation marketplaces

in the United States in 2001 and found seventy-five competing marketplaces, but they did not mention any outstanding or unique ones.[17] At the same time there were at least ten global steel marketplaces, not including proprietary marketplaces owned by a particular steel company, where only the products of this company were traded. Internet sites are in general less different from one another than the business ideas of traditional companies and most companies are forced to copy the business models of sites that already exist.

In addition to the general creativity that many authors thought they could identify on the Internet, they argued that companies would be able to offer a wider range of products. Companies, it was argued, would integrate product ranges from a number of industries in one offering. This would reduce distribution cost, because people and companies would not have to pay for separate deliveries from a large number of different companies. It was also argued that companies would need to have fewer geographic locations, because customers did not need to visit them physically any more. Product delivery would be separated from the ordering process, as opposed to traditional shopping, where people selected goods from the shelves and took them with them when they returned home.

In our analysis, David Lundberg and I agreed that growing electronic business would have a number of effects on productivity, but we could not understand how a decrease in the use of resources, the need for fewer companies and the merging of industries would in itself lead to growth. Instead we made the following analysis:

- The above consequences, which could be summed up as a decreasing need for resources in the future, could be expected where e-business grows.
- This will probably lead to a restructuring of the economy, possibly in many ways a painful restructuring.
- A large volume of resources could be freed. Growth may come when the freed resources have been made productive use of once more, but not at the time when the resources are freed in the first place. Looking at the overall decreasing need for resources in the economy it will gradually become more and more difficult for each unit of resource that is freed to become re-employed in the economy.
- The more rapidly the transition to e-business goes, the faster will be the restructuring of society and the economy.

- The use of the Internet would gradually make the offerings of different companies more similar to one another, and this would make it more difficult to create unique features in an electronic market than in a geographic market. The fewer unique advantages that could be developed, the more difficult it would be to make a profit. The average profitability would be lower in an electronic market than in a traditional one.

In 1998 we never explicitly stated the fact that e-business in many cases would compress time to almost zero through the automation of information flows. Instead, we tried to describe a situation that was signified by tougher competition through increasing transparency. Now, it is clear that this is probably the most difficult aspect of electronic business for companies and the economy as a whole to cope with, since it means that there is no reason to invest in future development when the time and cost of information flows has been reduced to almost zero.

We made very rough calculations of the potential for reducing the need for resources and came up with figures in the range of 50 per cent. This meant that we could easily see how developed e-business in society could, for the same volume of production, marketing, sales, distribution and services, produce the same volume of goods and services as in 1997 using 50 per cent of the resources used then. By the standards we used to judge the maturity of e-business, the phenomenon is still, in 2004, at a relatively early stage in its development, since overall the penetration of e-business, using our definition, in most industries is relatively low. Even though most companies have invested in IT-systems with advanced potential, we know that many companies are far from having reaped the complete advantages in terms of cost and time of this development. There are a number of factors that substantially limit the pace of penetration of e-business in established industries and we will look at these in more detail in Part III.

One of the main factors that is seen to limit the penetration of e-business in established industries are the IT-systems structures and supply chain structures of existing companies. These often limit the pace with which companies can integrate their different systems. In most industries, the structural changes have been relatively small so far. According to our hypothesis, we still have the lion's share of the structural changes ahead of us.

In order to justify this rough calculation of a 50 per cent decrease in

the need for resources (which was based on the experience of actual cases), without going into detail we developed the E-step Model below. In addition we wrote that if someone in the late eighteenth century, when 70 per cent of all people worked in agriculture, had predicted that it would be possible in the future to produce the same volume of food using only 35 per cent of the population, few would have believed it. Now we know that it is possible to produce more food than at that time, with less than 3 per cent of the population directly employed in agriculture. The total share of the population that is involved in food production and distribution may be a little more than 10 per cent. Regardless of this we realize that it has required a tremendous structural change to arrive in this new situation. Also, during the industrial revolution many people were needed to work in factories. In this earlier development, industries were nowhere near zero time or zero cost. Companies needed to invest in order to establish factories where production could be done more efficiently than before. If the opportunities to improve efficiency further are running out, it is difficult to see how a similar development could happen once more. Where are the new business opportunities where resources are needed, if we cannot speed things up further?

Another way of looking at the reduced need for resources is to consider how many types of work can be automated using existing IT technology. We find that virtually all jobs can today be automated using existing technology. Administrative jobs in order-taking, purchasing, sales and customer service are gradually being replaced by electronic services. So, too, are jobs in production, production planning and logistics planning. All of this is relatively well known, at least by people who have studied these phenomena, but it will also affect the need for managers, controllers and different types of analysts. With fewer people in organizations, fewer managers will be needed. When more and more transactions are computerized and integrated business systems are used, data will be easily retrieved from computer systems, and modern analysis tools make it easier and easier to reorganize data and do a number of different analyses. One analyst can become more productive than in the past and the need for assistants to collect and assemble data for senior analysts to work on will be reduced. We have not done this analysis in detail, but it is possible to conceive of a production and administrative structure where the majority of all jobs that are done manually today would be automated.

This indicates that e-business is a long-term development. The early applications of 1996 and 1997 were only weak, but important, examples of what may come in the future and I believe that our prediction of a 50 per cent reduction in the need for resources was a cautious figure. We also indicated that it is often difficult, in the early phases of a development, to foresee the consequences that it will have at later stages, but we claimed that we need to make an effort to understand this process in order to prepare for a development that may be inevitable.

However, a 50 per cent reduction of resources across the whole economy, everything else being equal, would reduce GNP by roughly 50 per cent. In order for economic growth to occur, some other development would need to come along that could compensate for this decline. This was in stark contrast to all previous technical developments that had all created new business opportunities and new resource needs on their own.

The combustion engine and the growth of car and truck transportation

In order to show how the development of electronic business differs from previous technical developments with respect to the creation of a need for resources, we here, very briefly and without the ambition to go into detail, look at some main differences between the creation of resource needs during the growth of car and truck transportation compared to the present growth of electronic business.

After the combustion engine had been developed it took several years until a number of markets had found their forms, but in retrospect we realize that a number of new product and service markets had to be developed in order for the combustion engine to serve as a viable alternative to horse, train and other transportation. Products and services that had to be developed were:

- Reliable cars and trucks were the basic need.
- Suppliers of car and truck components.
- Sales networks for the vehicles.
- Service networks (either through training of drivers in how to service vehicles or through specialized service firms/organizations).
- Oil and refining of oil into petrol and diesel.

- Sales networks for petrol, diesel and other necessary oil products.
- Road construction and the development of road surface materials and construction technologies that make it possible and economical to use cars and trucks for transportation.

In due course the use of cars and trucks as means of transportation helped trigger other industries into existence or growth:

- Roadside restaurants and hotels for travellers and truck drivers.
- Road maps, guide books and other publications for travellers.
- Road signs and radio-based traffic information.
- Etc . . .

It is clear that in some cases none of the above would be needed if we had no cars or trucks. In other cases, the need would be reduced if we took away cars and trucks from the total means of transportation.

Before the combustion engine was invented, local transportation was undertaken by horse carts. Long-range transportation was by train or by ship. Markets were much more local, and the growth of trucking has helped to open up wider markets for goods and services and to bring many types of production, like food and household services, into the organized economy. After each of the above products and services had been developed, value could be added to these products, and services that sparked off other new industries, like heating systems in trucks and cars and vehicle electronics, could be created.

One of the main points of this description is to bring to the reader's attention the number of new industries that were directly or indirectly created by the invention of the combustion engine. In addition to this there are a number of industries that were not created but whose growth was augmented because of car and truck transportation. These new industries offered ample business opportunities for investors and entrepreneurs.

Industries that were replaced by the car and truck industries and their offspring were either much smaller industries, like wagon making, or activities that were largely outside of the organized economy, like horse cart transportation. Thus, this development opened up the markets for business exploitation that we know of today. This exploitation necessitated investments in large volumes of cars and trucks, which gradually wore out or became old-fashioned and subsequently had to be replaced by newer products for economic, technical or other reasons.

The same could be said for any other technical development prior to the Internet. The development of the telephone, the airplane, the computer, television and the radio have all opened up new markets for infrastructure, hardware, services, ancillary products and, more recently, software. These developments, and a host of others, taken together have created the product and service markets that we know of today.

The inventions mentioned have increased the demand for labour, capital and real estate to the present-day levels and have added large numbers of new business opportunities that could be exploited by companies.

As we have seen in this book, the development of electronic business is of a completely different nature from that of the mentioned industries. While electronic business creates the need for new resources in the early stages of its development, it gradually takes away resource needs in later stages. In later stages e-business also brings companies closer and closer to the limits of development in terms of time and cost in many areas of their businesses.

The argument above should not be interpreted as saying that no previous developments have had the effect of saving resources. We have seen numerous developments in the past that have saved resources in one way or another. We can only look at the development of transportation mentioned above and see that there is a substantial resource saving component, although it has also increased the need for resources by opening up new markets. Another resource saving development has been the development of new materials, like plastics. These new materials have often replaced existing and more expensive materials in some areas, such as when plastics have replaced wood or metal. These materials have also required new production machinery for the manufacturing of the material itself (often sold in the form of plastics granules) and for the forming of the products. All this has required production resources for machinery, sales people and purchasing. Whole new industries in the area of specialty polymers have been created. We can thus see that even resource saving innovations in the past seem to have created new needs for resources, and overall the developments taken together have created a steadily increasing need for resources. In addition to this, the resources have gradually become engaged in more valuable forms of production, which has gradually increased the need for training and education in society.

The E-step Model

In various situations David Lundberg and I tried to explain how e-business would affect different structures in society. We believed that the consequences of e-business implementation that could be observed at the beginning were only the signs of initial investments and implementation activities and that these effects were transitory. When an electronic business model is up and running it does not need the same amount of resources to maintain it. In order to show how the different steps in an e-business implementation affected structures and resource needs, we developed a model that we called 'The E-step Model'.

In 1997 there were already e-business models in existence that showed what could be achieved by companies that understood the power of doing business on electronic networks. The thought experiment that was needed was to envision society in a future where a large share of all business is done within e-business models in the higher stages of the E-step Model. We needed to extrapolate the situation of 1997 in order to understand what business would be like in 2010 if e-business grew. The model that is presented below facilitates this type of thinking, and we published it originally in a book in Swedish in 2000.

As measured by its share of the total volume of business across industries, e-business still is at a very early stage of its development in most industries. For companies this still represents a substantial opportunity to compress time and reduce cost. Many companies have still not managed to get significant value in the form of savings from their investments in IT and e-business. For society as a whole it represents a risk, since the more advanced that companies become at utilizing e-business, the closer companies will come to the limits of development in terms of time and cost, and this will reduce the need for resources in these areas. The projects that are running at present, however, will have an effect in the next few years. We are looking at a situation where change is cumulative. The projects that are run today build on the results that were achieved in previous change efforts, and the projects of tomorrow will build on the results of the projects that are run at present. This change in companies on the micro-level will, taken together, create tremendous change on the macro-level of society. The need to change on a society level has not been recognized yet in the debate about future challenges.

If automation is accelerated, new business development must speed up as well (mustn't it?)

We cannot create an economy where people have no jobs. This would result in a situation where companies would have no customers. The changes that are described in this book will not go unnoticed in society. Many areas where automation has previously been impossible are now increasingly affected by computerization and automation through advanced production technologies. A number of tasks will gradually disappear in society in the same way as secretaries have largely disappeared in the past. Some secretaries have become 'assistants' instead, but it is questionable if other categories of people will easily find new jobs:

- Order-takers will gradually be replaced by Internet-based order systems.
- Sales representatives will to a degree be replaced by various types of electronic information exchange.
- A large number of purchasers will gradually be replaced by automated purchasing routines.
- Production planners and other administrators in logistics and production environments will gradually be replaced by electronic planning routines in ERP systems.
- Service people at authorities will gradually be replaced by Internetbased self-service systems as '24-hour' authorities are established.
- People who provide information of various kinds over the phone or in person will gradually be replaced by electronic information exchange.
- Production personnel in a number of industries will continue to be replaced by increasingly automated production equipment.
- Distribution of books, CDs, DVDs and computer games (see Part III) will be reduced, which will then reduce the need for personnel in transportation-related companies.
- The demand for consultants in projects and for computer hardware and software will be reduced as processes and products come closer and closer to zero time and cost. Large projects and investments will no longer be justified when the time remaining to be cut away is small and the remaining savings potential is reduced to a minimum.

We know that these developments and a large number of other similar developments are occurring in a large number of industries. We don't know at which pace different companies and organizations are progressing or what the exact results will be of the projects that are currently run. What we do know is that there is a large amount of activity taking place that will reduce cost and that the freed resources will need to find new employment in the near future. We also know that since the burst of the 'Internet-bubble', investors have difficulty in finding new promising growth opportunities to invest in. Is there a sufficient level of new business development activities going on for all the freed resources to find new areas of demand in the near future?

It took a number of decades from the invention of the first computer until the computer industry grew to a size when it could be counted as a large industry. The bio-technology industry has long been spoken of as a potential growth industry of the future, but growth in this sector has not taken off in the way that was expected. Which are the candidates for new high-growth industries that can take over expansion now that the service sector, the computer industry and a number of other producing industries are closing in on the limits of development?

The model consists of five steps. The steps need to be seen as general principles that could be applied in different ways in practice. Any one company could be involved in doing electronic business at more than one of the below stages at any one point in time in different parts of their business. The hypothesis that we developed early on in our work with *The Transparent Market* was that e-business at first generates substantial new resource needs. On the surface, this seems to create business opportunities for companies and venture capitalists. On the society level new electronic businesses exist in parallel with traditional business models, which need to be run at full scale until the situation occurs (or may occur) when e-business takes over such large volumes from traditional business that these cannot be maintained at full scale. During this initial phase it will seem as if e-business is a complement to existing business models and that the new markets will develop in addition to the old ones.

If electronic business continues to take over from traditional models it will be more and more obvious that the two are competing against each other (as is now the case between electronic banking and

traditional banking in many countries). The model below shows that e-business in its later stages is likely to require substantially fewer resources than the traditional business it replaces. If this process goes on for some time, the relative cost advantages and advantages of easy access and reach of electronic business will grow, as higher and higher stages in the E-step Model can be reached when increasing numbers of consumers and companies adopt electronic business. At the same time, traditional manual services are likely to become more costly and difficult to access.

The E-step Model shows how all types of resource needs change as higher levels in the development are reached. As we are looking at time and cost specifically in this book, we may note that the E-step Model also shows that the opportunities to compress time and reduce cost increase for each higher step in the model.

Over time and with the growth of e-business, traditional business could face a difficult competitive situation. E-business will gradually become more advanced and cost-effective, while traditional business will become more costly and difficult to access as the cost of offering the manual or analog services will be covered by fewer and fewer customers. This does not mean that e-business in the future will only be done by new start-up companies. On the contrary, existing companies use information technology to change their internal processes and to change the ways in which they do business with customers and suppliers. Due to the need to change existing companies, and create new supply chains and value networks that also include new electronic intermediaries, each step in the E-step Model will be approached in a different way by different companies and different industries. Table 10.1 offers an overview of the steps and their main effects, and a more in-depth description of each step follows.

E-step 1: E-windows

This simple step was taken by many companies at an early stage of Internet development. It only means that companies created a non-interactive site on the Internet where customers and other interest-groups could find information. This is equivalent to a shop window or a brochure. The existence of an E-window does not change anything in the business model. The time it took to perform some marginal activities, such as ordering brochures or looking up the names of contacts in a company, was reduced.

On the other hand, the need for Internet sites created a need for programmers and sales people in the IT companies. It also created a demand for new computers, servers, modems, Internet connections and other

Table 10.1 The E-step model

E-step	*Main consequences*	*Effect on existing business and economy*
E-step 1: E-Windows	Creation of non-interactive sites.	No effect on existing business. Creates new resource needs and drives economic growth.
E-step 2: E-Channels	Creates new communication channel between company and customers/supplers. This channel has no or few electronic connections to other systems in company.	Creates new investment needs and usually new tasks. May make some tasks more efficient. Creates new resource needs and drives economic growth.
E-step 3: E-Break-outs	One step in value chain is broken out and performed electronically. No or few other changes in value chain, but E-break-out has connections to other company systems.	New investment needs and substantial increase in efficiency of single steps in value chain. Initially requires investment, but dramatically reduces resource needs for steps involved.
E-step 4: E-Platforms	Whole value chain is reconfigured based on well-integrated computerized solutions.	Short-term competitive advantage for first mover, but relatively easy to copy business model. Creates investment short term, but reduces overall resource needs dramatically and for longer term.
E-step 5: E-Values	Whole sectors of society are changed based on integrated electronic solutions. Requires mature users and companies with well-structured systems complexes.	Creates little investment and reduces resource needs to previously unseen levels.

things which had a positive effect on the labour market and on the economy in general.

E-step 2: E-channels

An E-channel means the replacement of an existing communications channel by electronic communication. This means that tasks could be

performed more efficiently, but it does not change anything else in the value chain, outside of these tasks.

An example would be the transfer of electronic orders, instead of phoning in orders or sending them by fax. At this step there is no backward integration of the order-taking system into other business or enterprise resource planning systems. At the time when our books were written there were examples of this in the case of supermarkets or bookshops that were taking orders on the Internet, printing the orders on paper forms and then picking the books or groceries in the shop, before delivering to customers.

The Tesco Internet service is a case in point. Contrary to advice from consultants, Tesco decided to pick goods that had been ordered over the Internet in their stores. This reduced the time needed for deliveries compared to large centralized warehouses, and it does not create competition between the stores and the Internet service. If the Internet service becomes very popular it will be difficult to pick goods in stores, since there needs to be room for customers in stores and the layout of a store is not optimized for efficient picking by professionals. In the early phases this was not considered to be a problem and the pragmatic approach to their Internet business has probably helped in making it a success for Tesco.

In this case it was noticed that e-business actually increased the demand for resources, rather than decreased it, since goods had to be picked manually and sometimes also delivered in special deliveries from the store to the customer. There also arose a need similar to that in the case of E-windows, for more advanced Internet sites, sales people in IT companies, and project managers for these more complex projects, and at this stage, too, there was a negligible impact on the existing business, which ran as usual. Some observers at the time held that because of this an increase in e-business would inevitably increase demand for resources. They believed that e-business in all industries would be a service that would add a substantial amount of value to the economy and be in demand only by those who could afford to pay for it.

E-step 3: E-break-outs

There were already companies that used the Internet more creatively than to only send and receive orders, but many people at the time believed that this would only be possible in a few industries, like banking.

We claimed that early E-break-outs were examples of what would happen on a larger scale in the future and that companies would gradually learn from their own and each other's mistakes and that more and more industries would have to experience such innovations in the future.

An E-break-out happens when one single step in a value chain is re-engineered. This step is broken out of an existing value chain and changed with the help of electronic business models to be done much more efficiently than before. When a large share of the activity in this step has been taken over by e-business, it would change the structure of the industry, but only for this step.

The obvious example at the time was electronic banking. One transaction on the Internet cost 1.5 cents as compared to 1.5 USD when the same transaction was done in a bank (figures taken from American banks). The main difference in cost between the two transactions is in the form of the cost of the cashier and the bank office, which need to be there in the case of manual banking. The cost of the computer system that is used to do the transaction is roughly similar for both cases. As a consequence of a decreasing demand for bank transactions in banks, there would be a need for fewer and fewer bank offices. Due to the high penetration of Internet banking in many countries, this has already started to happen and in many countries some banks have reduced the supply of manual services by cutting down on branch offices.

Another example of this could be taken from industry marketplaces like eSteel for the steel industry, Covisint for the automobile industry and a number of other marketplaces aimed at companies in a specific industry. These marketplaces supply suppliers and buyers with a wealth of market data and the opportunity to trade in various ways. Electronic information gathering replaces a number of manual sales calls and phone calls between customers and suppliers and the final transaction is done over the Internet as well, which replaces order-taking. The order may in this step automatically go into the ERP system of the supplier, but from this point onwards it is processed in the same way as was done before. Pricing models such as 'reverse auctions' could be offered as alternatives to traditional pricing.

This reduces the need for some of the interaction between suppliers and customers. It decreases the cost of doing business for the companies that understand how to use electronic tools. In 1999 people were arguing that companies would still want to send their sales people to customers, because of the value of controlling the sales process. There was, however, already evidence in case studies and business magazines

that this worked the other way around. A reduction of the manual sales and purchasing activities was driven by customers instead of by suppliers. Companies like GE had started to tell their suppliers that they could look up their tenders on their Internet site. In many cases they were told that they need not bother to visit the customer to present their offers until they were asked to do so. Many companies install electronic purchasing solutions with the aim of reducing purchasing personnel. (Such solutions could belong to E-step 3 or, in most cases today, to E-step 4 as in the case of Dell, where the whole process from customer order to components purchasing and delivery is integrated into an automated process.) With fewer purchasers employed by companies, it is to be expected that purchasers will have less time to meet with sales people in the future. This could be expected to reduce the need for sales people as well.

E-break-outs could have a substantial impact on how business will be done, but in a very limited area within an industry. In many cases it was initially assumed that only a small fraction of all purchases a company makes could ever be done over the Internet. Findings by GE (formerly General Electric) in their efforts to apply e-business across the group indicated that almost anything, even very advanced systems purchases, could be done with increased quality and reduced cost over the Internet. This was illustrated by cases that were published on the Internet site of this company. In many purchasing processes of technically advanced products there is a substantial need to exchange drawings and other information between companies. In some cases GE could not manage to send tenders to more than two possible suppliers because of the number of drawings that had to be copied and included in the tender. When tenders were posted on the Internet and drawings could be downloaded by the suppliers themselves GE received many more offers, also from companies that it did not know had the ability to supply the product in question.

In many cases there still remain a number of manual steps in a complicated sale, but some steps could be done electronically with the aim of reducing resource needs. The transfer of business from a traditional model to a modern and more cost-effective one is a gradual process where companies move along the learning curve. The experiences from the use of electronic data interchange (EDI) in the car industry are worth mentioning. Eighty per cent of transactions could be transferred to EDI immediately and the rest could be transferred after some changes had been made to processes and after customers and internal personnel had received some training. This is in a situation where the same transac-

tions are repeated over and over again, which is true for most business-to-business situations.

The changes due to the E-break-outs would in some cases be visible in society (banks closing down branches), but to a large extent the effects would not be widely noticed. The example from the cheese manufacturing company above is a typical example, where only initiated people will know about the change.

E-step 4: E-platforms

E-platforms constitute a more dramatic shift towards increased efficiency, and the impact on company and industry structures would be more dramatic if E-platforms were in place and extensively used than if many E-break-outs were created. Dell is an example. Another example that we used in 2000 was the on-line bookseller BOL, which was started in Sweden before it was taken over by the German company Bertelsmann. BOL is a better example of an E-platform than Amazon, because Amazon operates bricks-and-mortar warehouses, while BOL manages to serve customers without keeping stock of their own.

An E-platform is an electronic business model where the whole, or a substantial part, of the value chain is changed through the use of electronic tools. (The example from the cheese industry could best be described as an E-platform, where the business system Movex is the systems component that controls all activities in the process for storing cheese.) Therefore business processes change to minimize non-value-added time, and cost, and to maximize conformity in the handling of tasks. This often means that all unnecessary manual activities are taken away. In the example of Dell, this company does not keep a stock of assembled computers. Instead, they keep components in stock or require their suppliers to keep components in stock or rapidly produce them when a need arises, so that computers can be rapidly assembled based on customer orders. Stocks are also kept low (one week of stock) throughout the value chain. Dell has eliminated the need for dealers. Through this move there is no need to keep assembled computers in stock through the whole production and distribution chain and customers are happy because service levels are improved. Customers feel that they have more choice, since they can configure computers themselves on-line. This business model reduces the need for labour in several steps of the value chain. It also reduces the need for retailers and warehouses for wholesalers.

As long as only one or two companies in an industry do this, there will not be too many structural consequences. But if this behaviour puts

enough pressure on competitors to change their value chains as well, it will have consequences for wholesalers and retailers. If there is no need for these intermediaries, they will go out of business or will need to find other things to sell. If many industries went the same way it would also be difficult for these companies to find other things to sell, because there would be a smaller demand for retailers and wholesalers in other industries as well. This is a simple way of showing, through a thought experiment, that e-business, if applied on a large scale, can have dramatic effects on whole sectors of the economy. In order to know if this is likely to be the case, we would need to analyse the strength of the different forces and the propensity for customers and suppliers to change their way of doing business.

Today many companies invest in increasingly sophisticated E-platforms delivered by ERP systems suppliers like SAP, JD Edwards, IFS, Intentia and Baan and that are integrated with Internet solutions, supply chain management systems (SCM) and systems for customer relationship management (CRM). From the point of view of society as a whole, this type of development could progress on a large scale almost completely unnoticed, which is shown by the example from the cheese industry. Few newspaper articles are written and there is no stock market boom, because it does not require large new companies or other spectacular investment events.

How to create an E-platform

In his article in *Harvard Business Review* from 2001, 'Strategy and the Internet',[18] Michael Porter assumes that complete value chains will only rarely be 'cannibalized' by e-business in the way that is suggested by the case of the E-platform of Dell. He does not justify this conclusion in his article, and in order to 'de-mystify' the idea of E-platforms we could look at a few simple examples and an analogy that indicate the contrary.

Since the publication of the book *Reengineering the Organisation* by Michael Hammer and James Champy (see ref. 6), which started the wave of re-engineering projects across industry, the idea of business process optimization has been on the radar screens of many companies. These companies have analysed their processes and identified the obstacles that need to be removed before they can optimize them. An E-platform is, in other words, an organization

where processes have been optimized so that time and cost have been minimized and all tasks that could be automated have been automated. This reduces time and cost to a minimum and ensures that tasks are handled in a uniform way to the largest extent possible. Few companies have arrived at the creation of an E-platform, but many have analysed the requirements and started to work in order to achieve it. I can relate some examples from my own experience as a consultant.

One large company that produces energy supply units for telephone networks has telephone network operators and suppliers of network equipment as its largest customers. These large customers require increasingly transparent bidding procedures from their suppliers and they put more and more emphasis on the reduction of lead times and cost. When we analysed the opportunity to optimize business processes at this company the main obstacle was the very wide range of products. Energy supply systems could be offered in thousands of configurations. The company had on its own started to modularize this product line to boil it down to 20–25 standard offerings and a small number of ways to configure each offering that would cover 90 per cent of customer needs. This would reduce the complexity in production and in the sales and order process and it would reduce the number of suppliers and the number of parts bought. When this giant task has been fulfilled there are still many things that need to be put in place in order to develop a complete E-platform, such as an Internet-based tool that customers can use to configure systems themselves on the web, using a number of modularized building blocks. The implementation of an integrated SAP system in 1998 was one critical component, but the value from this implementation cannot be fully reaped until a number of other prerequisites for optimal processes are in place.

A producer of motorized lawn mowers analysed their business processes before they made the decision to buy an integrated wbusiness system. It turned out that the opportunity at this company to optimize their business processes and align their production closer to market demand, was hampered by the dependence on supplies of engines from the world leading producer of such engines. The lawn-mower manufacturer only bought a total of about 2–3 per cent of the total annual output of this engine company. This supplier had a very inflexible production system and they required our client

Continued

to place orders for engines six months in advance. Since lawn mowers are mainly sold in the summer, production plans had to be frozen during winter and they could only be changed to some extent during the sales season. Our client had decided to buy a new ERP system, but they could not go all the way towards creating an E-platform until the supplier of engines had become more flexible or they had found a new supplier.

A company in the special steels industry suffered from a lack of integration of their existing systems structure. Sales people didn't have access to production schedules, so they sold more than the company could supply and promised their customers unrealistic leadtimes in order to get their orders. This frequently resulted in situations where customers received their goods 8–10 weeks late. The problem could be solved using either of two solutions. One alternative was the implementation of an integrated business system. This company was looking at SAP, an enterprise resource planning (ERP) system from the *global* market leader in this industry. The other was the implementation of a system that would integrate the existing systems more closely with one another and provide the users with new interfaces, where they could access all the information that they needed to make decisions. Both alternatives were perceived to be risky by top management as they could potentially cause interruptions of production, if it was not done right. In this case, an E-platform could probably be created within three years after such a decision. The critical problem of integration between sales and production could be achieved earlier than that.

In order to show how risky this type of implementation could be if something goes wrong, I could mention a visit to a unit of a very large company in the food processing systems industry. When I visited this company, which was a customer of the company I was working with at the time, the unit had been at a complete standstill for four or five weeks, due to an implementation of an IT-system that had gone wrong. Something was wrong with the system or with the data and nobody at the time knew when production could be taken up again. Since companies today are completely dependent on their systems for all information about orders, components and suppliers, there was no point in trying to do anything until the system was up and running again. The cost of this type of failure could be very high and there is good reason for trying to avoid it.

An analogy

The creation of an E-platform could be compared to building a motorway to connect the towns A and B in a mountainous landscape. At the start there are a number of different roads that wind along the sides of the mountains and connect different towns, villages and cities with each other. Before building the motorway there may be several different routes to go from A to B. This situation represents the situation in an industry before integrated business systems have been implemented, where manual routines in different companies have been developed in different ways, with no common template or idea that is followed by all the companies.

The road network in the area is going to be modernized and a new motorway is going to be built along the shortest possible route between A and B. Three different architects are asked to suggest how the road should be built. They may use as many tunnels, bridges and other changes as they need to arrive at the shortest possible path. All three architects use a ruler to find the shortest possible route on the map and then adjust this optimal route to allow for reasonable deviations to accommodate for cost and practicalities. The results that they come up with are all relatively similar, because they try to arrive as close to an optimal stretch of road, a straight line between A and B, as possible.

This situation could symbolize the situation when a number of different companies in an industry analyse how they should optimize their processes. They all want to reduce the time of each process to as close to zero as possible and they want to reduce the cost as far as possible in the same direction.

In the exact project plans for each suggestion, the different people that analyse the task of building the road may suggest different starting points. One may suggest that the modernization should start with a bridge, another with a tunnel. The third may have suggested starting with both at the same time.

This situation could symbolize how different companies start to re-engineer different parts of their processes, depending on their starting point, and how large the steps they are able to finance at one particular moment. Even if each company runs its own creation of an E-platform in a unique way, depending on its situation, the results of a number of different efforts at re-engineering in an industry would be relatively similar process flows, close to the optimum.

David Lundberg and I estimated that a well-run E-platform could reduce the need for resources throughout a value chain by more than 50 per cent of the previous situation. We may assume that the economy as a whole could be built on E-platforms. In this case the opportunities to exploit advantages of scope by merging industries with each other in the same way that Amazon does would be used to a maximum (Amazon offers books, CDs, DVDs, games, toys, clothes, etc.). The resource needs in the economy as a whole could probably be reduced to less than 50 per cent, as indicated in the comparison with the automation of agriculture above.

One factor that complicates any discussion of the opportunities to change is that the experiences of change efforts based on IT that many people have read about, or studied, were made in the 1990s. In those days it was not possible to integrate systems, create automatic work flows and take away many manual tasks. At least this was not possible at the rate that it is now. The experiences made earlier are relevant, but only if it is kept in mind that only in the last 4–5 years have technologies of the necessary degree of power and integration been available, and most companies still have only just started to use them. The effects of projects that are run now will be visible one, two or three years into the future.

As shown by the examples above, there are a number of reasons why E-platforms cannot be implemented immediately. Given the difficult structures of existing IT-systems complexes, that for one company may extend into the inflexible planning and production systems of a key supplier, the benefits from the implementation of integrated business systems are likely to come gradually.

E-step 5: E-values

BOL isn't the final step in book distribution, and even when a company has created an E-platform internally, the development of e-business could be taken one e-step further. The last step we called E-values, and there were not many examples of this in 1999 and still there are not. Nevertheless, we can envision a situation where e-business has developed so far that several such examples exist.

The existence of many e-platforms is a prerequisite for E-values

If we had electronic access to a number of E-platforms run by a number of different companies in different businesses, in order to create an E-values network, companies may integrate the offerings of a number of companies on an electronic marketplace. Customers can use their computers to identify offerings, combine pieces of different offerings with each other to form new bundles, select delivery alternatives, quality standards and delivery times, all based on choices offered by independent companies.

E-values is simply the opportunity for customers to configure a selected range of the offerings in a market to suit their needs. Existing electronic marketplaces do integrate offerings from many companies, but they usually do not offer the opportunity for customers to configure offerings, and to actually configure the whole market, to serve their needs.

Assume that we want to use the latest technology to completely re-engineer the value chain in the book sector. We have electronic access to all existing titles of books that have ever been written. We have access to local print-on-demand facilities, where books could be printed and bound in the covers that customers prefer within a day or two of placing the order. After this, the customer may be able to pick the book up at the print shop or get it delivered to their home. Presumably, customers who only wanted to read the words and did not care about the cover would be offered the opportunity to print it on their own laser printer at home or at the office, which would be a tempting offer for students and business people who may be more interested in the ideas than in the binding.

Assume even that customers could access books that had not been gone through by a publisher, who would spend thousands of dollars on proof-reading and checking by language experts. People who were happy with that could buy the raw text written by the author, and those who wanted to could buy a proof-read and bound copy and could pay a higher price.

In groceries we would think of this type of market as one where groceries of different grades are kept in stock and packed in different locations by different companies. One company may have huge silos and containers of grain, vegetable oils, wine and other foods. They grind grains, bottle oils, pack flour and bottle wine on customer order.

Another company is keeping bottled wine, oil and pre-packed flour in their warehouse. Upon a customer order they pack the groceries and a transportation company that has been selected by the customer comes to pick the order up and they assemble the complete order consisting of many different deliveries and deliver the total, together with two books that have been printed on demand, one shirt that has been sewn on demand, one kit to assemble your own bicycle and the clean suit from the launderer.

The same model would be possible in business-to-business sectors. Through various marketplaces companies could order all the goods they need and they do not need to know which company is stocking it or in which form or shape it is kept in stock. Binders and envelopes could be ordered from one company based on quality and price and another company could supply other office equipment ordered on the same electronic order. The marketplace would not only find the alternative suppliers, but would also calculate the optimal split of the order between 10, 20 or 4 suppliers to minimize the total cost for the customer.

Profits and the internet

Contrary to most other authors who have written about e-business, David Lundberg and I argued that the electronic market would become more competitive than the traditional market and that it would become more difficult than before to make profits when e-business was applied on a larger scale. At the time we received tremendous criticism for this 'stupid' argument.

In 2001, Michael Porter, in *Harvard Business Review* (see ref. 18), stated that this is exactly the case:

> While deploying the Internet can expand the market, then, doing so often comes at the expense of average profitability. The great paradox of the Internet is that its very benefits – making information available; reducing the difficulty of purchasing, marketing and distribution; allowing buyers and sellers to find and transact business with one another more easily – also make it more difficult for companies to capture those benefits as profits.

Porter goes on to mention that electronic business will influence industry structures and industry profitability. He states that different industries will develop in unique ways and that Internet tech-

nology will drive structural change that will 'likely continue to put pressure on the profitability of many industries'.

He also mentions that it is difficult to develop unique and sustainable competitive advantages by using generic business packages.

Electronic markets show features of greater transparency than traditional markets and the 'perfect market conditions' of classical economics require market transparency. Both customers and buyers in a 'perfect' market have an overview of supply and demand and all available production technologies. In our book *The Transparent Market*, published in 1998, David Lundberg and I argued that electronic business would make markets more transparent than most markets have ever been before, and that this would make it more difficult to make profits in the electronic market than it has been before in traditional markets.

E-business and recession/stagnation

With e-business a number of technologies have been introduced that have the potential to increase the pace of development towards automation and to make it possible to save resources in areas that have previously been largely unaffected by automation. Companies that drive development towards administrative automation expect to dramatically reduce their resources in various administrative areas. If this succeeds to the expected degree, we must also increase the pace of business development in order to maintain a high level of employment and demand for other resources to cover the increasing loss of demand caused by e-business.

In 1999 and 2000 new business development flourished and many people believed that e-business would continue to be an area of investment. Through the E-step Model we showed that the initial investment in e-business would not be sustained. Instead of a continuous new demand for resources we predicted that e-business would lead to increasing unemployment and a decreasing demand for other resources as well.

We predicted that by the time investment in e-business took off, unemployment would increase and economic growth would turn into recession or stagnation. At the turn of the millennium, unemployment in the USA was at 4 per cent. Investment in e-business took off around this time and in April 2000 a stagnation/recession followed the previous rapid growth. Now, the USA has a level of unemployment slightly

below 6 per cent. Many people wait for an economic recovery that would make companies again employ more people. The administrative automation that is on-going has the purpose of making it possible to serve more customers and do more business without employing more people.

Which companies do we expect to recruit more people on a larger scale? In which sectors of the economy are there currently the investments that will create new demand for manual labour in the future? Few people seem to be aware of the current ambition across the economy to automate administration and production and to save resources in all areas in companies and organizations. Many people who work in companies that have such plans expect other sectors in society to increase their demand, but even health care and the public sector save money and resources through e-business.

Even the new companies that are founded in the future will need fewer resources than start-up firms did a decade ago. Today such companies start with optimized processes and the most modern production and administration technology. Resouce-saving models are used for order-taking, distribution and logistics. This means that in order to employ one thousand people, we need to start more new ventures in the future than ten years ago. If we say that the pace of development towards automation doubles compared to ten years ago and each new company employs half as many people as they did at that time, we need to start four times as many new companies in the new situation compared to the old in order to put the freed resources back in use.

We now see that companies improve their profitability again, largely because they have cut down their costs. This is not a sustainable basis for economic growth, because a well-functioning economy needs both individual consumption and investment. E-business is a threat to both of these for the longer term. Individual consumption is reduced as unemployment increases and the reduction in the need to invest is the main topic of this book. The most probable development of unemployment in all western countries in the near future is an increase in unemployment and a reduction of the demand for other resources as well, even if the economy temporarily picks up speed now and again. Unemployment in the USA will probably reach 7, 8 and 9 per cent over the next few years and unemployment in other countries will move in the same direction. Where this will stop, nobody knows. In Parts IV and V we look at two possible developments that may reverse this trend.

11
The Limits of Development

We have been looking at a few areas of management and business development that have been important growth engines in the near past. We have seen that growth in these areas may not go on forever and that demand for resources in a number of industries may decrease in the future. Now we turn to the more difficult issue of whether there may be a limit to new technologies or new products that may be invented in the future.

Economists and business people alike view the economy as a never-ending source of new inventions. In the past centuries we have seen an incessant flow of new products and technologies, and as soon as one product or technology has started to mature, companies have invented new products. As we have seen above, however, companies in some industries have found it difficult to find new areas of growth in recent years, but this has not yet been assigned to any inherent lack of potential new opportunities in the economy.

We may establish a few facts, so that we do not divert our attention unnecessarily in our analysis of the real issues that will be discussed here. Clearly, there are growth opportunities within existing product areas in the global market. This is not to be doubted. The opening up of China as a new market for western companies has shown that companies in many industries can benefit from new and emerging markets. A large number of people in the world still live below subsistence level and an even larger number do not have access to modern products and technologies like healthy food, a decent home, television, computers and mobile telephony. There is clearly a potential and untapped demand for existing technologies and poor countries are gradually rising out of poverty to become able to demand such products.

Yet, somehow the existence of such a demand does not seem to be enough to ascertain growth in the global economy. Historically, we have needed growth in the large developed economies to be able to drive growth in the developing parts of the world. It still seems to be true that when the US sneezes the rest of the world catches a cold, or at least we need to have growth in North America or in Japan or in the European Union in order for the rest of the global economy to stay healthy. These three regions commanded 72 per cent of global GNP in 2000 and they will remain the most important growth engines for a long time to come. (See Figure 11.1.)

If somehow the growth opportunities in these and other developed economies are coming close to exhaustion, the global economy will face a problem. In that case we need to look for growth opportunities that have not yet been exploited in order to drive continued growth. One reason behind this dependence on western growth is the need for companies in developed countries to make investments in developing economies. Developing economies do not grow by themselves, they are dependent on infusion of money and technologies from developed countries. When business is slow in the west and in Japan, companies in these countries hesitate to invest heavily in risky projects with long pay-back cycles in often politically unstable developing economies.

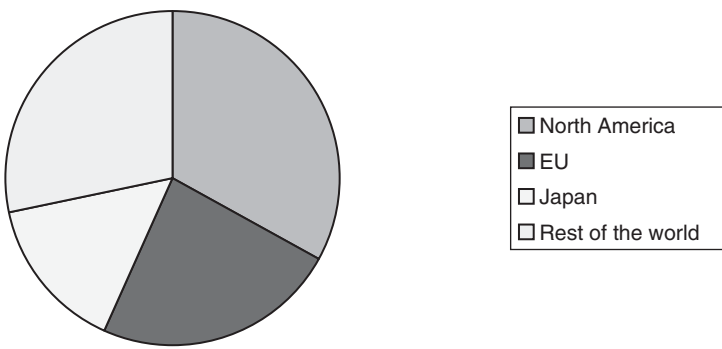

Figure 11.1 Distribution of GNP

Source: *Statistical Yearbook*, United Nations, New York, 2003.

'Visionary technologies'

When asked about technology development in the future, many people believe that in the future everybody will fly around in their own airplanes or helicopters, that we will live in subterranean cities or on the moon or that we will have implants of communication hardware operated into our ears or brains at birth. Another example is the assumption that large cities will have rail systems for commuters where people will no longer need cars. There will be individual railway cars for people when they need them and we will be able to order them to our doorstep via a phone or over the Internet.

These are some of the visionary technologies that have been presented in technology programmes on television. Will these be able to contribute to economic growth in the future?

Possibly. One of the issues related to these technologies is the one of timing. We need growth industries of substantial volume in the next decade, probably in the next few years. It usually takes time for a new industry to grow. The business that has been developed on the Internet is based on the growth of the computer industry that was founded more than fifty years ago. The habit of using telephones, which is the foundation of the mobile phone industry, has developed over more than one hundred years. The current high-tech industries have not been developed in the last decade. Products have been developed, habits have been changed and knowledge has been developed over a much longer period than this.

The message of this book is not that we are at the end of technical development. There are numerous possibilities, but new industries develop slowly and most of the new business concepts that have been developed in the past decade have only been more efficient versions of things that people have done for centuries. We need to realize this and start the search for genuinely new business opportunities. Maybe, some of the visionary technologies mentioned here are candidates that can become future growth industries, but it is also possible that they will not grow rapidly enough.

One other aspect of new business development is the genuine need for a technology and the willingness of people to pay large sums of money for new products or to risk large sums of money in an investment. Could we save time by flying in helicopters or

Continued

planes compared to going by car? Will we then be able to start at our house door and park in a parking space close to the building where we are going for a meeting? If we need to land forty minutes' distance from our place of destination, there may be no time saving. Are people willing to move into space or underground or would it be more convenient to practise birth control in order to limit population growth? Many developments that are technically possible may never happen, because they may not be the preferred choice. In other instances, they may not happen because it is difficult to find the money to invest. The existence of well-functioning alternatives, such as car transportation as an alternative to helicopters, sometimes makes it difficult to find investors who believe that a new technology could compete with existing alternatives. In Parts IV and V we look at business opportunities that are realistic and that could be exploited almost immediately.

We cannot rely on developing markets to sustain economic growth in the global economy, at least not yet, and we cannot be certain that a number of visionary technologies will create new jobs in the short term. We can now focus on the limits of growth in the developed economies, because this is what tends to drive growth in other parts of the world.

I have argued that the fact that nothing can be done in less than no time and at less than no cost could curb economic growth in the future. How do we go about analysing whether growth opportunities could be exhausted in more ways than this? It clearly is a tricky question and I do not hope to be able to *prove* that there are absolute limits to growth. What I hope to be able to do is to show beyond reasonable doubt that more and more companies in the future will face genuine barriers to further development and that a large number will probably also face a much more difficult growth situation than they have in the past.

We have already seen that the absolute limit of reducing time in products and processes will mean that companies that are driving towards compressed time will find it increasingly difficult to develop further advantages in this area, and many will have to develop advantages in new areas. We may also note that there are relatively stable limits to growth in other areas as well.

Mature markets

Companies in the past have experienced saturated or mature markets. The fact that a product or a market has become mature has been seen as a sign that a relatively stable barrier to development has been reached. Sometimes, companies have found ways to invent new product features to 'revitalize products' in order to make growth take off once more, but in many cases this has been difficult to do consistently, because there are actual limits to how much can be consumed or used of a certain product or limits to how much people make use of a product. Companies that work in a particular industry usually know reasonably well what the factors are that drive growth or that limit growth. In society as a whole we have substantial amounts of information about things like the relationship between GNP growth and individual consumption. Yet, this knowledge is not as widely spread as we may believe. I often hear people make unrealistic assumptions about key economic relationships. When we make prognoses of future growth we must base our work on the best information that we have about what has driven and limited growth in the past. As an example, we cannot expect people to increase their consumption in the face of a recession. We could look at a few examples of how such limits of consumption limit the growth potential of a market.

A human being needs only to consume a certain number of calories per day. Over-consumption, which has already happened in many countries in the western world, can result in obesity and sometimes illness. We can still increase our intake of low-calorie food, which is a potential growth area still for the food industry, but there is a limit to the total amount of food that human beings can consume. Even if this limit seems to be negotiable, there is still a limit to the amount of money that we can spend on food. This amount tends to be dependent on economic growth. When people have plenty of money they tend to spend more on expensive food and better restaurant meals. When we have less money to spend, we spend less on such 'luxury' items. Thus, limited growth opportunities in other areas tend to limit growth in the consumption of more expensive food. Companies in the food industry are aware of how fast this market is growing and how this type of consumption is affected in a recession or a stagnation. There is no reason for society as whole to found any unrealistic expectations on this market.

There is also a limit to the amount of fluid that we can take in and there is definitely a limit to the amount of sugar we can take in through our food and drink. We may increase our consumption of non-sugar beverages and beverages with artificial sweeteners, but there is still a limit to how much we can drink in a day. This may increase, but the above argument still applies that we tend to cut down on spending when we have less money and we need growth in other areas of the economy to increase our consumption of expensive beverages.

Another example of a product where there is a limit to the amount that can be used is detergent. We tend to change our habits only slowly and we may increase the frequency of washes or wash fewer clothes each time we run the machine, but with a given number of people in the western world, the amount of clothes that need to be washed is given by the amount of clothes that we are wearing every day, which tends to be relatively stable. Detergent manufacturers can naturally invent new and more powerful detergents and persuade us that the new product makes our clothes ultra-clean and that we should be willing to pay more for this, but the truth is that there are diminishing returns to the further development of a product that already takes away most types of stain. The idea in the past few years has instead been to make people pay more for compact detergent, a development that could possibly be sustained for some time.

Many types of traditional products are facing some type of maturity. Clearly there are limits to how much furniture people can use, since the amount of furniture that is needed is related to the floor space. In the same way there are limits to how much soap and shampoo people need to use, how many desks people need at work and how many bakeries, grocery stores and steel plants are needed. In many areas we can identify the limits to growth and we can see that the slow rate of growth in a number of industries is there because consumption and investments have grown to a situation where these factors are close to certain limits. In principle the amount of money paid for these things could still increase, because people could buy more expensive varieties of things or change their furniture or clothes more often. In reality there is a segment in the market for which this is a valid argument, but there is also a large segment that increasingly buys low-cost goods, private brands and generic products. This is shown by the growth of such companies as IKEA, private brands like Sainsbury's cola or Virgin Cola instead of Coke and Pepsi and other products that are sold under retailers' own labels. Customers tend to become better and better informed, and in order to charge a premium, companies need to offer

superior quality or more interesting features. The idea that increasing individual consumption would be a way of staving off a recession that is caused by a decrease in the need for investment is not supported by experience from the past. The first thing that people tend to cut down on during a recession is luxury goods and other forms of individual spending.

There is one additional problem with the assumption that private spending may cause economic growth in the future. Consumer goods companies invest in the same type of computer systems and production technologies that business-to-business firms do. This means that an increase in the demand for food or other consumer goods would not create the same amount of new resource needs in the future as an increase in these fields has done in the past. In their internal processes consumer goods companies are also coming close to zero cost and zero time. Many companies will be able to increase production substantially in the future, without creating new jobs or new investment needs.

A new view of growth

We may take a new look at the type of growth we have experienced that comes from the electronics industry, the service sector and a few other industries.

I worked for five years in the early 1990s with a Scandinavia-based consulting company called SIAR-Bossard. This company had an academic background. It was founded by a business school professor, who also served as a visiting professor at Harvard Business School for a few years, by the name of Eric Rhenman. One of the analysis tools of this company was a number of industry logics that we used in order to analyse the most important factors that drive growth in different industries. The industries were not defined in the traditional way as steel, paper, etc. Instead we had industries with 'brand based logics', 'raw materials based logics' and 'service logics'. The type of logic that I will discuss here is called 'the project based industry logic'.[19]

In a number of projects during the 1980s, this consulting company found that many industries have no lasting markets, and instead they grow through 'investment waves'. An investment wave starts when a new piece of legislation is passed, when a new technology is developed or when a market is deregulated. It then grows to a point where all customers that need the technology or to whom the legislation applies have adopted the change, and growth then turns into decline and com-

panies need to live off a market for smaller refurbishments and maintenance until a new investment wave starts as a new technology is developed or some new legislation is passed.

SIAR, as this company was called before the merger with the French company Bossard, worked in a number of industries where the existence of investment waves became obvious. In the 1970s, Swedish shipyards produced heavy tankers for oil transportation. Super-tankers was a new technology that was introduced in the 1960s, and these huge oil ships reduced the cost of oil transportation to a level that was much more competitive than the use of smaller ships. Swedish shipyards saw this as a market that would be stable for a long time and they saw no reason why demand in this market should dry up. Apparently, they had not calculated the total amount of oil that needed to be transported in the world and divided this amount by the total annual capacity of a super-tanker. Had they done this, they would have realized that the market for tankers would be saturated when the necessary capacity had been installed.

When the market became weaker most of the remaining orders went to Japanese shipyards, because they had lower production cost and lower prices. This led to a regional crisis in areas that were dependent on the ship-building industry. While shipyards in other countries started to search for new markets outside tanker building, Swedish shipyards had organized themselves entirely for tanker production and it was a very slow process to change the mind-set of management, politicians and the local communities. The Swedish government subsidized the under-utilized ship-building industry for a number of years in the belief that the demand for tankers would come back. At the same time Finnish shipyards started to gear up for the production of luxury cruise ships. Now, there is almost no ship-building industry in Sweden. Instead, Sweden has jumped on the bandwagon of the electronics and mobile communications industries, and hopefully learned something from old mistakes.

In the 1950s the Swedish government started to realize that the quality of Swedish apartment houses was too low. There were still many apartments that had been built in the nineteenth century. These had primitive toilets in the back-yard. A decision was made to dramatically raise the standard of living in the country. A plan was made to facilitate the financing of one million new apartments in ten years between the mid-1960s and the mid-1970s. For a country with a population of eight million people, one million new apartments is a

large number. At the same time many old apartments that remained in areas in or near city centres were refurbished and modernized. This created a huge market for construction firms and for firms that supplied material and equipment to these houses and to the building sites. Companies that sold elevators, bathroom equipment, flooring and other products experienced a boom. After this boom, construction activities could not go on at the same level and construction companies that had leading positions in house construction saw their markets wane. Even if there was another boom in house construction during the 1980s, there is no way that a population of between eight and nine million people could sustain a house construction market of 100,000 apartments per year. The normal level is much lower than this and between the booms there is a market for maintenance and refurbishments. (It turned out that many houses that were built during the boom in the 1960s and 1970s were relatively poorly built. This created maintenance needs in the 1980s and 1990s and in some cases houses have even been torn down.)

One Finnish company in the elevator industry, Kone, is a company that has found a continuous market opportunity in the elevator sector, even in times when there is only a small demand for new elevators. In the 1980s they and other elevator companies across the world realized that there are large numbers of elevators that work for years without maintenance. There were also many elevators that needed to be modernized. The lack of maintenance and modernization was both a safety hazard and a matter of convenience. Better and safer doors, higher speed and other factors are important for tenants. By signing up landlords for maintenance contracts that are in line with legislation and by offering them refurbishment kits, these companies found substantial new markets that could be profitably served on an on-going basis. This is, however, only possible for a small fraction of all companies. It is difficult to sell annual maintenance of water taps, bathroom equipment and electricity sockets. Elevators is not a unique example, but one of a few where a maintenance business is possible.

Instead, most companies in industries that are driven by investment waves have to subsist on a lower level between investment waves. We must note that there are instances of legislation and new technology development where this does not lead to an investment wave, but to a new on-going market. In the case of catalytic cleaning of exhaust gases from cars, this legislation and technology development have led to a market where all cars in the future need to be equipped with the

technology. The same is true for car safety devices like safety belts. It is only when the lifetime of the equipment is so long that it does not need to be constantly replaced that there is an investment wave. Cars are regularly replaced and this creates an ongoing need for catalysts, but all water purification plants in a country get a new technology within a few years after a law on improved water purification has been passed and then it works there for decades and during this time it does not need replacement. Houses last for decades and sometimes for centuries, so that we do not need to keep rebuilding all houses. Instead, we maintain and refurbish them so that they outlast generations.

The point of this description is to ask whether many more markets than we previously have thought may have the same logic as these investment-wave-driven markets. To some extent, we have already shown that some features of such markets are present in the growth areas of the last decade. One such feature is the existence of a limit that effectively limits the size of the market. In the tanker industry the limit was reached when 'all' oil that was produced in a year could be transported on cost-efficient super-tankers, and in the housing sector the limit was reached when everybody in a country could live in a decent apartment of a size and shape that worked well for them. When these limits have been reached, growth slows down or the market may disappear altogether.

Is the whole computer market an investment wave? Maybe we will experience a situation in the future when there will be no need to further develop new computer technologies. In order to understand how current growth industries may be examples of global investment waves, we make another brief historical detour. The current computer industry started its growth in the 1940s when the first commercial computers were sold. At this time the founder of IBM forecast the total world demand for computers as approximately five units. Computers were huge and complex, yet the early computers had very little computing power compared to present-day machines. Parts were large and the current miniaturization of the computer started when the semiconductor started to replace transistors. Growth in the computer industry has been going on since the beginning, through a constant and rapid development of new technologies and an on-going miniaturization, combined with rapidly increasing capacity and decreasing price.

Even though the computer market has been expanding for so long that we believe that the constant development of new machines,

standards and programming languages will continue forever, we can still see that the past fifty years of development have been an investment wave or a series of investment waves that may slowly be closing in on a point of saturation.

If network computing becomes the norm, people and companies no longer need to constantly invest in new PCs. We have started to believe that the user will always need a new terminal, to accommodate the need for more and more capacity, but if capacity is no longer located in the terminal, this may change. As a consultant I have often come to companies where they have used software and hardware for old systems for fifteen or twenty years. This was the reason for the large need to upgrade systems before the new millennium. Companies had bought systems in the mid-1980s that they expected to have to change within a decade, but the need to invest in other systems all the time made companies keep systems longer than expected. They even upgraded old systems in 1998 and 1999 so that they would last another few years into the new millennium. Often these systems have been migrated into modern hardware environments, but it is still the same old systems that are running. The network computing systems with thin clients that are now in use at more and more companies and organizations are installed with the purpose of reducing the need to constantly upgrade user terminals. We cannot judge for how long these new systems will be in use by measuring the frequency of updating PCs in the past decade. We need to look at situations where products have not become technically obsolete at as high a pace to understand the logic of replacement of this type of terminal.

When all users of the Internet can access and order all books, CDs, DVDs and games in a particular market in close to no time, there will not be a need to invest more money to be able to offer this service faster. When many people have broadband access, it will not only be possible to order the CDs, books and DVDs in no time, but the whole film, book or record can be accessed and downloaded in close to no time.

When an exchange of information between companies or between consumers and companies can be completely automated it can be done without the use of manual labour in close to no time. Can this be improved in terms of cost or speed? Will it be possible to justify further investments when the limits of time and cost have been reached, or is the current development of business processes and implementation of business systems an investment wave that will subside when the limits of time and cost have been reached?

The most advanced mobile phones (I write this in December 2003 and when the book is published in the autumn of 2004, this will already be yesterday's technology) can communicate speech, documents and pictures and they can also be used as game consoles and MP3 players and for a number of other purposes. The constant development of new models of mobile phones may come to an end, because there are not very many additional electronic services that could be included.

These simple examples of areas where we may already be close to the limits of development, may serve to raise the question of whether these are examples of investment waves. The electronics and mobile communications industry are closing in on the limits where growth is likely to become more and more difficult to attain in the future.

Since the early 1990s low-fares airlines have grown rapidly and forced traditional full-service carriers to offer similar services. Southwest Airlines, Ryanair and German Wings are only a few examples of this trend. I do not claim that the need to travel with these companies could be interpreted as an investment wave. No; but the establishment of a new type of airline and the establishment of a number of new companies in this sector will prove to be one. Each of these new companies needs capital to buy or to lease aircraft and they need to employ pilots, stewardesses and ground personnel.

There is a limit to how many companies can operate in the world market, and when this number of companies has been established there will be no need to invest in new such companies. When people have become accustomed to flying inexpensively when they have the need, the market will grow at a slower pace than at present.

The growth of this industry is an example of an industry where a particular set of circumstances has created a one-off opportunity to create a new service concept. The fact that this has happened in the airline industry does not mean that there necessarily exist similar opportunities in other industries or that low-fares airlines can continue to grow forever. Each such development needs to be understood on its own merits. There may exist a number of similar opportunities in other industries that can be released through legislation, deregulation or technology development. It may also become very difficult to find new growth opportunities in the future. If we do not analyse each particular situation we cannot possibly know. The market forces cannot help us to create new growth opportunities if the number of such opportunities is starting to become exhausted.

A lot of discount business

In the past decade discount business has been on the rise. We now have low-fares airlines, low-fee taxi companies, discount retailers, low-price hotel chains, private brands, inexpensive Internet services, broadband, lean production and lean management and low-cost materials, such as plastics. The creativity at reducing cost has been tremendous, but companies seem to have been less creative in the development of new sources of value.

What developments are there that would not be affected if companies are coming close to the limits of development? I have worked as a consultant in a large number of industries and I have used many of them in this book as examples of industries that are coming close to time, cost or capacity limits. Even the development of military weapons seems to be closing in on limits in a number of respects. Missiles can be used to strike the enemy in almost no time and with increasing exactitude. They can now be guided to hit their targets almost exactly where they are intended to strike, even if the target is moving. This does not mean that warfare has come close to its limits in all respects, but in a number of ways we can see that there are limits also in this area.

One field of development that I thought had nothing to do with time, cost or capacity is the field of research and exploration, but this is clearly wrong. We now have technologies that we can use to explore space and the sea and bore deep holes in the ground. There are no longer any areas or climates in our vicinity that we cannot explore or research. We may, of course, develop better, cheaper and faster space ships or vehicles for sea exploration, but we can see that there are limits to this development as well.

In the fields of DNA research, instrument companies constantly develop new instruments that can analyse more samples in less time. Even tasks like protein sequencing of DNA have now been automated. The cost of each analysis has decreased from hundreds of dollars fifteen years ago to a few dollars today.

The claim that time, cost and capacity have been important drivers of development in the past and that there is no other driver that can match these, is not so adventurous, after all. It is easy to show the importance of cost and time reduction in all areas where I have experience. It is much more difficult to find areas where development has had nothing to do with them.

Another trend that has set off the creation of a number of new industries is the trend towards out-sourcing of services, production and product development. This has been going on for a long time with the out-sourcing of computer services and security and it continues to go further and further. Today, the most advanced companies out-source accounting, logistics, invoicing, production and even product development. The situation has gone so far that some researchers and authors call the trend 'vertical disintegration' and note that in some industries this is going on at a 'blinding pace'.[20] The idea is for companies to be able to focus on their core business and try to out-source all functions that are not core. In a consulting project for the Swedish government's IT-Commission in 1999 and 2000, David Lundberg and I described a new type of industry structure with new forms of specialization for various types of companies.[21] We identified companies that could specialize in production, companies that could serve as electronic intermediaries, logistics companies, and so on, and within each of these categories it is possible to identify even more narrow areas of specialization. The point of this is to say that there may exist a limit to outsourcing as well.

Economists tell us that traditional monolithic organizations existed because this was the most efficient way of organizing a business, because it reduced transaction cost in a situation where computing and electronic communication were only weakly developed or not developed at all. The recent growth of the outsourcing trend, so economists tell us, has come about because electronic communication and computer technology reduces transaction costs so that even communication between separate organizations can be performed at a low cost. In this new situation there are even higher transaction costs associated with the monolithic organization form. We do not know whether the transition to completely new industry structures will ever be completed. But we may assume that there exists a potential situation where outsourcing can go no further and a new stable structure has been arrived at. Outsourcing may not be a random restructuring to find any of a number of more advantageous new situations. Instead it may be a gradual move towards a state of equilibrium, which is based on a situation where the structure facilitates production and administration at the lowest possible cost and where all transaction costs are minimal. We may even give it a name. In our E-step Model, David Lundberg and I called it 'E-values', the fifth and final step of our model.

We have thus seen that business developments that have been important drivers of development in the near past may be examples of

investment waves. When the wave of investment is finished or when a restructuring is completed, activity wanes, and companies that have profited from the wave have to subsist at a lower level of business activity.

The problem is that our economy as a whole cannot subsist for very long on a lower level of business activity. In order to experience virtuous circles in society as a whole we need to constantly be able to find new sources of growth, because resources like labour and capital need to be employed in order for society to function. People must be able to buy food, and people who own capital must be able to invest this profitably for the global economy not to break down.

In the first chapter of this book, 'A Grim View of Development', it was argued that time is not one among a number of different competitive advantages that have been pursued in the past. Instead, development in many industries can be interpreted as major efforts to reduce time and cost. Through centuries and millennia humans have struggled to simplify production and make tools and products less expensive and easier to manufacture. Now we are finally in a situation where many things can be done in close to no time and at a very low cost. Time and cost reduction has been an extremely important driver of development, and we need to find out exactly how important it has been and we also need to identify the ways in which we are now approaching the limits of time compression and cost reduction. This is not a task that we can take lightly. The examples of relatively detailed process analyses, that are given in Part III of this book, only 'scratch the surface' of the need to further investigate this topic.

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Part III
The Race Towards Zero

‘Unless my friend could be persuaded to spend a few weeks studying the same cases, he would continue to believe that each one could be explained away as fraud or deception. If I had actually said that to him, he would have felt that I was being patronizing. He was convinced – quite correctly – that his powers of reasoning were as good as mine. What he could not see was that, if reason is to be effective, it has to operate on a broad range of facts. Without facts to work on, the most brilliant deductive mind in the world is spinning in a vacuum.’

Colin Wilson[22]

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The General Drive to Compress Time and Reduce Cost

Why worry about computerization? Companies have invested in increasingly efficient production technology for a long time and computers have been in existence for more than fifty years, and we have never experienced anything but growth and new opportunities from this development. Even if the previous chapters have provided examples of the current development, we still do not have a complete picture of why this development is different from previous attempts at computerization. I will try to show, sometimes in painstaking detail, what the significant differences are and why we now need to fear recession from a development that has previously contributed to growth.

At the core of this argument is the idea of the limits of time compression and of cost reduction. Another key aspect is the use of the most modern technologies for production, logistics and administration that are available. A number of technical developments in different areas have made these changes possible. First, in the case of production technology the digitalization of machines has played an important part. Second, is the development of new management principles, such as time compression and its offshoots. Third, is the increase in computing power, decrease in the cost of computing, the establishment of the Internet and the invention of the graphical user interface, that makes it possible for everyone to utilize computers for advanced purposes, without knowledge in programming. When I was a student at the university we could only use a computer to do statistical calculations if we had some basic knowledge of a programming language. To perform advanced tasks, you had to have advanced knowledge of programming. Today, people can perform advanced analyses without any knowledge of programming, because of the availability of such systems as Excel and

the graphic user interface. In the same way more and more tasks in all areas can easily be performed without expert knowledge. In many situations tasks and whole processes are even completely automated so that no manual labour is required to perform them.

The road to conformity

Twenty years ago manual communication between departments inside organizations dominated. Different companies that used relatively similar levels of technology competed against one another. Competitive advantages were created through an understanding of the customer needs in a market and the ability to build organization structures and competences within the organization that could satisfy those needs. The development of this type of advantage has often taken many years and the structure and competencies are often difficult for competitors to copy. In one industry it may be of supreme value to customers if they get above-average support at the point of purchase. The response to this could be to provide sales people with information that they have not previously had access to, or to hire people with a superior education or to train people in skills that they did not previously possess. In another industry a number of customers may value a product of a slightly higher quality or in a slightly wider range of colours than before. To collect this information, understand its importance, and take the right action, weighing cost and competitive advantages against each other, and to improve the competencies or skills in the right way, takes time and persistence. Often it may have been more luck than skill that made the founders and managers of a company configure their business idea in a particular way. Even subsequent steps may be taken because of luck or meticulous analysis, but it took time to arrive at a superior configuration of skills and resources. In an analogue environment the configuration of an organization's skills that were arrived at after much experimentation was difficult to copy. The path that had been followed in order to arrive at a particular solution may never have been clear to anybody inside the company, or had been forgotten. So no one really knew why a company had made certain decisions. When I worked as a strategy consultant in the early 1990s one of the tasks in a strategy project was to understand what the unique competitive advantages of different competitors in an industry were and how they had been developed.

In an environment that is streamlined through the use of integrated IT-systems and where modern production technologies compress a

number of process steps into one completely automated process, the situation is different. Any piece of information that is needed by a customer can be made available to the sales force, or to the customer himself over the Internet, an extranet or to the sales force via an intranet, if this is appropriate. There is little need to go through lengthy learning processes, where different customer needs are weighed against each other, because the cost of making information available is relatively low.

One key competitive tool in wine retailing has always been the skills of the sales person to recommend a wine that goes particularly well with a certain dish. Sweden has a national state monopoly in the area of retailing of alcoholic beverages and the quality of advice has varied substantially between stores. It has also been expensive and difficult to develop the competence of sales persons and keep it up to date with changes in the product line. Now, it is possible to use the web site of this company, enter a particular type of food into the system and ask the system for a selection of wines that will go well with it. This tool can also be accessed in the stores by the sales people if they feel uncertain about a recommendation. Still, some people enjoy asking the sales persons in the store, but no employee has to feel ashamed because of his or her lack of competence or interest in this area. Similarly, no customer needs to feel unlucky or badly treated because the quality of advice was not as good as he or she had expected. Many customers use this tool at home when they plan dinners and these customers arrive well prepared at the store, where the electronic service saves time and cost in the sales process. In the case of the Swedish situation, there is no competition, but we can see that this type of system would be very easy for a competitor to copy. A competitor could even go into the Internet site of the first company that implements the tool and copy the advice from there. Almost no knowledge of wine would be needed to set up copies of it.

In the transportation industry, customers could look up the status of a package themselves by using an extranet to go into the data-base of the logistics company. If this turns out to be a competitive advantage, other companies could offer the same service in a few weeks' time. Twenty years ago it would have required a major investment to make this information available, and it would not have been done if it did not really represent a competitive advantage to the company. It is still true that it requires some resource to make data available in this way and that it is important to prioritize investments. The cost and difficulty of making information available in one part of the company that

is already available in another part has, however, decreased dramatically with the development of modern IT-solutions and Internet technology. Once an intranet or extranet has been created it can be used for a hundred years, and customers can always gain access to new information.

Since any customer in the world can access information about their goods in close to no time at close to no cost, there will be little need to invest in a new system in order to improve the cost position or the time aspect. Instead, the longer the system is used, and the larger the number of transactions that have been run in the system, the lower the cost per transaction. Information that is frequently asked for can easily be made available and in many cases the implementation of an integrated business system makes it possible to make information available to anybody anywhere at a very low cost.

In another situation a competitor may have reduced his cost substantially by reducing manual work, lead times and stock to a minimum through the implementation of new processes, modern machinery and a new business system. The quality of the products from this company may now be perceived to be more reliable than that of competitors, because of the automated workflows that guarantee that each task is done in the same way every time. It will be difficult for the competitors of this company to make a profit if they use manual routines that are several times more expensive than automated ones. It will also be relatively easy for competitors to copy the business model used by the first company, and implement similar systems solutions and purchase the same technology. These are likely to be available in standardized business systems, and any company that implements this type of system creates processes that are similar to those of its competitors. This is because the parameters needed to manage a certain process are already built into the system. In the old days companies needed to experiment for years to implement a working variety of order-based manufacturing. It was important to decide on how exactly sales, production and purchasing should cooperate in order to arrive at an optimal relationship between speed, cost and product varieties. In a modern system the different parameters can be set up in the system and tested during the course of a week. The consultants who implement the system often have experience from similar situations in other companies, possibly in the same industry. In case their experience and manual calculations are not good enough there are systems that provide help in process simulation and the optimal configurations of work routines. Systems suppliers, such as SAP, have found that different companies in a particular industry want to configure their systems in a similar way. Because of this,

they offer their systems in industry specific versions where many parameters are set from the beginning. Many systems suppliers offer such specific versions for industries like the paper industry, the food industry, utilities companies and so on.

In addition to this, where the industry leader has changed its processes and the way of working together with suppliers, many suppliers to this industry are likely to have changed their way of working to suit the first company. This often makes it easier for competitors to copy the leader's move and to learn how not to repeat the biggest mistakes of the first company, which are likely to be well known in the industry. In all aspects of the change a substantial amount of experience will be built up that can be accessed by companies that repeat the actions of others. It has taken the automotive industry almost twenty years to arrive at its present level of automation and time compression. With the use of modern ERP and supply chain management systems, system integration technologies and consultants and managers with advanced process development skills, it may only take half that time or less for companies in other industries to cover the same distance.

The strategic use of IT ten years ago

In a discussion a friend admonished me for only looking at the difficulties in this development: I should also try to find a number of 'beautiful examples' from companies that use modern IT solutions in a creative way to develop unique business advantages. He mentioned the clothing company Benetton, which ten years ago became known for its investment in a sales system that communicated store sales of different articles back to production in real time. In order to take advantage of this instant information flow regarding customer behaviour, the company produced un-dyed knitwear and dyed it when they received information about which colours were sold in the stores. This substantially reduces inventory volumes, cost and risk in the system, just as Dell's order processing on the web has done.

Now, the principle of point-of-sales (POS) systems, as these systems are called, has been applied in many industries and 'POS' has become a part of IT jargon. Another example of a company that applied such a system at an early point comes from Toys'R'Us. When this company launches a new product in their stores, sales are monitored on a day-by-day basis, and orders to manufacturers can rapidly be increased for toys that sell well. In the same way,

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additional orders can be cancelled for toys that do not sell so well. Suppliers of less attractive toys do not need to manufacture more of those and the whole supply chain can benefit from this real-time information from sales.

For a few years the efficient use of POS systems constituted a competitive advantage. Today, they are available as standard systems that are much less expensive than ten years ago and any company can buy them off the shelf. As Porter noted in his 2001 *HBR* article (see ref. 18), standard systems no longer constitute a competitive advantage. In the fashion industry, clothes used to be produced in Asia, because of the cost advantage. Volumes of clothes are now produced in Eastern Europe and companies can now use POS information to replenish stores in season with clothes that are sewn on demand close to the European market. The delivery times get shorter and shorter and the implementation of a POS system is only the first step in the change of this type of process.

In the same way, 'cross-docking' at Wal Mart was a creative practice that constituted a unique advantage for a number of years. Now, this is common practice in logistics companies. Some companies apply it more skilfully than others.

As mentioned before, Gary Hamel provided us with nine examples of 'creative applications' of electronic business that had already been copied extensively on a global scale when Hamel's book was published in 2000 (see ref. 16).

I try to find 'beautiful examples' of unique ways to apply IT that cannot easily be copied, but I fail. I have discussed issues related to e-business with managers in a large number of industries, some of which have been mentioned in this book. They tend to complain that IT investments that they have made can be copied by competitors.

It would be pointless for me to call the latest practices based on IT-implementation 'creative'. Before this book is available to the readers, the IT solutions and business practices that are new in early 2004 will already be available as standard systems. They will be applied by consultants on a global scale to improve business practices and offerings and there will be nothing unique about them.

In my discussion with my friends we also discussed IKEA. How could the development of IT and e-business reduce the competitiveness of this company? IKEA is one of the few companies in the world that has no close competitors of its own size in the global market. There is no other company in the world that is currently

expanding a distribution concept for self-assembly furniture on a global scale.

The advantages of IKEA in terms of scale and global presence are immense, and the advantages are not based on IT-solutions that are easy to copy. Instead, almost fifty years of development have given IKEA a number of unique advantages:

- Knowledge of how to design self-assembly furniture that is inexpensive, easy to assemble and yet nice-looking and durable.
- Knowledge of how to organize design, production and packaging of products so that the previously mentioned advantages are maintained in product after product.
- Creation of a global brand that is based on a strong tie to its Swedish origin and the unique, simple and tasteful design that is globally known as 'Scandinavian'. The distribution concept and self-assembly idea are other important aspects of the brand image.

Not many companies enjoy this type of position and it becomes increasingly difficult to create it. IKEA has been created through a long process of trial and error. Companies that are founded today are increasingly based on the application of 'best practices', IT-supported processes, and a number of global consulting companies use the same methods to rapidly start up new companies. In many cases companies are copies of existing companies from the start. Because of the unique business idea and knowledge base the business concept of IKEA isn't easily copied.

To illustrate the point that companies are increasingly easy to copy, we could take the example of a knitwear company. Fifteen years ago such a company would be structured around manual administrative routines and manual communication between departments. As we have mentioned before, production required a number of steps that in different companies could be integrated in more or less efficient ways. Similarly, purchasing, production planning and order-taking could be integrated in a number of different ways, depending on the way products were sold, the lead times or the location of production or the customer requirements. The number of possible configurations of operations and of routines in such a company would be immense. One company could have the whole production process in Western Europe in order to stay close

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to the market and be able to respond quicker to changes in market demand. Another company may have decided to produce at a lower cost in Asia and accept the longer lead times and the transportation cost that would result from this.

If we started up a similar company today, we might organize it around four standardized building blocks: modern knitting machines that eliminate the steps of steaming, cutting and sewing from the production process, an ERP system of a 'fashion industry' version, a POS system that could provide sales information from the stores in real time to production and an extranet that could be used by customers to monitor the status of their orders. Using these building blocks, a company could minimize the number of manual tasks in each process and production could be located anywhere in the world, because labour cost would not be an issue. Preferably, production would be located close to the market, so that lead times were minimized and as much as possible of production could be run in season, in order to reduce risk and minimize inventory.

Through the use of these standardized tools, we would not need experience from the fashion industry, as we did before. With all resource needs reduced to a minimum through automation, this type of company could be set up in the same way as broadband service providers and mobile phone companies were set up during the IT-boom – from scratch by a number of consultants and managers with largely general management competence. There are still areas where experience and industry skills would be required, but these areas would be fewer than previously. A small number of experienced managers who knew the business would be needed. Design would still require experienced designers and production would still require production competence, albeit in fewer individuals than previously. Purchasing of yarns and other consumables would require someone who knew these industries. There would be no need to integrate the different steps in production, no need for expertise in sewing, no need to integrate administrative flows, because these are integrated automatically by the ERP system. If four companies were set up using the same components, these companies would be relatively similar and existing companies would gradually move towards the same type of configuration as the one mentioned here. Regardless of which customer categories are served, or the geographic markets, or the types of garments produced, the same building blocks would be more efficient than any other existing way of organizing this type of production. There are

no customer categories that prefer long lead times or high prices. This is the reason why this sub-heading is called 'The road to conformity'.

The company that sells 'natural' cosmetics, The Body Shop, was a success story ten years ago. The unique strategic position of this company in the area of natural and environmentally friendly cosmetics that had not been tested on animals, was seen as a sustainable position. Now, we can see that the business idea of The Body Shop has been extensively copied and there are many companies that offer natural cosmetics in various types of retailing concepts. The design, production and distribution of these products seems to be much easier to copy than the design, production and distribution concept of IKEA.

I find it difficult to identify 'beautiful examples' from competitive advantages that are derived from IT and it seems as if other types of advantages are increasingly copied as well. Companies are gradually becoming less unique and it is difficult to think of new and innovative products and distribution concepts. Most companies tend to use the same standard systems and more and more companies arrive at a situation where time and cost have been reduced to a minimum. In many ways companies perform better than ever, but it has become more and more difficult to make a profit.

At the point of implementing a business system, a POS system or a new production technology, it is usually not considered to be a strategic issue whether other companies could set up their system in the same way. After all, each automated routine and each piece of information that is built into the system looks harmless enough. Issues that are dealt with in a project typically involve whether production should be done in batches or by customer order, and whether purchasing should try to purchase in optimal order sizes or order parts for each customer order, or on a weekly basis. Many of the general settings for one company will be the same for other companies in the same industry and many minor things may differ. Even if companies use different systems similar settings could be achieved. Standard systems are today so well developed that most include the same set of general parameters and alternatives.

Companies make superior profits by being different from their competitors. Now they implement systems that increase the similarities

between companies. This increased similarity between processes in different companies was noted by Porter in his 2001 article in *Harvard Business Review* (see ref. 18). As can be seen in the quotations made earlier from that article, similar companies find it more and more difficult to become profitable, even though their cost may be substantially reduced.

If the improvement of speed is coming to an end, companies will find that they are neither unique, nor faster or more cost-efficient than their competitors. Eventually many competitors will have arrived at the same level of efficiency and every competitor will be able to do almost everything at a very low cost in close to no time. In such a situation profit margins will be low and it will matter less and less to a customer which supplier he or she chooses. In order to see why companies decide to implement solutions that are not unique, we may look at a simple case study.

One food company that bought an integrated business system could choose between two alternatives: either they could pay for their almost fifty modifications in full themselves, or they could share the cost with the systems supplier. If they decided on the second alternative, they would participate in the future sales of the system, together with the adaptations, to competitors in their industry. In the case of such a sale, the other customers would have to pay for their share of the adaptations. The management team at this company considered that the system was an administrative tool, much like any other administrative tool, and that there was no particular reason to guard the modifications. The advantage of sharing the cost of making them would be more important, since any competitor would be able to access the same functionality relatively soon by building it into another standard system.

Until a situation is reached where all competitors use similar systems to run processes in close to no time and at very low cost, we are likely to experience a move towards greater and greater conformity of competing organizations and increasing difficulty in achieving satisfactory profitability. There are no easily identifiable pockets within an organization that will by necessity go unaffected by this development. In the early stages of this development, which are the only ones that we have experienced so far, there is still so much 'inefficiency' in organizations that there is substantial room for variations between competitors. In the way that is described in the example of the construction of a road between A and B above, different companies start from different situations and with different activities. The end result will be an almost straight line between A and B, and at this point there will be few variations between the three solutions. Different companies end up

with processes that take almost no time and cost almost nothing to perform.

Reasons why it takes time to arrive at optimized processes

Through the use of modern IT technology any company could develop processes that are optimal, meaning that they are automated as far as possible and that they could be performed in minimal time and at minimal cost. In each industry and for each company there are a number of reasons why this could not be achieved immediately. We will now look at some of these reasons.

When companies first bought IT-systems they were used in order to increase the efficiency of paying salaries each month, or to monitor stock in the warehouse. The salary system was used only by the personnel department. They were the only people who could enter data into the system and data could only be taken out of the system by the same people, always in the same form. There were pre-specified lists, payments to the bank accounts of the employees or summaries at year-end that were programmed into the system. In order to make a new type of listing a programmer had to be asked to create this. People who were going to run a system had to be specially trained and no person outside of the department in question had any reason to get such training. Terminals for a particular system were often specific for the particular type of computer used for the system and people in different departments could have different terminals that were only fit to use for their particular set of systems.

All systems in a company were unique; they sometimes required unique hardware and always unique training. When material was taken out of stock, the people in the stores had to do the transaction in their system before they handed over the material to production. In the production department they started the work order (if they had a system for this).

Since the systems all worked in isolation they created a substantial amount of administrative work and they had little or no influence on how companies were organized. When I worked as a consultant in the early and mid-1990s I often met this situation. It was, for example, difficult to know exactly how much of a particular type of material had been used in production, because this piece of data was not of particular interest to anybody and it was thus not possible to find it in any system. At a number of hospitals we wanted to know exactly how many chemical analyses had been done at the lab and how much each analysis cost, and it was impossible to get this data and make it comparable

between different labs. No laboratory knew exactly how many analyses of each type they actually made, because there were always a number of sources of distortion in the figures. When we tried to follow up the cost of each analysis we encountered even bigger problems. A cost figure was assigned to each analysis, using a standardized price list, but nobody knew how much manual work each type of analysis required or exactly what quantity of reagents were used or the cost of these reagents. They were bought in bulk and the exact consumption per analysis was not followed up. The same situation was found in all kinds of organizations and departments.

In this situation it is relatively obvious that it would be a saving of administrative cost for the company if different systems were integrated with each other. Alternatively, it would be an advantage to have only one system that contained all data and where the number of analyses of different kinds, the amount of reagent purchased and the manual time used for a particular task could be captured in the same system. Twenty years ago this was not possible. This integration still represents a substantial investment, but it is becoming easier and less costly for each generation of technology that is developed. The alternative to integration of existing systems, which is used by many organizations, is the implementation of a new and completely integrated business system.

In such a system, production knows exactly how much material and labour is needed to produce a particular product. Each time a work order is produced this generates a picking order in the stores of that exact amount of material, and a transaction is released to the costing module for the reagents used by the analysis machines. In this case the stores do not have to enter a new transaction each time they pick goods, and the information in the production system and the stock system is always synchronized. The only thing the stores have to do is to print the pick list and press OK when the order has been picked and sent to production.

Twenty years ago some exchanges of information could at high cost be achieved by messaging between different insular systems. Then the structure did not contribute to visibility or transparency within the company. Production would see when they received a production order, but they would not be able to check stock levels or purchasing orders, since these would be stored in systems in these departments. Sales would not be able to access the production plan on-line. They would have to enter the available production slots from a paper copy of the production plan or they would receive the production plan through a message run as an overnight batch. They would never be able to tell a

customer about the exact status of his order, because it might have been changed since the batch was run. As was shown above in the example from the special steels company, this situation still exists in many companies.

The description above is taken from many years of experience from working as a consultant with companies that have old IT-environments and it shows the difference between the different stages of integration between IT-systems.

Steps in business systems integration

1. Each department runs its IT-systems in isolation.
2. Systems are connected through messaging technologies at a high cost for each connection.
3. The isolated systems are replaced by an integrated system that provides transparency within the company or existing systems are integrated using modern integration software.
4. Companies can access information from other companies through 'extranets'.
5. Systems in different companies are integrated via EDI or other types of messaging, like Internet communication or mobile phone networks, to suppliers and other types of partners along the supply chain.

Using the Internet and company 'extranets' it is possible for companies to allow customers and suppliers to see selected data in their systems. These extranets could be set up so that a customer has access to the sales orders and production orders for his goods, in the same way that a travel agent has access to selected parts of the booking system of an airline. It is also possible to set up this communication so that a company can get information about the production status of the suppliers of his own suppliers and the suppliers of these companies in their turn. As has been shown in the examples above, there is usually a need to deal with a number of issues that are not IT-related in order to optimize process flows within a company and in a supply chain.

One complicating factor is that many large companies have grown through a number of acquisitions, where each company that has been acquired, and sometimes each unit, has a unique set of systems. In order to arrive at optimized processes in such a situation, systems need to be integrated both at business unit level and within the whole company. Often, different parts of the product line are produced at different

plants. In order to obtain similar processes throughout the whole company, where customers can check their order status on-line, for all production units or where the company can manage all production units in the same way internally and serve the customers in the same way from all units, information flows everywhere need to be aligned. For many companies this is now urgently needed, since customers increasingly expect to be able to communicate electronically with their suppliers. Some also expect to exchange information on a day-to-day basis through the use of advanced collaboration software, in the way that companies do in the automobile industry.

In many cases customers respect the fact that not everything can be achieved immediately, but if one supplier improves their systems structures dramatically, it becomes increasingly difficult to accept that others remain at a very low level. The same situation has been experienced by the automotive industry and car manufacturers have gradually decided to treat as first-tier suppliers only those companies that are able to communicate electronically via EDI and to maintain a high level of order in their operations through advanced IT-supported routines. Suppliers that have not been able to adapt rapidly enough to these requirements have either been displaced entirely, or they have been demoted to second-tier or third-tier supplier positions.

The complexity of systems structures

When we talk about integrating systems structures in a company we are not thinking of structures containing five or ten different systems. Many companies use between fifty and one hundred systems and a large group may have several thousand systems. Some of these may be integrated, some will be taken away and others may be kept for some time as stand-alone systems. The task of developing a plan for this is immense and very important. The business professors C.K. Pralahad and M.S. Krishnan provide us with the following example from General Motors:

> For instance, the CIO at General Motors estimates the organization has installed more than 7,800 distinct software systems worldwide, and more than 1,800 of those systems are dedicated to financial applications. Merely having that many systems doing the same tasks can be problematic. When systems are not compatible, transferring and sharing data, let alone trading knowledge, become almost impossible.[23]

If we look at this development from the perspective of time compression, we find that the initial stages of computerization still required substantial time for a process to be completed. Data had to be entered into every single system, and in order to transfer data to other systems a list had to be printed and the data entered again into each new system. This delayed the process between each step. It was also a costly procedure, since manual tasks are more expensive than computerized tasks. The computerization in the early stages saved some manual labour, but it also created new manual tasks and the net saving was not always very large.

One car manufacturer sent six-month production forecasts every month to 12,000 suppliers in the mail. At each of these a secretary had to spend between one and two weeks entering the data in the production planning system of the supplier. Today, a few hundred first-tier suppliers receive a six-month forecast every day via EDI. The manual labour involved in the dispatch of the data and in the entering of it all into the business systems of the suppliers has been reduced to zero.

In the later steps we see how processes are gradually facilitated by systems with a higher and higher level of integration between them. First, the most frequent transfers were automated with the help of messaging technology. In this case batches of data were transferred every night. The delay was at this time reduced to 24 hours, but the cost of these links was high. In later stages, the transmission of information is completely automated and immediate. This is first done within the company and later within the supply chain. This reduces the time and cost substantially. An order that is entered into Dell's order system at nine o'clock could immediately be broken down to orders for components and a minute later the suppliers could have orders for their respective parts. This reduces time and cost in the ways discussed in Part I, where we discussed the importance of time as a competitive weapon, but it also makes it difficult to go further in the same direction.

Grocery retailing

In order to prepare the reader for in-depth analyses of possibilities of future change we may look at a situation of change in the past, familiar to most of us. This example will help us to realize that change has been the norm in many areas of our lives in the past century. We now find it difficult to believe that we will do things in other ways in the future, and that companies will organize production, sales and pur-

chasing in new ways. It has always been difficult for people who are not close to a particular industry or technical development to foresee change. Companies that work in a certain area often know a number of years in advance what the next steps in a development are likely to be.

At the beginning of the twentieth century, people bought groceries in stores where few goods were pre-packaged. When people wanted sugar, flour or potatoes, the clerk in the store put the desired amount in a paper bag and weighed each item and calculated the price. This was a relatively time-consuming process, and when supermarkets started to appear in larger cities they needed pre-packed groceries, because it would not be practical for customers to pack and weigh goods themselves in a self-service store. To a large extent, it was the change to a self-service concept that created the need for pre-packed groceries, but this also saved time. One supermarket could serve many more customers in a day than the old type of store where clerks had to pack and weigh everything for each customer. The time saving and the efficient production and packaging of groceries decreased the cost of food. In the store, workers had to change their roles. The personal service consisted of checking customers out at the cash register when shopping was finished.

The supermarket was also an acknowledgement of the increasing competence of customers. Given appropriately packaged and labelled products, customers are able to serve themselves. In the case of IKEA, this company has found that customers all over the world are not only able to serve themselves in the store, but they are also able to assemble their furniture when they have taken it home. E-business is in many ways an attempt to further explore the abilities of customers to serve themselves, if they are supplied with the proper tools. In electronic banks customers can perform tasks that were previously done by bank clerks, and in electronic marketplaces they can configure products, such as computers, without the help of sales engineers.

Initially, the task of checking out customers consisted of reading the price tags and entering the price of each item into the cash register. Sometimes customers needed a written receipt, which had to be written by hand. Gradually this process has been simplified. Today, most of the items in a grocery store do not have a price tag. This saves the shop the time and cost of putting price tags on every item. At the cashier, bar-code readers are used in order to read the price of each item. The development of these readers has progressed during the last decades, so that minimal time is now needed to read the bar codes.

The German discount food retail chain Aldi waited for many years to install bar code readers in their shops. They relied on the efficiency of their personnel to enter prices on traditional cash registers. But during the 1990s the overwhelming advantages of using bar-code readers and integrating these with inventory systems and automated ordering routines meant that this chain, too, had to invest in the time-saving technology of bar-code readers. At the beginning, bar-code readers had only been used as an efficient device for the reading of prices, but gradually the whole product flow in stores became managed by the point-of-sales systems that were connected to the bar-code readers.

In some supermarkets, customers who hold loyalty cards are provided with bar-code readers at the entrance. They can then read the bar-code of each item themselves as they pick them. This saves them the time of queuing at the check-out. To discourage theft, a few customers are randomly selected to be checked at the exit. The cost of checking a customer out is between one and three dollars in labour cost, and in order to save this amount, a small loss through unpaid-for goods could be acceptable.

Modern technologies are developed that may in the future replace bar-codes. Instead, a very small transmitter on each product may send a signal that contains the article number and the price of each item in a customer's shopping cart to the computer at the checkout. The customer could then be automatically charged from his or her account. These are three examples that show how companies constantly try to reduce the time that employees need to spend with each customer. Reductions in terms of time reduce cost and this is done through increasing levels of automation.

When the supermarket had become accepted by customers, new and larger retail concepts appeared. The supermarket represents a significant saving in terms of time and cost compared to specialty retail stores and it does make sense for supermarkets to carry other types of products than groceries. As we all know, a modern hypermarket has almost everything from standard clothes and household goods to consumer electronics. This saves time and money for consumers, because the distribution cost of the products isn't the only saving. These large stores allow customers to practise one-stop-shopping, which also saves time and money compared with driving around to visit a number of different stores. In the wake of this development, supermarket concepts have arisen in all areas of specialty retailing, where time and cost is saved through reduced personal service and higher turnover per square metre of floor space. Today's customers are more knowledgeable about prod-

ucts than people were twenty years ago and in many cases they do not require the same amount of personal service. Products today are also more self-instructing and simpler to use than they used to be.

We now see that a number of different retailers offer services on-line. Many people believe that this has to be a more expensive way of purchasing than traditional shopping in different types of supermarkets. With the added cost of goods that are picked by professionals, and home delivery, this couldn't possibly be a saving in terms of cost. Electronic shopping concepts seem to save time for the customers, but it adds picking time and delivery for the company, which comes at an expense. This is true for the early forms of electronic shopping, but it is also possible to see a future where electronic shopping has grown to a level where it becomes less expensive than traditional shopping. At a certain point it becomes impossible to pick goods that are shopped over the Internet in the stores. The aisles simply become too crowded with pickers and at that point specialized distribution centres need to be opened, unless Internet customers are willing to carry the extra cost of picking during the night when wages are higher.

The professor in technical logistics at the University in Lund, Sten Wandel, calculated that an automatic distribution centre could reduce distribution cost by 75 per cent for groceries, compared with the distribution cost in a normal supermarket. This would reduce the price of the goods by some 15–20 per cent. For this type of distribution centre to become financially viable, it would need 300,000 households to be served on a regular basis. This number of customers could, however, be found over a large geographic area with a radius in excess of 300 kilometres. This would mean that 90 per cent of the Swedish population plus the whole Copenhagen area, Oslo and possibly Helsinki, Rostock, Lübeck and Hamburg could be served from a distribution centre in Jönköping, Sweden, 200 km north of the southern border. In the UK a similar centre could serve London, Birmingham, Liverpool, Bristol, Manchester and all other cities in the southern part of England and Wales. In Germany a distribution centre in Kassel could serve the urban areas of Hamburg, Berlin, Bremen, Frankfurt, the Rhein–Ruhr area, Stuttgart, Munich, Dresden and Leipzig, etc.

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Print-on-Demand

We are now going to look at a few examples of the development that is going on in particular industries to see how this development may change structures and business practices in the near future. In particular we will focus on changes to the process that will reduce the time and cost of production, printing and distribution of printed products.

Among the opportunities to transform complete industry value chains, two of the trends that have been widely discussed are Print-on-Demand (POD) and broadband. These are said to change value chains in the printing industry and in media industries in general in the case of broadband. These two developments will be described in detail in the following two chapters. We will start by describing POD and thereafter we will discuss the development towards broadband communication. POD means that books, brochures and other written material could be printed when they are wanted by a customer. As the situation is at present, printing is done in runs of a few hundred up to hundreds of thousands, or millions, of exactly identical products that are produced at the same time. The primary advantage of POD is that copies of a book or a brochure could be produced as they are needed. Almost no stocks of printed products need to be kept by publishers or distribution companies. With POD the products could be customized, meaning that each customer could get a brochure containing items that are of particular interest to him or her and we would move away from material that is mass-produced. This is discussed as an opportunity for marketing to address each customer with the offerings that are likely to appeal to him or her and to 'kill two birds with one stone' by doing this. Firstly, it has been found that the 'hit-rate' of direct marketing increases when a customer is addressed

personally with the offerings that are of particular interest to him or her. Secondly, the cost of marketing could be reduced, since companies do not need to send the whole catalogue to every customer. Only the parts that may be of interest to each customer need to be printed and sent, which reduces both the cost of printing and the cost of distribution.

Some people wonder why POD takes so long to break through. After all, it is possible to make all types of written material available on the Internet. It can be down-loaded and printed on any office printer at any time. But still the POD industry, which is expected to emerge, seems to be very small or almost non-existent. In order to understand why this is, we must look at the process of printing in detail and also at the economics of some of the stages.

Digital printing machines: the development of a new technology

Later we will go through each step in the process and see how it needs to change in order to facilitate POD, but it makes sense to first take a look at the printing machines. The Harvard professor Clayton M. Christensen has, in his book *The Innovator's Dilemma*,[24] described how 'disruptive' technologies emerge, from first being inferior, to existing technologies, and that these technologies gradually develop into more and more attractive technologies for the future and eventually replace incumbent technologies. Christensen used the shift from large computer memories to small computer memories as one example to bring his point across. In this case nobody believed in the 1980s that the small computers produced by Commodore and Atari could be developed to become significant competitors of mainframe computers. Memories for small computers were perceived as a completely different industry from the mainframe memory industry. The early small computers were much cheaper but also clearly inferior in many ways to mainframes and no large company would dream of purchasing an Atari or a Commodore to run its accounts on. Now, we can see that the small computers of the 1980s were the predecessors of the PCs that are used in client-server environments today and that technologies based on PC solutions have replaced mainframes.

It is easy to see that equipment for POD up until very recently has been inferior to the technical masterpieces that are used to print our books and brochures in a modern print shop. Heidelberg is the undisputed leader in the market for analogue printing machines. This company is known to offer the best technology for the most demand-

ing customers. Their most advanced machines print 15,000 identical sheets per hour on both sides with high-quality colour print. These machines print six colours on each side of each paper and turn the paper half-way in the process. Apart from the four colours cyan, magenta, yellow and black that are used to print any four-colour brochure, there is room for two more special colours if customers want gold, silver or a particular colour for the logotype that cannot be easily reproduced using the three basic printing colours.

This is a very efficient printing machine, printing with high quality at low cost. Compared to this, an office printer prints a few hundred, or a thousand, customized pages per hour and the cost of printing becomes high, because of the manual work it takes to handle papers, bind them and so on. In a print shop these tasks are done automatically in specialized machines. Besides, the quality of print is much lower in an office printer than in an offset press.

Up until now there have been no digital printing machines that could match the speed and quality of even a four-colour Heidelberg machine that printed one side of the paper at a time. This may have run 10,000 copies per hour and the fastest digital printing machines ran at half that speed with a slightly inferior quality of print.

The printing industry runs product development in four-year cycles, because of the Drupa printing exhibition in Germany every four years, where printing-machine manufacturers normally present their new innovations. The last Drupa exhibition was in 2000. In between these exhibitions there are the IPEX exhibitions in Birmingham, where some companies may exhibit prototypes of new machines or where major launches may be done, if there is a pressing need for them. At IPEX in Birmingham in 2002, Xerox presented prototypes of their new generation digital printing machines. Those are the first digital printing machines that come close to the speed and quality of an offset printing machine. The Xerox machine can print 12,000 unique copies per hour with excellent quality of print. An analogue printing machine prints one colour in one print press in the machine at a time, so a 12-press printer (6 colours × 2 for two sides of the paper) takes up relatively much space — some 20 metres in all. A digital printing machine prints all colours in one press, which requires less space. Another advantage of the digital printing machine is that it runs more quietly than its competing analog machines. It is conceivable that later versions of these machines will become even faster and produce print of a higher quality than the fastest existing analogue printing machines.

Now, at least, there exists a digital printing technology that can make POD of colour brochures a reality. Still only few printing companies have seen such machines at work and have been able to assess the quality of print themselves. Even fewer customers of printers know that there are now print shops that can offer the service of customizing their brochures to the needs of each customer and that can print small runs economically on demand. If customers did know about this, there would still be many things that need to change, as we will see below when we go through the whole process from idea to printed matter.

The existence of digital printing machines does not immediately lead to the customization of brochures. As we will see, there are cost advantages and advantages in terms of customer satisfaction also when a digital printing machine is used to print mass-produced products. The opportunity to print single copies when needed is in itself a reason for a demand for digital printing. Customization can come gradually as the opportunities of the new technology are better understood.

One publisher in Sweden, who publishes mainly paperback books, has invested in a digital printing machine in which they print books in black and white on demand in small runs as they are ordered. In this equipment books that sell in small numbers are printed and bound and the company can operate with a minimal stock of books. This reduces the risk in publishing a title, and a number of cost components that are necessary in traditional printing are eliminated. The technology for digital printing of books in black and white has existed for a few years and it is gradually becoming more competitive and well known in the printing industry.

The printing process

Printing is only one of the stages of the printing process. Before a brochure or a book is printed all material needs to be prepared and all the steps leading to the printing of the product are at present aimed at producing long runs of identical products. Several steps need to be changed substantially in order to arrive at the customization of printing. Roughly, the stages in the printing process could be described as:

- Ideas
- Production
- Pre-print

- Printing
- Finishing
- Distribution

We will now look at the production of a marketing brochure to see how each of these stages would change in a POD environment.

Ideas

In the ideas phase it is decided which type of brochure will be produced. Today, many companies send the same brochure to all their customers, presenting everything or a representative selection of what they have to offer. This is the case with travel companies, clothing companies and mail order companies, to mention only a few.

In the POD case it would be technically possible to produce one individual brochure for every individual. It is, however, obvious that in such a case the work in the ideas phase would be very different from the way it is done at present. Today, the people who order the brochure plan in general terms how they want to address their customers, and which items they want to market in the pages of the brochure, or at least the general impression they want the brochure to make to a particular category of customers.

In the case of POD they would have to decide how many customer groups they would like to address and how the material for each customer group should be presented. The whole point of POD may, for a travel company, be to offer different products to a number of distinct customer categories. A travel company may find that one customer of nineteen years of age may want to go on a trip to southern Europe with his or her friends. A family with two small children may want to go to the same place but they have entirely different expectations of what to do or what to see. A couple in their old age may also want to go to the same place with a different set of expectations. In all these cases different pictures may be shown in the brochure, different hotels could be chosen, and different price lists, containing only the alternatives that would be perceived to be relevant for each category of customers, may be included.

In a travel company that produces coach tours to destinations in Europe the size of the brochure is determined in a relatively simple way. The number of destinations and departures for each destination in the previous year's catalogue is compared with the number of seats that were sold. If there was a high demand compared with the number of seats available, the number of destinations or the number of departures

can be increased; if the demand was overestimated the year before, the number of destinations and departures may be kept or reduced. When the number of destinations has been decided upon, each destination gets two pages in the catalogue. In addition to the presentations of the destinations, there will be a few pages in the front of the brochure. These present the company, the network of feeder bus lines from various parts of the country of departure, some new developments of the year and some general information that is relevant for all destinations. In the ideas phase the number of destinations is determined – new destinations are added and a few of the old ones are taken away. In this phase the general profile of the catalogue is decided upon – what will be highlighted for this year and what should perhaps be played down a little. One example of this type of decision is whether the brochure should in the future be profiled towards families with children (a possible growth segment for coach tours to the Mediterranean), or whether to show mainly adults without children in the pictures that present the destinations. Since the same catalogue is distributed to all categories of customers, the balance between different types of destinations and the way in which these are presented is very important.

If the company wanted to adress 20 different categories of customers, selected by age, sensitivity to price, travel preferences and maybe a few more criteria, the planning in the ideas stage would have to be done on a much more general level. Otherwise the time and cost of doing the same piece of work would increase substantially. Consider also the situation where some customers may belong to several categories. For marketing reasons the travel company may divide its customers into a number of categories, such as young, family, singles and elderly. There may be five categories of trips that could each be relevant for all or some of these categories: big city, beach, cultural round-tour, mountain area and wine tours. In this case a few customers may order one very specific part of the brochure that would have 20 different possible configurations (four customer categories × five tour categories). A family may want only beach alternatives that are relevant for families. An elderly couple may find it more difficult to decide and they may want all the five tour categories presented with relevant hotels and other selections for their customer category. In the case of print on demand it would be simple to print a very thin brochure for the family and a slightly bigger one for the elderly couple, but all such possibilities need to be thought of and set up in the system where configurations are selected. The two resulting brochures need to look professional so that the general texts at the beginning refer to the selections of trips that are actually pre-

sented and do not describe alternatives that the customers in question have excluded already.

Production

During production, texts are written, pictures are taken or selected from databasses, and the layout is chosen. When only one brochure is made for all customers the layout needs to be carefully thought out. The pictures are selected and the size of these is adjusted so that they will fit exactly in the space beside the information boxes and general text.

In the case of the coach tour operator that produces one brochure for all its customers, the production of the catalogue requires very detailed work. Data banks of pictures are searched. Maybe a photographer has been commissioned during the previous season to visit a number of the destinations in a week and take pictures that contain buses painted in the colours of the operator in question and travel guides that wear the correct uniforms. Such pictures will not be found in data banks and they are needed to give authenticity to the brochure. Each picture is chosen exactly for its spot in the brochure and texts are written that support the message that is given by the pictures. Overall, a balance is looked for between the destinations, so that some pictures show young families with children and others show elderly couples, if all these are among the customers that normally go abroad with this company. Colours are chosen to support the image of the company so that the catalogue gives the general impression that is looked for by the operator. When the production is ready, each text, picture and information box are in their correct places, and the sizes of pictures, the wording of texts and the general layout of the catalogue have been gone over hundreds of times by different persons.

This task of producing the catalogue becomes much more complex if the company wants to publish a number of catalogues aimed at different categories of customers. The amount of work that needs to be done to customize brochures increases, at least the first time it is done in a POD way. Every time the brochure is made from scratch, the same amount of work needs to be done, but on the other hand not all information may have to be updated at the same time in the future when POD is used. All brochures are not printed in one print run and pictures could be added all the time and changed at any point in time. A number of different pictures for a certain space in the brochure could be kept in the database and a number of different texts could be kept in the same way. A certain customer could get different catalogues every year for five years, without any changes to the pictures or texts in the

database during this time. As long as there are enough variants of texts and enough pictures available in a database, so that different brochures can be printed for five consecutive seasons, this would not be a problem.

The production work could for future editions of the brochure be planned so that one section of the catalogue would be updated every month of the year. Customer categories could be broken down further as the company came to know their customers better. Maybe all customers who do not drink alcohol would see only non-alcoholic beverages in the brochure and a non-smoker would never see a cigarette.

Pre-print

In the traditional work-flow the pre-print phase consists of making all pages ready to print. A traditional offset machine works with printing plates for each page that are made once-and-for-all and kept for a number of years by the printer. This is because the customer has paid for the plates, and if the customer wanted the same brochure again, or a few pages from the brochure, they have the right to not have to pay again to re-make the same plates.

A digital printing machine works without printing plates. It prints almost in the same way as an office laser printer. In the same way as an office laser printer changes the content of each page, a digital printing machine does the same. The computer sends the necessary material to the printing machine when it is needed. Pre-print in digital printing consists of setting up the pages correctly in the computer, filling up with paper, inks and other consumables and waiting for the machine to start printing. In digital printing, material can be changed at any point in the process at a very low cost.

Printing

In an analogue machine the very nature of the printing process, using printing plates, means that papers for a brochure always need to be sorted afterwards, since each page is printed separately in a long run. Printing plates need to be changed between runs and this takes ten minutes or a quarter of an hour, during which the machine remains idle.

In digital printing, sorting is done automatically as part of the printing process. A 16-page A4 format brochure is printed on A3 sheets. The four sheets of every single copy of the brochure could be printed in a row and the machine could deliver the papers sorted and ready. In all cases the brochures would need to be folded and stapled in the finish-

ing process. In analogue printing no brochures can be finished until all copies of all pages have been printed, which may be several days or weeks after the start of the printing of the first pages.

Finishing

Finishing means sorting, cutting, folding, binding, stapling and other steps that may be needed to finish the printed product. Through the use of digital printing some of these steps are eliminated and the total time from pre-printing to finished product is substantially reduced.

Companies that use digital printing could dispose of the sorting phase in this value chain. In the case of the analogue printing of books the binding of the book is often done by a separate bookbinding company. This company gets the printed folded books or sheets from the printers on a pallet and they bind all the 1,000 or 2,000 copies in a streamlined binding process. In the case of POD of books, which is as technically possible as POD of brochures, the printers may print ten copies of one book at a time. It may not be rational to send these copies to a binder and for him to find the appropriate covers and bind the copies. In the case of POD, books will need to be bound at the printers, or the process at the binders would need to be changed to accommodate smaller runs.

At the IPEX exhibition in Birmingham in 2002, Xerox presented their prototypes of their next line of printing machines to the industry. They did this in 30-minute presentations for about 100 people at a time. During the presentations they printed and clipped together personalized copies of a Birmingham tourist brochure with a selection of restaurants at the end, and they printed and bound in soft covers ten copies of each of two different novels. All this was done in the space of 30 minutes in a print shop that was set up at the exhibition. For the advantages of digital printing to take effect, some structural changes are needed in the distribution of the brochures.

Distribution

Normally, the finished brochures and books are delivered on pallets to the customer, to a publisher or to a company that is responsible for storage and distribution. From there, copies are distributed at the rate at which they are ordered.

The coach tour operator in the examples above has a cooperation with a storage and distribution company, which receives all the pallets with brochures in one load. The brochures are in packages of fifty, and many are stamped with the name of a particular travel agency on the back. It has been possible for a long time to relatively inexpensively print the

name, address and logo of a company on the cover of a brochure. The distribution company puts address tags on some of the packages and sends these in pre-decided numbers to travel agencies, making sure that each agency gets brochures with their logotype printed on the back. They then keep the remaining catalogues in stock for the rest of the season until the travel company orders some to send to a travel agent who has run out. When the season is finished remaining copies are sent to be recycled. This could be a substantial amount, since it is not considered possible, for financial reasons, to print more copies of the brochure in the season. A sufficient number of copies must therefore be printed from the start.

In the case of POD, copies could be printed and finished when they are ordered. In extreme cases no copies would be kept in stock. This may require that the printers take care of the packaging and distribution as well. If, on one particular day, ten different copies of a travel brochure are ordered by customers belonging to ten different categories, it would be expensive to send these copies to a distribution firm and have them sent out from there. Otherwise, the distribution companies would have to set up shop close to the printers and take over where the printers finish. They could then package and send out the finished products.

The coach tour operator has two different types of customers. Some customers order their brochures directly from the operator and receive them in the mail to their homes. Other customers go to their travel agent to pick up the brochure. The travel agents want to be able to give the customers a brochure when they are in the shop. In this case customization of brochures would only be possible for the brochures that are sent directly to customers. Travel agents would need to have standard brochures. These could also be printed on demand. If 500 brochures were printed each month, information could be added or taken away in each edition as sales progress through the season. For companies where product development is an on-going process, new products could be added in the brochure all the time and not only once every year when the year's need of brochures are printed, as the situation is at present. Today, it is substantially more costly per copy to print short runs of digitally printed brochures, but for some companies the advantages may outweigh the cost. The cost difference is rapidly becoming smaller, and in a couple of years there may not be a difference any more.

The printing, finishing and distribution of brochures, which in analogue printing are done as three separate steps, could be organized

as a continuous production flow. The time from pre-press to distributed product could be reduced from several weeks to less than an hour, and the cost of the process would be reduced substantially at the same time. Companies that have the advantage of distributing all their catalogues directly to customers (mail order companies and companies like IKEA may be cases in point) could perhaps print only customized brochures. These would not have to maintain a standard brochure that would appeal to all customers and be distributed through retail partners.

The location of POD

So far we have been discussing print shops as if they were located approximately where print shops are located today. There are several forces that may drive the creation of new geographic structures in the printing industry. Firstly, the opportunity of POD is to locate printing closer to the final customer and reduce the need of transportation of printed products. Secondly, printing companies may have to participate in the restructuring of the binding and distribution industries in order for POD to work out well.

At present the printing of a product is ordered by a company that wants to print a brochure or a publisher that wants to print a book. These companies assign a printer to print the whole run of books or brochures. It is possible that the same will happen in the future, and, at least at the start of POD, on a larger scale. One printer may get the assignment to print, bind and distribute all copies of a book or brochure needed by the customer.

On the other hand, it may be that the advantages of POD would be more fully realized if each book or brochure were printed close to the customer. If I order a book, why print it in the US and send it to Europe via mail? Maybe the customer wants to have it printed in a cheap cover, and another customer may want all books in his bookshelf to be bound in red hardcovers. This may be technically possible today, but the production structure in the printing industry is lacking and the cost would be high.

We could also imagine that there would be a network of print shops that belong to the same company that were assigned to print a book by publisher X. Regardless of where in the world it was ordered this company would be able to print it locally or regionally. Then it could be sent to the customer in any binding from a selection of bindings that had been previously specified by the publisher. In the case of a brochure

or a magazine, the same may be true, apart from the selection of bindings.

Any of these scenarios would cause structural changes. The present structure in the printing industry consists of primarily small printing companies, with a few larger ones running huge factories where they primarily print long runs of brochures for large companies in large markets, such as IKEA. With the growth of POD the number of long and medium sized runs may decrease. Instead, the IKEA catalogue may be printed and distributed locally to customers, who are divided into 15 customer categories. Each edition of the catalogue may be printed in exactly the number of copies needed at any particular time, but the runs of hundreds of thousands of identical copies printed in one printing factory may not exist twenty years from now. It is too early to speculate about the details of any future structure, but it is sufficient to say that the physical distribution of printing locations may look different in the future and the ordering process between the customer and the printer may be different as well.

It is also appropriate to note that other industries related to the printing industry may be affected. If printing were to be done locally or regionally, the volumes of printed matter distributed from central printing facilities to customers all over the world may decrease. Instead, small parcels would be distributed locally or regionally. The need for bookshops may become different. With POD, books could stay in print forever and the selection of books may be wider. There would not be the same type of risk-taking for a publisher in publishing a particular title, if they didn't have to print it in an initial run of 1,000 copies. With ten times as many titles available, it may be difficult to run a traditional bookshop carrying a thousand titles in stock. Instead, books may be electronically selected and ordered at the printers or over the Internet. The previously mentioned Swedish publisher who uses digital printing of books that are sold in small quantities has 1,000 titles in print for which the demand is less than 100 copies per year. These are not kept in stock. They are printed on demand when they are needed.

All we can say is that POD opens up a number of new possibilities. We could also note that the same development that is possible for the printing industry is possible in a number of other media industries as well. The same type of distribution system could be conceived of for music, computer games and DVDs, though the technical opportunities may in some respects be further ahead or lagging behind compared to printing. Local burn-on-demand facilities would be possible in these

industries as well as an alternative to pirate copying and to global distribution.

All in all we see that the development of POD could reduce the time taken from printing to distribution of a brochure from more than a week to 24 hours, including the distribution of the brochure. This would at the same time reduce cost. In the case of the distribution of media products, time and cost could be reduced even further through the use of the Internet or broadband networks.

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The Gradual Growth of Broadband Communication and Print-on-Demand

Large investments have gone into the building of optical fibre networks for broadband communication. There are a number of service, or content, providers that offer broadband connections to customers. These also offer content on the network in the form of services (e-mail, on-line photo album, etc.), music, films, magazines, tv-programmes, computer games, electronic shopping and other forms of electronic entertainment and useful services.

I will not go into the structure of this industry, different offerings or projected growth rates. The simple issue we are looking at in this book is the issue of time compression and the structural changes that are needed in order to take advantage of the cost-reducing opportunities. Now, we are going to analyse whether broadband distribution will bring us close to the limits of what is possible in terms of time and cost in the areas where this technology is applied. This is an example of the application of the thinking behind the e-step model in a particular industry. It takes into account the specific circumstances that will determine the path of change in this particular environment.

Broadband network and service providers already exist

As in all the other cases of establishment of electronic services, the establishment of broadband fibre networks and service providers involved large initial investments. Different categories of people were involved in project planning for the construction of the physical fibre networks, the roll-out of fibre cable and the setting up of routers and other equipment, including development and implementation of software for the management of these high-speed and high-capacity networks. At the same time service providers were set up. They needed technical depart-

ments that planned and implemented the various ways by which customers could be connected to the networks. Marketing departments set up offerings, and pricing, and initiated sales activities. Purchasers negotiated with suppliers about contracts for music, films, games, electronic trade, etc. In addition to this a large number of consultants were involved in strategy development, project management and systems development of the billing, provisioning and other systems that were going to run millions of transactions every day. This amounted to substantial activities that were connected to the start-up phase of these companies. A lot of time and money were invested in this build-up and the focus was on the competitiveness that broadband distribution would enjoy compared with traditional forms of distribution.

Growth of broadband distribution: a model for step-wise change

Based on experience, we know that changes usually come gradually, one step at a time. We have seen in the account of POD that many things still need to change for POD to take over larger shares of the printing market. In all situations there are obstacles that need to be overcome in order for change to take place. Professor Clayton M. Christensen of Harvard (see ref. 24) described how 'disruptive technologies' sometimes take the whole market away from established technologies. The first versions of a new technology only take small shares of the market. Later versions tend to be better and less expensive than existing technologies and may take over the whole market. A case in point would be the shift from analogue to digital watches. When all watches were analogue, the Swiss watch industry had 90 per cent of the world market. After digital watches had taken over, the Swiss had only 10 per cent, and the lion's share of the market was held by manufacturers of digital watches. The ironic fact in this story is that the Swiss invented the digital technology themselves, and exhibited it at an exhibition, where it was picked up by Texas Instruments and a number of Japanese manufacturers.

Based on experiences that indicate that structural change comes gradually and in steps, we may assume that broadband distribution of information and media products will grow in the future. We also have to assume that more and more media products and services will become available on these networks. We will now look at the drivers that may make this market grow. We will see how a new printing technology and digital access may change some things in the distribution of media products, and then we will look at how the drivers behind this change

may drive a gradual increase in the pure electronic access to information. This latter case would be a situation where the need to print brochures, and burn CDs and DVDs, may decrease dramatically.

Step 1: Some people start to download information from the Internet and some brochures and books are printed in a POD fashion

This is already happening. People increasingly access information over the Internet, and companies make more and more information available. Because of the initially small number of people who prefer to access information electronically, companies that thrive on publishing information in the traditional way do not notice any substantial change. Small fluctuations in advertising volume or a small decrease in the printing of brochures could be for reasons other than the increasing access to information over the Internet.

At the same time, as we have seen above, digital printing machines have become better and faster, and eventually more types of print could be economically printed in POD. Gradually, customers become informed about the opportunities, consider if it is possible or desirable for them to use the services, and, supposedly, more and more customers try electronic forms of distribution on a limited scale.

In the first step we see few consequences for traditional forms of distribution from the new ways of accessing information. Instead, the new technologies trigger some economic growth. Companies need both new hardware and new software to set up their Internet sites, in order for their customers to access information. This creates a demand for servers, modems and other hardware, and for consulting services, sales people and other human resources at the software developing firms. In the same way, the development of new digital printing machines generates a demand for these machines from existing printing companies and from new digital printing firms. Since most customers are not aware that the new opportunities exist, and because of the need to change routines in the preparation of customized brochures, it takes time until any substantial volumes of printing move from traditional offset presses to the new technologies. Thus, companies with old offset machines will still want to replace those for new machines, since they do not see a threat to their business from the digital printing machines, which they perceive to be an inferior alternative.

Step 2: Offset printers will feel a slowdown

If more and more people and companies use the Internet and digital printing technologies to access and spread information, the demand for

offset printing will decrease. Traditional printing companies will feel a slowdown in their business. While they wait for the market to pick up speed again, they may wait to buy new equipment.

At the same time, in the computer industry, the switch to electronic distribution of printed material may not create much new business. Even though more and more information is exchanged over the Internet, the demand for new servers for the Internet may slow down. The earlier growth in demand for such equipment could be seen as an 'investment wave'. This means that the substantial market growth takes place when companies invest in such equipment for the first time. After this, there is an after-market of companies that need to upgrade their equipment, because of an increase in traffic. For most companies both the initial hardware and the software will be sufficient for a number of years, with minor changes. Even if activity on the Internet increases substantially, the need for new investments in hardware and software will not grow at the same rate.

The difference in the logic related to capacity expansion between electronic services and traditional industries could be explained by viewing electronic networks as 'dynamic structures'. In a traditional industry a company needs to double its investment to get twice as much capacity. If I own a printing machine and I want to double this capacity, I will have to buy another complete printing machine. If McDonald's want to serve hamburgers to people in two places, instead of in one, they will have to build two restaurants. In an electronic business environment, the initial investment in a computer system and a number of functionalities that are built into that system will last forever. As the number of users of the service increases from 100 to 1,000 to 100,000, the investment in software will never have to be repeated. As more users connect, only the capacity of the server, which is a small fraction of the total investment in the system, will need to be increased. This is one explanation of why the plans of so many Internet start-up companies included a rapid geographic expansion to a number of countries. The investment needed to run the same web-site for a number of markets does not increase for an electronic service in the same way that it does for a company in a traditional market, where local representation is needed on a large scale. The fact that many start-ups underestimated the cost of marketing the services in many markets at the same time and that they overestimated the potential of rapid growth of business in each market, does not disprove the general fact that was discovered in project after project where I have participated. The investment needed to expand the capacity and reach of an elec-

tronic business is dramatically lower than the investment needed to expand a traditional business. The capacity of the software, which is often a substantial part of the initial investment, is indefinitely expandable.

All of these developments are intertwined with each other. As people get used to accessing information electronically, companies will make more information and services available, the cost of using these services will decrease and companies will try to force customers to use electronic services instead of manual services when possible. This is already the case at many airlines. The cost to the airline of booking a ticket electronically is only 20 per cent of the cost of a manual booking. The reduced cost is due to the fact that some steps in the process can be done electronically, and for these steps there is no need for personnel. There are still back-office procedures that need to be taken care of manually, like checking the tickets and sending them away to the customer, and these cost the same in both cases. Similar relationships can be found in all areas where companies move from analogue to digital communication. The printing of a brochure may cost 3 dollars per brochure. Accessing the same brochure over a broadband network costs almost nothing at all.

Step 3: The increased reach of the Internet

It is possible that direct Internet access to information will always remain a complement to printed information. The key question is how much information in the future will be directly accessed in electronic form over electronic networks like the Internet?

Changes in behaviour are gradual and are not only dependent on the availability of a service. Other factors such as existing habits, perceived advantages and ease of use, cost, availability of information and network effects (the more people that use a network, the more value it provides to each user) influence the rate of penetration. Today, young people grow up with computers and the Internet and are likely to develop habits that are different from those of older generations. As people with experience of computers and mobile phones from their childhood grow up to become consumers, we may expect the use of electronically available information to increase. The people who are now in their early twenties have been using computers for a number of years, and it is possible that they will develop different shopping habits from those of people who today are in their fifties. Thus, this is not an issue that lies several years ahead in time. For every year, the share of

consumers who have a long experience of electronic communication increases compared with the share of people who have only limited knowledge of computers. Another factor may be the decreasing need to access the Internet over a computer and a telephone line. With broadband connections households may be on-line all the time. New interfaces to the Internet could be built into household appliances, like refrigerator doors or other surfaces that are central in a home. Going into the Internet may not remain an activity where the user has to exclude himself or herself from the outside world for half an hour. Ordering goods may be done at the same time when a meal is cooked or when we are waiting for the dish-washer to get ready. We may also be able to access the Internet on our television sets between programmes or while watching a tv-show, using only a part of the screen for the Internet.

We may not believe that all information will ever be accessed over the Internet and that no books or brochures will be printed on paper. It may still make sense to ponder the development a little further to find out how changes in the availability of information may change the structure and volume of the printing industry. This is not to try to foresee changes that may take place fifteen years into the future, but to try to understand how changes come about so that we can prepare for some of them, if we find this appropriate. Some changes may become realities in the next few years, while we may have to wait longer for others.

Consider a company that has started to customize brochures to the needs of individual customers. First they print different catalogues for 20 different customer categories. In order to get more information about their customers, to be able to break the customer needs down in order to serve them better, they ask customers to provide more information about preferences. There are many ways to collect this information, ranging from old-fashioned questionnaires to more advanced electronic tools. Now this company has the e-mail addresses of most of their customers and they are about to print brochures that are more and more individual in their nature.

As an example, each brochure costs 1 dollar 50 cents to print and the same amount to send it to the customer in the mail. The company has 200,000 customers and out of those they have the e-mail addresses of 50 per cent. The saving that this company could make by sending the brochure by e-mail to 100,000 customers is 300,000 dollars. Now, the company knows that not all customers want the brochure

electronically. They prefer to get the nice printed brochure in their mailbox. They know, however, that 40,000 of their customers for whom they have the e-mail addresses prefer to receive an electronic copy of the brochure, because they can then print the pages they want, and read the rest on their computer screens. This company decides to send these 40,000 copies electronically to their customers, with the offer to send a real paper brochure at any time if a customer wants one.

To the other 60,000 for whom they have the e-mail addresses they send an e-mail one week in advance, in which they ask those who want to have the brochure electronically to reply and those who want the printed brochure to do nothing. Another 20,000 customers want the on-line brochure. After this, the company may monitor the sales figures closely to see if they lost any customers by sending electronic brochures to 60,000 of them. The savings amounted to 180,000 dollars and it seems like an attractive proposition. If the electronic distribution of the brochure was a success the company may in the future simply send out a link for each person in an e-mail. Through this link each person could access his personalized electronic brochure via the home page of the company and download the individual brochure. People who want to, may print it on their home or office printer or keep it stored in the database of the company to be accessed over the Internet at any time. As more and more households get broadband or ISDN lines to the Internet, there will be no disadvantage in storing information in locations other than on their own computer, especially not this type of information, which a customer will not be afraid of losing. In this case, the only information that needs to be stored by the company that publishes the brochure, is the personal data and preferences of each individual. The individual can then get access to a personalized *updated* brochure every time he wants to access it. The company may want to show how many article numbers are available, or the number of seats available if it is a travel company, or it may want to change prices rapidly depending on the popularity of products. This increases the usefulness for the customer, and the remote storage of the brochure minimizes the need for data storage space overall and the need for communication capacity.

If companies decide to do this and it turns out to be an attractive offer for customers, it may have a relatively rapid effect on the volumes that need to be printed. One of the thresholds to the use of the Internet, but not the only one, is the difficulty of finding the information that is relevant for each person. With the accumulation of information on electronic networks it becomes increasingly probable that the information

that I need is actually available. It only remains for me to find it. The problem for a company is then to help me find it when I need it and make it available in the most customized form possible.

The main driver on the part of companies to make people use electronic services instead of analogue ones, is cost reduction. In order to increase the understanding of hotel guests for the savings that the hotels make on soaps and other items that were previously given away to guests, and the cleaning of towels and other services, hotels point to environmental reasons for their savings. In the same way an increasing use of Internet communication can be justified on environmental grounds, even if the main advantage for a company may be cost savings. The opportunity to reduce the number of brochures printed, the reduction of the need for transportation of these brochures and the reduction in the need to take these brochures back to be recycled may appeal to a number of customers, not only the ones that normally would look for information on-line. The reduced need to print brochures reduces the need for paper, inks and other consumables that are used in the printing process. Other advantages, such as always having access to updated information via a personalized link to the web-site, could provide further incentives for people to opt for on-line information instead of printed information.

When people can access information, media products and services on a broadband network, these can be accessed in close to no time. The cost for the service provider of one customer who downloads a few songs or a film will be a few cents. This should be compared with the cost of printing brochures, burning CDs and distributing these products via shops or directly to customers. The cost advantage of electronic distribution is huge. The initial investment when the services are set up is substantial, and there are then strong incentives for companies to try to make their customers use electronic services as much as possible. Based on what we have experienced of cost-saving technologies in the past, we need to assume that this type of distribution will grow. It will be a problem for companies when more and more customers use electronic access to services and there is no opportunity to improve the cost position or service level further. Thus companies that are leaders today in terms of time and cost will not be able to sustain this leadership in the future as competitors arrive at the same level. In addition, there seem to be few opportunities to differentiate these services against competitors. However, companies have no other choice than to increase their share of electronic services as long as competitors do this.

Summary

In the above description of factors that are likely to have an influence on the structure of media industries in the future, I have mixed fact with 'fiction'. It is a fact that digital printing equipment has not been competitive against traditional offset printing presses until now. It is also a fact that the leaders in the printing machine industry fear this development and that they see a substantial risk of losing their leadership position to the leaders in the digital printing sector. It is also a fact that an increasing amount of information is every day accessed over the Internet instead of in the traditional way through newspapers and brochures.

What we do not know is how long it will take for digital printing and the downloading of music and films to take over the traditional markets for media products, and for digital distribution technologies to replace traditional technologies, or the exact nature and size of the future advantages that may be achieved through the implementation of digital communication. In some cases the transition may be fast and in other cases it may go at a slower rate.

At any rate, we should prepare for change. In the case described above, the first impression is that we may see relatively rapid structural change in the printing industry. One of the first signs of structural change may be sales of more digital printing machines and fewer offset printing machines.

In step 3, however, we see a consequence that may be unexpected by many readers and that may be difficult to evaluate at present. The use of digital printing makes it possible to create personalized printed products and by doing this it may become attractive, and definitely possible, to distribute this information in forms other than as a printed brochure. Customers can get their own link to the home page of a company, where the site could customize the information immediately upon access and always make sure that each customer gets updated information that is of particular relevance to him or her.

Initially, it requires new resources to set up this functionality. In the long run it becomes obvious that this type of development would dramatically decrease resource needs compared to the present situation and that information and services could be accessed in close to no time at almost no cost. For those brochures that are electronically distributed there is no need for:

- printing of the brochure
- some of the paper for the brochure, since customers may print only a part of the data they receive
- wrapping of the brochures for the transportation and distribution that is needed
- distribution of pallets of brochures from the printers to the customer or to the distribution company
- storage of brochures
- distribution of brochures from the distribution firm to the consumer
- handling of brochures in the waste process

The books and brochures that are still printed will be printed in the simplified printing process of digital printing, in which the need for manual work is reduced compared to analogue printing. There is no longer a need for graphics experts, people who make printing plates, change and take care of printing plates during and after printing. There is no need for sorting, and fewer people will be needed in the other parts of finishing and distribution as well. In total, the need to print things will be reduced and the resources that are needed to print the remaining products will decrease.

This is not to say that it is necessarily a bad thing to get rid of some paper waste and some use of other resources, but this type of change would have a substantial impact on our economy. This may be especially true, since brochures and other printed products are only examples of this possible development. As mentioned before, the same general logic could be predicted for other types of media products as well, like music, films and computer games. In the case of food, clothes and other goods the logic is different and must be analysed separately.

The description above has no other purpose than to show that:

1. an increasing use of the Internet and related digital technologies is likely to cause structural change;
2. in the more advanced stages of the use of new technology the need for resources could decrease dramatically compared to the present situation;
3. the time it takes to access information and services will be reduced to almost zero and the cost to the same level;
4. the technology needed to facilitate change is already in existence and people and companies already use this technology.

We are looking here at a massive change that is waiting to happen. We do not know yet if it will happen, but many experts treat it almost as a certainty.

The search for the 'promised land' or a growth industry

Throughout history people have left areas of unemployment and poverty and moved to places where the prospects have seemed better. In the eighteenth and nineteenth centuries many people from poor parts of Europe moved to the United States, Australia or New Zealand to start a new life. In the 1960s people from southern Europe moved to more affluent countries to earn a living there and people from Mexico are moving to the USA for the same reason.

In industry the same type of migration has happened over and over again. During the industrial revolution people who became unemployed in agriculture moved to the cities to work in the factories. As industry has gradually become automated and fewer and fewer people are needed, service industries have grown.

In the 1990s people believed that electronic business, IT consulting and information management would employ people on a large scale in the future. Now it seems as if tasks related to automation of administrative processes, implementation of IT systems and information management require fewer and fewer people. The tools used to implement systems are developed to levels where less work is needed in an implementation project and information management does not require large volumes of resources. The hope that IT will be the new area of employment in the future seems unrealistic.

At the same time automation is reducing the need for resources in industry upon industry. Where is the new promised land, and which are the growth industries of the future? The market is not a machine that automatically creates opportunities as resources are freed from the existing economy. The market consists of people that are known to have bounded powers of rationality and possibly also limited powers of creativity. We need to systematically analyse the current situation and try to identify new areas of creativity and possible growth in order to create new areas of sustainable growth in the future.

Part IV
New Sources of Competitive Advantage

'Traditionally, it has been considered the responsibility of religion to prescribe what behaviours are wholesome and what are not. However, in today's society religion has lost its prestige and influence to some degree. And at the same time, no alternative, such as secular ethics, has come up to replace it. So there seems to be less attention paid to the need to lead a wholesome way of life. It is because of this that I think we need to make some special effort and consciously work towards gaining that kind of knowledge.'

His Holiness the Dalai Lama[25]

15
Secondary Qualities

On the 21st of April 1996 I was on a plane from Paris to Copenhagen when I read the first chapter of a book called *When Corporations Rule the World* by Daniel C. Korten.[26] I remember the date, because it is my birthday, and I remember the place because after having read the first chapter I realized that there is a very simple and somehow 'undiscovered' solution to the dilemma posed by Korten. The same solution can be used to drive economic development in the future and this is the reason why I bring it up in the context of this book.

Korten's book is about the increasing power of multinational companies. Korten argues that these and other financially powerful organizations can exploit the world economy, cause economic instability through speculation, exploit poor countries and increasingly influence legislation and political decision processes in developed countries. The argument in the book is that the corporate giants of this world are creating a new power structure which makes democratic systems powerless and that we need to become aware of this threat to our freedom. The same type of argument has been forwarded by other authors like Naomi Klein in *No Logo*, and it is supported by large numbers of people in 'anti-globalization organizations'. One such organization is called Attack, which protests against globalization, in the same way that Greenpeace is protesting against pollution and environmental destruction.

There are numerous authors who argue that this view of globalization is entirely wrong and that multinationals and global trade have contributed to economic growth in the last century. There may be a downside to this development, say the proponents of globalization, but the benefits outweigh the negative aspects. There is still no better cure to poverty than capitalism. I do not believe that large-scale business is bad

in itself, but I do believe that all systems can be improved. There is a way to create new business and profitability in business, by satisfying a wider range of customer needs. The 'trick' is to identify needs that are not yet satisfied by business and find ways to satisfy them, in the same way that companies have found ways to develop practices and products that are friendly to the environment.

Sitting there on the plane, I found no reason to form an opinion about globalization at this point. My idea isn't related to new forms of protest or political forums where the anti-globalization movement could make their voices heard. Instead it is based on an understanding of where globalization and the growth of multinationals comes from and how the same forces that have made global companies grow in the past could be used to make small companies grow in the future. This was not based on any feeling of mine that globalization is necessarily bad, only on the idea that enough people think that it is, it can relatively easily be stopped. Instead of the globalization that we know of, it could also be given 'a human face', which the anti-globalization people argue is lacking in the type of globalization that is driven by multinational companies today.

We're not talking about socialism, restrictions or about militant demonstrations, but about the expansion and development of the mechanisms of the market economy. If many people agree that a particular change is desirable and that they have identified the exact mechanisms that need to be triggered to achieve a certain impact, any changes in the global economy could be brought about through the use of market forces. If it is agreed that there is a need to create new growth opportunities in the economy, it could be done through the use of the market as the primary tool. In this description I will often refer to the promotion of small business as an example of a cause that many people support. I have chosen to use this example because it has already been widely debated. This should, however, be seen as an example only, and market mechanisms can be used to trigger other types of change, as will be shown later in the book.

The most simple and straightforward explanation of the growth of any company is the fact that people increasingly buy its products. There is no way that a company can grow if people buy less and less of its products. As long as people all over the world keep buying the products of multinationals, these companies will grow. When I sat on the plane I did not have the opportunity to check it, but I had worked as a consultant in many industries, the food industry being one of these, and I was certain that there, at least in Sweden, existed alternatives in all

product groups in the food industry that were produced by small or mid-size companies. In general such companies struggle to maintain profitability and growth, because they cannot afford to advertise their products at the same rate as multinationals. Even though people buy food several times per week and even though many people believe that globalization is bad, still the multinational food companies continue to grow at the expense of smaller companies that offer products that are often less expensive.

Later, I went through the entire product range of a normal Swedish grocery store, using groceries as an example of an industry that would be relatively easy to change, because of the frequency of purchasing and the ease of communicating information about this market to people. I found the following:

- Companies that were represented in the store could be divided into multinationals (Philip Morris, Nestlé, Unilever, etc.), Nordic food groups (Orkla, Arla Foods, etc.), large Swedish dominants, mid-size Swedish companies that distribute on a national basis, and small regional or local producers.
- In all product categories there existed mid-size companies or small producers that competed with the multinationals and the national dominants.
- There was no general indication that products from small companies were of lower quality than those of the large companies, but they were very often less expensive. This is contrary to what many people believe, but small companies often have to compete on price, because they cannot afford expensive advertising. For the same reason they often cannot position themselves as the companies with the most modern product range, because they cannot afford to invest large sums in product development.
- It is often difficult to identify which products come from multinational companies and which come from smaller alternatives. All food products tend to be marketed under a brand name and the name of the company that owns the brand name often does not appear on the package.

The development of environmental products

When I was a child I watched television and saw how the early environmentalist movement grew and how there were arguments in the

news against pollution and discussions with the managers of large companies, who argued that it is not the responsibility of companies to improve environmental conditions. Instead, these managers argued, national governments would have to pass laws that limit pollution and then the companies would have to obey those. In total the whole issue was played down by companies, who did not want to have limits on the pollution levels from cars, or restrictions on the substances that could be used in detergents.

Gradually, the importance of environmental issues began to sink in and consumers started to look for products that were more environmentally friendly. Some smaller companies spotted this trend and realized that they could increase their sales if they developed products that were more environmentally friendly than the leading brands. Leading brands often tried to resist, and relied on the popularity of their brands to avoid changing their formulas. Gradually, the success of the environmentally friendly brands and the start of environmental certification of products forced the leading companies to follow and develop products that were more friendly to the environment.

Now we have environmentally friendly products in all areas. We have cars that emit cleaner air than the air they take in from the outside, just to mention one example. To a large extent this development has been possible because of the interest of consumers in finding environmentally friendly products in the market and thus making it increasingly difficult for companies to sell products with undesirable environmental consequences. From a situation in the 1970s when nobody had any idea about which products were environmentally preferable, activists and experts began to identify those that consumers wanted, and attached certificates to the packages of these products to enable customers to quickly recognize the specific product qualities.

When I studied the products in a grocery store from this perspective I found that I could easily have included all brands in a small four-page leaflet. If such a leaflet had existed it could have been used by consumers who wanted to identify the products of smaller companies and distinguish those from the products of large companies. In Sweden there are five or six large coffee brands. Two of these belong to multinational companies, Kraft General Foods (Philip Morris) and Nestlé, and the rest belong to small or mid-size national companies. There are less than ten large breweries and soft-drinks manufacturers and some of these are multinationals (Coca Cola, Pepsi), two belong to large Nordic food companies or breweries (Carlsberg, Pripps) and there are a larger number of small and medium-sized breweries that offer products of a high

quality. These are only examples that show the relative simplicity of identifying the products of multinationals and those of smaller companies. If a large number of people want small companies to grow, it makes sense to do this through buying more and more of their products and less of the products of large companies. It is in fact counterproductive by the government to subsidize small business by helping people to start new local companies if people at the same time are unaware of the need to help these companies into business through buying their products.

Gradually, I found out that all political parties in Sweden, and probably in other countries as well, are in favour of the growth of small companies. The conservatives and liberals argue that more small businesses increase competition and that competition is good for consumers. 'Greens' want small businesses in order to create local markets and local production and reduce transportation of globally produced products, and social democrats want more small businesses in order to create new jobs. Anti-globalization organizations and debaters argue that small business is preferable, because small companies do not pose a threat to democracy, or shuffle production sites and billions in financial assets around the world, and they do not wreak havoc in labour markets by moving production or product development to the most advantageous countries in the world. There is a strong support for small business, but nobody seems to have identified the best way to support it. Instead, anti-globalization organizations spend their time protesting in the streets of Oslo or Seattle when there are meetings of the G8 powers or the OECD. The most valuable use of their time may instead be if they had stayed at home, writing informative leaflets and newspaper articles that could enlighten people as to why they should increasingly select products from small companies when they go shopping.

The issue of small-scale versus large-scale business serves as a good example of a trait of companies that is easy to identify. If we foresee growth problems in the future, because many industries are facing limits to further development, this issue can be analysed from the point of view of which business activities from companies could create new growth. Companies that run their businesses along these more desirable lines could be identified and customers could 'vote' for these companies by choosing their products above those of their competitors. People need to realize that it is their patterns of consumption that have created the current structures and behaviours of corporations in our economy, and that these same structures and behaviours can certainly

be changed if people make a concerted effort. As long as consumers demand less expensive products companies will continue to use fewer resources.

The key to change is to buy more of the products of companies that show desirable behaviour and less of the products of companies that show less desirable behaviour. We cannot expect all products to be bought from the better companies all at once, and this gives time for preferred categories of products to slowly grow, and for companies to learn and to gradually change their behaviour.

If consumers in today's market started to select more products from small companies, they would not only make it easier for existing small companies to survive, but also easier for new small companies to be started, and we could imagine a whole new economy that consisted of companies that pursued other values rather than just time and cost reduction in their operations. Customers should identify and support companies that carry any preferred trait or show any desired behaviour.

I have begun to call such traits or behaviours in companies 'secondary qualities' of products. Secondary qualities are complementary aspects of products and could be distinguished from 'primary qualities'. Primary qualities are taste, smell, the fit of clothes or the durability of a fabric. Secondary qualities are qualities that are related to the way that a product is produced, the way that the producing or distributing company is owned, its size or the policies of employment that are in use by a company. We could think of a number of different secondary qualities that could be developed by companies and the development of these could add new growth to the economy, if consumers and purchasers see a value in supporting them. Secondary qualities are the type of values that are discussed in political election campaigns every few years, but we are unaccustomed to thinking that we are able to influence these values in ways other than through our election of a particular party or a particular candidate. In these political situations our ability to influence anything is indirect and uncertain at best, and an illusion at worst. Through the market we can directly influence development every day of the year and adjust our behaviour as we receive better information.

The systematic development of secondary qualities

Throughout this book we have been analysing the possibility that companies may be close to the exhaustion of their sources of competitive

advantage. Undeniably, companies are aiming to reduce time and cost in all areas of their business to a minimum. They do this through the use of new technology, new management practices and improved internal routines. The reason behind this pursuit of time and cost is that consumers believe that it is in their own best interest to select the least expensive products that offer 'the best value for money'. This is an excellent strategy both from an individual perspective and from the perspective of society, if there are no limits to growth or to the development of new competitive advantages, but these preferences among consumers drive the current development towards the limits of competitive advantage in terms of time, cost and capacity. But, if there are limits to the development of competitive advantages, it may be more advantageous for consumers and for the economy as a whole if other values were emphasized in the purchasing situation, rather than the incessant pursuit of 'smaller, cheaper and faster'. It is true that there is no point in companies searching for new advantages to develop if these are not valued by customers. If customers could make up their mind about what they want from companies, they could also, as in the case of environmental friendliness, force companies to develop in the direction that they want. In order to make this possible, customers will need the help of debate, research and analysis to form an opinion. At present it is not clear which values customers would want to pursue and in which ways they could best pursue them.

Customers may find that the ability to influence certain areas in society is important, and that if this can be done at a low cost or no cost at all, it may be worthwhile to gradually change consumption patterns towards products from companies that offer more advantages than just the product. Small companies versus large multinationals is only one example of a possible secondary quality that consumers may find valuable. Many books have been written on the subject of globalization and people are starting to become aware of the downsides of globalization. Through intelligent play with the use of market forces we may be able to create win-win situations where we can keep the advantages and reduce or eliminate the negative or risky aspects of a development like globalization. In the debate about this issue the relatively rigid arguments have caused a polarization of views of a type that is rarely fruitful for creative problem solving.

Multinational companies could contribute to the development of small, local business

In order to show the wealth of opportunities that the market economy offers, if we manage it right, it would be possible and it may also become profitable for multinational companies to support local business. Instead of the centralized development of global business concepts, which are marketed in the same way all over the world, multinational companies could use their global presence and financing power to start new local business concepts. In the development of these concepts they could finance a part of the development and allow local entrepreneurs to become partners. In the same way that a company like McDonald's now offers business support around the marketing of its global hamburger concept, the multinational companies could offer support in concept development and in the development of new products and services. The entrepreneurs and the multinational companies could own such concepts jointly and also franchise them to other entrepreneurs in other parts of the world.

Instead of spreading one single concept all over the world, or a single line of products that look the same in all countries, multinational companies could contribute to increasing proliferation of products and business concepts and could become major forces in the creation of new business.

The limits of business development are to some extent located in our brains and we need to learn how to develop new concepts that can renew the economy. In the same way that Greenpeace is working together with companies in order to develop solutions that are more friendly to the environment, multinational companies could get many new ideas through a dialogue with people who want to develop more local business. If there is a big enough demand, multinational companies are likely to find ways to take advantage of it.

We can easily identify a number of other secondary qualities that could be communicated to consumers, such as supporting companies that employ people locally by increasing the purchases of locally produced products. It may be of interest to people to buy food, clothes, etc. from companies that produce locally, because the money spent with these companies will go into taxes locally, and they will create new job opportunities in the area, and so on.

One other secondary quality could be embedded in products from companies that employ handicapped people in meaningful occupations or that improve the situation in the labour market for other weak groups like immigrants.

We need to keep in mind that these are not socialist ideas or ideas that limit the market economy. Instead, secondary qualities could be used to increase choice and increase the power of the market economy by making people aware of the tremendous influence that their purchasing habits inevitably have on the structures of society. If there is nothing that needs to be changed and if the economy can go on growing forever, based on traditional competitive advantages, we have no reason to seek new ways of identifying customer needs that can be satisfied through the market. On the other hand, if there are people who are in doubt about the advantages of globalization, or who would like to support the handicapped, or who believe that we need to identify new sources of competitive advantage, secondary qualities could be one alternative.

A strategy containing secondary qualities

The natural cosmetics company The Body Shop has built its strategy around the development of secondary qualities in addition to its product offering. The cosmetics of this company are developed without testing on animals and they are produced in environmentally friendly processes. Sometimes the raw materials are bought from native peoples who have these raw materials as one of the few sources of money income. Each shop is encouraged to initiate local projects where the personnel offer their help locally free of charge.

This is a good example of a company that has been developing secondary qualities for a long time and that has also derived substantial strategic advantages from this development. From a strategic perspective it is relatively easy to copy this type of advantage, but the main point is that in a society where customers value such aspects of business, they may be willing to allow this type of company to make a higher profit.

If more companies developed such qualities we may find that competition would change. If it is no longer in the best interest of consumers to go for the lowest-cost producer, they may select products on other grounds.

I have been in discussions where business professors have described the view of an economy that is coming close to its limits as 'catastrophic'. There is no need to look at the situation in that way. We need only to apply our creativity to the problem and find ways of solving it. In the 1970s environmentalists were thought to be naive, when they believed that it would be possible to make companies develop environmentally friendly products. Now, we know that this is possible, and we need to further explore how this was done in order to understand how we can use the market to solve other problems in the future.

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Customers Can Help to Create New Economic Growth by Demanding New Features and Secondary Qualities

The customer takes a central position in the development of all types of new products, features and business practices. All companies in a number of ways monitor their markets and general developments in society to identify new forms of demand that can be satisfied. Customers are often not aware of this, but their purchasing patterns, new political inclinations and interest in new technology are keenly observed by companies that try to implement 'early warning systems' and other devices, by which they can spot changes in consumer behaviour and preferences at as early a point as possible.

Many times markets develop in entirely predictable ways, as when customers demand the next generation of smaller and more powerful mobile phone to replace the one they already have. At other times the market surprises companies, as when a previously successful product rapidly falls out of demand for reasons that are not completely understood. The decline of Apple's Macintosh computer is such a case. A previously highly successful formula was suddenly not favoured any more and a previously amazingly successful company started to lose customers and money at an alarming pace.

Such changes happen because customers change their preferences in ways that cannot easily be predicted by companies, and they do so for reasons that are difficult to anticipate. If many customers suddenly started to demand secondary qualities as well as traditional product features, low price and rapid delivery, and make this known to companies through the forming of organizations with the aim of supporting this development, this would rapidly be spotted by companies. Some would see an opportunity in this and others would see a threat, but many companies would initiate activities to take advantage of the new situation, or take measures to diminish the negative impact of the change.

One of the problems that we are dealing with in this book is the possibility that resources may find it difficult to find new employment in the future, because companies are close to the limits of the development of their existing markets and competitive advantages. We can see that a focus on secondary qualities may be a source of new employment. In order to understand different aspects of the secondary qualities that become desirable, companies would have to start research, and employ managers with the responsibility of exploiting the new opportunities. In their turn these managers would hire external help like advertising agencies and consultants that could help in developing products, services and organizational systems to take advantage of the development.

In the same way that companies previously had to develop expertise in environmental issues, train production managers, logistics managers and production and logistics personnel to act in an environmentally friendly way, such activities would have to be initiated. At the same time other activities may be discontinued, because they were not in line with the new objectives. This would also require analysis, projects with the aim of making change happen, and these projects would have to be run by people who make plans, run meetings, develop concepts, and so on.

Exploiting secondary qualities would open up new fields of creativity. New products and services could be offered by newly established companies and in the same way that the outcome of the environmentalist movement was not predictable when it started, we do not know how secondary qualities could be used to invent new products and business concepts and boost economic growth.

Not all customers would know initially which secondary qualities they would prefer in their products. To debate issues and to inform people about different alternatives there would also be an increasing demand for books, education and debate on a number of new subjects. Universities and schools would be able to identify new skills that would be needed and educate students in these and research would have to be initiated in a number of new fields.

This isn't only a theoretical idea. The development of environmentally friendly products and services has shown that it works in practice, and is an example of a development that was driven by a genuinely new customer preference. Companies had to engage in a number of new activities and they had to employ a number of new people and engage in training, research of markets and marketing, which required the skills of advertising agencies and consultants. Friendliness to the environment was for a number of years a trait in products that also

justified a higher price, which was also happily paid by customers who felt that they contributed to a good cause. At present the same is true for ecological food products, which are often more expensive than other products. If customers know that they are contributing to a good cause that will improve their lives or the future of the planet, most are happy to pay a little extra for this. This could be one attractive aspect of secondary qualities that could make companies interested in finding other such qualities to develop. The more recent development of ecological foods could be seen as an example, besides that of environmental friendliness, of a secondary quality that is increasingly in demand.

Sponsoring

Companies already do sponsoring. To some extent this could be seen as a secondary quality. The difference between sponsoring as it is done today, and the development of secondary qualities, is that sponsoring has the primary purpose of giving publicity to the company. Sponsoring is often aimed at the support of elite level sports events.

It would be possible to use the same amount of money in other ways and it may generate more benefits or other types of benefits if invested in other areas of society. Elite athletes and global sports entertainment are not necessarily the types of activities that people would prefer their suppliers of goods and services to support, using their money. Maybe it is, but if secondary qualities were developed on a broader scale there might be things other than sports, opera and so on that people would like to support.

In other situations the acquisition of new skills has been initiated by developments in the market or in the competitive environment, and it has had a positive effect on the economy. Companies that want to participate in global markets have had to learn about globalization, study overseas markets and develop new products and services that could cater to the tastes of a wider range of customers. This has involved the acquisition of new skills, and the hiring of consultants and advertising agencies, and it has opened up markets for new technologies, because of the widespread organizations and new management principles. All this has spurred research at universities and at private research organizations who develop products and ideas for commercial purposes.

Someone may at this point interrupt to say that each such development only has a temporary effect on employment. Once companies have internalized a large volume of new knowledge, employed new people and established an organization that could function in the new environment, a new trend is needed in order to sustain development. This is one way of seeing it, but I believe that it isn't the only way.

Since secondary qualities have not been in the focus of consumers or researchers in the past we do not know how such qualities could be developed. Instead of the pursuit of a number of different individual secondary qualities, customers may gradually learn how to integrate such qualities in order to demand from companies a type of behaviour that leads to economic stability and stable economic growth. This type of stable growth may not necessarily need to be caused by the incessant development of new products and services or the constant speeding up of processes or the reduction of cost.

Just to mention a few examples of how company behaviour is believed to destabilize the economy and cause unhealthy fluctuations, we could look at the financial policies of global companies. In order to invest their money where it catches the best interest rates, companies often go for speculation in global currency markets. Korten[26] describes how companies and increasingly also non-profit organizations use short-term speculation in financial markets to try to gain from short-term fluctuations in different markets. Companies use hedge funds, options and other types of financial instruments and services to facilitate speculation. This creates uncertainty and risk in economic systems and the main benefactors of this are the companies that offer the services whereby companies and private investors can manage these risks. For ordinary people, it creates additional cost that adds to the prices of all kinds of products and services in the economy.

The efforts of global companies to move facilities from one country to another in their search for the most advantageous countries to do business in, could also be seen as a factor that destabilizes labour markets and other factor markets. In economic theory it adds flexibility to markets and drives economic growth. In many cases it creates difficulties and adds cost to the economy for lengthy periods of time. Examples of this could be taken from the move of a substantial share of the American car industry from the Detroit area to Mexico. This move was done over a period of only a few years and it caused substantial economic disruption in many cities in the area. The disruptions created by this have been vividly described by Michael Moore in the film *Roger and I*. I do not argue that it should not be possible for companies to move

production or development to other countries, but it would be an advantage for customers if they saw the link between their purchasing behaviour and their preferences and the actions of companies. If these links became clearer, customers may want to support companies that made such moves gently and in cooperation with municipalities, so that negative consequences could be avoided. Customers may in later stages of the development of secondary qualities be able to spot the factors that constitute responsible behaviour from a company, and distinguish between companies that behave in a responsible way and those that do not.

This would not necessarily reduce the opportunities for companies to make profits, but it may induce them to try to make profits in ways that are in line with wider public sentiment. It may also be a way by which customers could identify companies that invest their profits in a responsible way and that use reasonable levels of remuneration for their boards and management teams. Responsible behaviour by companies could be rewarded by enlightened customers, who may be prepared to pay a price premium for the products of responsible companies.

All of this will not be achieved overnight. It may take decades of work to implement new management practices, evaluate secondary qualities, debate the strengths and weaknesses of different approaches, research alternatives and train people in a number of new disciplines. This would be good. It would create new economic activity and it would possibly bring a number of new benefits to society.

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Governments and Political Parties Can Support the Development of Secondary Qualities

We already have a number of organizations that exist because they want to change society. In many cases the political ways that they use are ineffective. This can easily be shown by the example given above. All political parties that I spoke with (I was in correspondence with the leader of each party or with a person appointed by the leader who worked particularly with business development and small-scale business) were supportive of the idea that we need more small businesses, and large amounts of money are invested each year in different measures to support the establishment of new business. These measures range from the financing of university research on small business, to the financial support of people who want to start new businesses and to regional support of small companies that are already established. Despite all this support, large companies constantly win a larger and larger share of markets, and small business is on the decline in many industries. And though there is constant criticism from authors who are successful in selling their books all over the world, and support for small business from political parties and other organizations, people buy more and more of the products of multinationals. Thus multinational companies grow at the expense of smaller firms.

My hypothesis is that this is not what people really want. It is a consequence of a lack of knowledge of the influence of buying behaviour on industry structures, and a lack of knowledge about which products are produced by multinationals and which are produced by small companies. Political parties that really want to support small business could help by identifying appropriate changes in purchasing patterns and by educating people about the benefits of improved competition. Other possible advantages of increasing small business could be the lessening of pollution through the reduction of transportation, the creation of

new jobs, and an increasing need for other resources as well. Since many parties receive substantial financing from large corporations, some may find it difficult to participate in this type of education and research, but there are probably other organizations that would find it interesting. It would, of course, also be possible to start new organizations with the aim of doing this.

Large companies can gain from secondary qualities. It is not a purpose of this book to hurt large companies by supporting small business or to hurt them through support of other secondary qualities. But large companies could identify strong aspects of their own way of doing business and identify improvement opportunities and use these as secondary qualities to promote to their customers. If customers want less of the negative consequences of globalization, but have nothing against the multinational companies themselves, these companies could find a multitude of ways to change their behaviour and become more responsible companies. Those that already act responsibly could use this as a strong marketing argument to customers who become more interested in this aspect of business.

The oil company Shell is one example of a company that has changed a negative public image. People even damaged and broke into petrol stations to show their dismay with the company. Now this company has implemented a global policy at group level to improve its image, and this has led to a number of advantages for the company.

Secondary qualities are not a clear-cut instrument that would make some companies winners and others losers. It is a new playing field for business that could be productively exploited to win new market share, and profile products and services in new ways, and could underpin a strategy of charging premium prices for products. There would be an initial cost of developing secondary qualities, as is the case for any other type of business development, but this would also bring new value to society and possibly take away cost from society in other ways. Instead of raising taxes, a share of public services could be handled by socially responsible companies, and companies that act in a less opportunistic and more responsible way may reduce cost for society as a whole.

In order to improve our understanding of how secondary qualities could be used to drive change in society in beneficial ways, we would need to discuss, analyse and research different opportunities and alternatives. This activity may need the support of governments and other organizations. The development of national IT and other high-tech industries have in many countries been supported by governments through the founding of schools and business parks. Secondary

qualities could become a growth driver and a way of improving society in a structured way and it could benefit from the support of governments, political and other organizations.

Secondary qualities could strengthen the market economy

We may assume that the systematic development of secondary qualities could create new businesses and job opportunities. This is one goal that could be achieved through the pursuit of secondary qualities, but it is not the only one. Many people perceive that the strength of companies is too large, and that ordinary citizens have too little say in the development of society. If all people could learn to use their purchasing power to systematically influence companies and industry structures this would be a democratic tool that could be used every day throughout the year. Political elections are held once every few years, and political elections may be seen as an indirect way of influencing society. There is an indisputable link between our purchases and changes in structures. Since this link has not been made visible, most people are not aware of it, and those who are, cannot use it very efficiently because people need to unite their efforts in this respect for them to be effective.

A certain amount of public dissatisfaction with companies, which has been caused by company scandals and a number of books that criticize business, may in itself merit the search for new ways to influence companies. This need would be even stronger if it turned out that opportunities for economic growth along traditional paths are not unlimited. This latter aspect is the real reason for our search for new growth opportunities in this book, and secondary qualities could be one way of finding them.

The development of secondary qualities could strengthen the position of the market economy in the minds of people, by placing the reins firmly in the hands of the general public. Secondary qualities, as we have seen, have nothing to do with primitive forms of showing disappointment, like 'boycotting' individual products or companies. Instead, it is the structured pursuit of the development of new advantages, that could be used for a number of purposes.

It could be argued that the use of secondary qualities would be an application by consumers of the type of structured buying behaviour used by companies. As we saw in our description of supply chain management above, companies are using increasingly structured ways to manage their suppliers. It is no longer enough to be a superior company

– a company needs to be a member of a superior supply chain in order to make superior profits. In order to achieve this, companies not only look for suppliers with the lowest price. By focusing on time compression, companies force their suppliers to apply a number of different management practices, implement quality control systems and sometimes locate production facilities close to the plants of major customers. Companies dictate how their suppliers should run product development, which features they want developed and which materials they use in their products. Customers often shun the use of environmentally questionable materials, and toy companies prohibit the use of inflammable materials, which is sound from the point of view of society.

If a company finds that the use of a particular supplier increases cost or risk in an area of its business, because of practices used by the supplier, it either forces the supplier to change, or it changes suppliers. In the same way the practices of companies may increase cost in various parts of society, and it may be more advantageous for customers to increase purchases from an alternative manufacturer with different practices. This could be done through the identification of secondary qualities. Companies are organized to systematically manage various aspects of their business on a day-by-day basis. Consumers are not yet organized to do this, except in a few respects, like environmental issues, but it is only a matter of will to do it.

Secondary qualities may not be the only way to create new business opportunities within our existing economic system, but it is one way of doing it, and it shows that it may not necessarily be catastrophic if current paths of business development are approaching a point of exhaustion. One point of this book is to open the eyes of people to the possibility that there may be limits of development. A second point is to show that there are opportunities for growth that we have not yet started to systematically exploit. A third point will be dealt with in Part V. There are opportunities for growth that could be created by changes in our monetary systems. This is another way of adding new features and mechanisms to the market economy. It is possible to create economic systems where people can not only choose between different products and services, but also between different currencies in which to perform transactions.

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Part V
Structural Change Could Create Further Growth

‘I’m writing this book on a computer. It is the summer, and it is hot. One of my computers has failed in the heat, but I have another, so I can continue to work. Is it so unreasonable that the brain would have this same kind of backup system, so cells in the cortex can take on different functions? With a couple of backup systems, one can function in difficult circumstances, especially if the circuits are in a parallel arrangement.’

Robert Ornstein[27]

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Existing Structures in the Economy Determine the Limits of Growth

In order to exploit the opportunities embedded in the discovery of secondary qualities, we probably need a movement in society similar to the one that spurred our awareness of environmental issues. In the next field of development that we will look into, there is already an existing small movement among economists that drives the exploration of new growth opportunities. I am totally indebted to Professor Bernard Lietaer for the reasoning and the examples in this part of the book. It is important to show that a number of tried and tested solutions to economic development exist, even though I am not an expert in the field. I can only recount the very interesting and inspiring work of Lietaer as it is presented in his book *The Future of Money*.[28]

The dustjacket of Lietaer's book introduces an author who should know the subject of money inside out: Professor Lietaer has worked in senior executive positions in a large European bank, he has created and led a very successful Investment Fund and he holds professorships at universities in Europe and the United States. He is known as a world leading financial visionary and has been involved in the design and implementation of the ECU, the mechanism of convergence before the implementation of the Euro. On top of this he was named the world's top currency trader by Business Week. This is certainly no meagre track record.

Professor Lietaer's book deals with a type of monetary system that has been tried for more than one hundred years in situations of unemployment all over the world. Many of the ideas that form the basis of complementary currencies were developed by the economist Silvio Gesell in the nineteenth century. The interesting aspect of these systems

is that they can create new work opportunities, new businesses and new wealth, without harming the traditional economy that is based on national currencies.

In the 1930s, during the Depression, hundreds of local currencies that contained mechanisms that encouraged cooperation were used to boost local and regional economic activity in many western countries. Lietaer describes examples of such systems, including the 'Wara system' in Germany, the 'Wörgl stamp scrip' of Austria, and US examples, which he calls 'Depression scrip'. In all these cases the currency systems were so successful that central banks and politicians felt threatened by them and prohibited their use. In the US, President Roosevelt introduced his 'New Deal'. In the famous speech where he coined the phrase 'The only thing we need to fear is fear itself', he introduced the New Deal and at the same time he prohibited currencies that could be complementary to the dollar.

Lietaer argues that the majority of applications of complementary currencies in the US were 'correctly designed and successful. There even exists a remarkable catalogue which illustrates several thousand examples of local scrip from every state in the Union.'

Before the introduction of the New Deal there were discussions between the influential economist Professor Irving Fisher of Yale and officials within the Roosevelt administration. Professor Fisher was convinced that stamp scrip was the best way out of the depression and he tried to convince Dean Acheson, the Undersecretary of the Treasury at the time, of this. Fisher argued that stamp scrip could bring the United States out of the Depression in three weeks. Acheson decided to consult the respected Economics Professor Russel Sprague of Harvard. Sprague agreed that stamp scrip could be used to bring the American people back to work, but he also saw some political implications and decided to check the matter with the President.

Lietaer argues that there is a growing consensus among economic historians that the centralised initiatives, that are summed up under the heading 'The New Deal' didn't bring America back to work. The programmes created many valuable jobs, but what really brought both the United States and Germany out of the Depression were the preparations for World War II.

As an aside here, we can see that the widespread belief that market forces are themselves able to put an economic system back in balance does not hold true in the case of the Great Depression. Many people who have studied business and economics believe that the market forces

normally have the power to bring an economy back into balance on their own. This may be true in less severe cases than the Great Depression, but there are more recent examples where this has not been the case either. In the UK the London Docklands were almost deserted for decades until an organization called The London Docklands Development Council was founded with the task of driving economic growth in the area. This happened in an area that lies within Europe's largest city. In Sweden the end of the investment wave in supertankers created a regional crisis in the 1970s and 1980s. The areas struck by this crisis had to wait for a number of years until the Swedish government and local and regional authorities found the proper measures to take in order to create new growth. It is ironic that even the crisis that gave us the term 'creative destruction' after the analysis by the economist Joseph Schumpeter, was not solved by market forces themselves. The validity of the doctrine of classical economics that the economy is a system that always brings itself back into balance, has to be doubted.

If we turn back to the idea of complementary currencies, this is held in high esteem by economists who have studied the subject. It is not only the two professors Fisher and Sprague who have expressed strong belief in these types of systems, but it seems as if several economists who have studied the subject have been persuaded of the efficacy of such systems, and for good reason.

Lietaer provides us with figures that show how the experiment in the Austrian town of Wörgl with a population of about 4,500 people worked. The local currency of Wörgl was in use from July 1932 to November 1933 and the currency was issued in three denominations of 1, 5 and 10 schillings. The outstanding amount of only 5,500 schillings was circulated 416 times, which is almost once per day and they produced 2,547,360 schillings of economic activity, which is equivalent to 7.5 million USD in today's currency. This is 12 to 14 times more economic value than was at the same time created by a similar amount of the national currency. As a result of this, the investment in productive assets in Wörgl jumped by 219 per cent compared with the previous year. The scrip was the idea of the Mayor Unterguggenberger and it was used to re-pave the streets, re-build the water system, and build new houses, a ski jump and a bridge. The bridge is still endowed with a plaque that proudly reminds visitors of the money experiment: 'This bridge was built with our own Free Money'. In order to encourage circulation and discourage hoarding of money, the scrip had a monthly

'demurrage fee', which is a gradual depreciation of the currency. This was set at the low depreciation rate of 1 per cent per month. When the success in Wörgl started to get noticed Unterguggenberger received representatives from 200 townships in Austria that wanted to copy the system. It was at this point that the central bank in the country panicked and decided to abolish such systems.

Wörgl had to go back to depression and 30 per cent unemployment. In 1934 social unrest shook Austria and a number of left-wing parties, including the party which Unterguggenberger belonged to, were outlawed. As Lietaer puts it: 'During the Anschluss of 1938, a large percentage of the population of Austria welcomed Adolf Hitler as their economic and political saviour. The rest is well-known history (see ref. 28).

Lietaer clearly implies that the Second World War might have been avoided if the peoples of Germany and Austria had been allowed to continue their alternative currencies. In Germany a system called 'The Wara System' was in use in a number of local communities until it was abolished by central government in 1931. In the experiences from the US, Germany and Austria this type of system can hold unemployment in check, and the explosive growth of the national socialist party from 1930 to 1933 correlates very closely with the growth of unemployment. Lietaer does not argue that there is a simple cause-and-effect relationship between the abolishment of the complementary currencies and the rising to power by the Nazi party. He merely implies that it may have been more difficult for Hitler to get the widespread following that brought him to power, if some mechanism other than centralized government employment programmes had held unemployment in check.

Instead of abolishing such systems, central and regional governments now take an active interest in exploring these opportunities. Lietaer describes how regional governments in 30 different US states, in New Zealand, Australia and Scotland have supported the initiation of alternative currency systems. These authorities have done this, because such systems have effectively solved problems of unemployment in local communities. In four very different settings the European Union is also funding such programmes.

Lietaer also describes how a national complementary currency has been implemented in Japan to pay for daily care for its rapidly aging population. In total, Lietaer managed to identify 2,500 complementary money systems that were in use around the world at the turn of the millennium.

Why Lietaer wrote his book

Lietaer's argument that we need to investigate complementary currencies emanates from an analysis that is similar to my own, but which also differs in a number of important respects. Among other authors, he quotes the influential economist Paul Krugman, who sees a number of similarities between the global economic development of the late twentieth century and the development that led up to the great depression in the 1930s. Krugman argues in the book *The Return of Depression Economics*[29] that a new global economic crisis may be imminent. This situation of 'Depression economics' triggered a number of regional economic crises during the 1990s in Asia and South America.

These general economic weaknesses that have been identified by Krugman are important forces that may continue to cause instability in the future. Lietaer refers all-in-all to four serious economic challenges that have been building up momentum in the past few decades and that will force themselves on the economy with full force between 2000 and 2020. The four developments are:

- The age wave: The population in the western world is aging at a previously unseen rate. In the future there will be more people in old age that will have to be taken care of by fewer and fewer in the working population.
- Monetary instability: The above-mentioned tendency towards economic crises that we have seen building up during the past decade.
- Information revolution: New information technologies make it possible to do more and more with no human resources at all. Almost everything that we need could in the near future be produced at a fraction of the cost of a few years ago, using the most modern information technology, and human labour will not be able to compete against computers. This argument is similar to the line of reasoning regarding e-business and information technology tools in this book.
- Climate change and biodiversity extinction: Biodiversity is reduced at an alarming rate, the climate is gradually getting warmer and we need to take innovative measures to reverse this development.

Lietaer argues that complementary currencies could be one possible tool that could be used in various ways to facilitate change and fend off negative developments in all these areas. He presents four different

scenarios for the future that are based on an analysis of developments in the past few years. One of these scenarios is called 'Sustainable abundance'. This is a very optimistic scenario, based on a growing understanding of how monetary systems work and the implementation of new systems with new mechanisms that complement existing national currencies. This scenario includes the creation of an abundance of new meaningful work and the opportunity for everybody, regardless of whether they formally have a job, to participate in economic activity. He also sees the risk that the current development could lead to one of a number of difficult scenarios, where different aspects of the current development have run out of hand. He calls these scenarios 'The Corporate Millennium', 'Hell on Earth' and 'High Street 2020'.

'The Corporate Millennium' represents a situation where global companies are given more and more power by unwitting citizens and governments. In his scenario these companies are able to seize power entirely and abolish democratically elected governments and rule the world according to their business rules. 'Hell on Earth' is a description of a society where a very large proportion of all children grow up in the streets and are given no education, and where violence and death is the daily norm for most of the population. 'High Street 2020' is a modern development that resembles 'the dark ages' after the fall of the Roman empire, when villages and towns closed themselves in, and created local sub-cultures often based on superstition and fear. People were hostile to strangers and to those with different views and backgrounds. In this scenario a global economic crisis has led to a situation where people live in secluded groups with little contact with the outside world.

In addition to these four scenarios, all of which Lietaer describes as 'equally plausible', there is a view of the future that he calls 'The Official Future'. This is the least probable development, according to Lietaer, but the one that is believed to be the most probable by the majority of people today and the one that is officially held by governments to be the best we can achieve. This is a 'more-of-the-same' type of scenario, a future that will basically be like the end of the twentieth century, only a little more competition, a little more globalization, a need to re-educate ourselves more often, and so on. Based on an analysis of all the four dramatic developments above, Lietaer cannot see that The Official Future could possibly happen. The strain on the economy caused by the forces mentioned above, will simply be too great to handle within our traditional economic system.

While I see a risk that economic growth may be threatened by the limits of economic development in a number of respects, Lietaer has

not arrived at that conclusion. He describes the future in terms of 'jobless growth', a term that I have also found in a book by Jeremy Rifkin, who has done an in-depth analysis of how new production technologies and service concepts reduce the need for manual work. Rifkin's book is called *The End of Work*.[30] He wrote this before the advent of electronic business and he does not bring up this subject. He describes how earlier forms of automation dramatically reduce the need for manual labour. He describes how agriculture, business administration, service business and production have gradually been automated. Before 1990, investments in IT had almost no impact on productivity, because companies were organized in ways that did not facilitate administrative improvement. From that time onwards, investments in information technology have substantially contributed to productivity, because companies have re-engineered their businesses in order to take advantage of the new technologies.

Lietaer gives a number of examples of how e-business does the same to administrative jobs and information-related work. He not only cites the elimination of administrative routine jobs, but also points out that there are now robots that perform replacement surgery, and that complete novels have been written by computers. He argues that the cost advantages of electronic business are so great that it is impossible to stop the transformation to the electronic economy from happening. Lietaer quotes Norbert Wiener, the originator of cybernetics, who has argued that 'the automatic machine . . . is the precise economic equivalent of slave labor. Any labor which competes with slave labor must accept economic conditions of slave labor. It is perfectly clear that this will produce an unemployment situation in comparison with which the present recession and even the depression in the thirties will seem like a pleasant joke.'

Economists would say that new economic opportunities will always be invented, where human labour is needed. The problem is, as is argued in this book, that our ability to invent genuinely new activities may be limited, and we can recognize most new inventions from the past as the mere speeding up of activities that humans have long been performing. This speeding up can only be taken to the limit where things can be done at almost no time and at a very low cost.

Lietaer sees that the development toward automation and a decreasing need for human labour can be stopped and that there is a possibility of a situation of 'sustainable abundance'. He helps us to trace the core of the predicament back to the mechanisms that are embedded in our monetary system, which has been developed by a number of his-

torical coincidents. We have then forgotten to analyse this system in order to understand why our economy, where national currencies are the norm, functions as it does. He tells an anecdote about a Martian who lands in a poor residential area and is met with the depressing sites of badly maintained buildings and poor people sleeping in the streets. He encounters people that go hungry and sees signs of an imminent ecological breakdown. To his surprise, he finds that the people here on Earth know exactly what to do about all the problems. In addition to this many people are unemployed and many who have jobs don't work with the things that they are really interested in. In Lietaer's words: 'They are all waiting for money.' Lietaer asks us to imagine that the Martian would ask what 'money' really is and finishes the story: 'Could you tell him with a straight face that we are waiting for an 'agreement within a community to use something – really almost anything – as a medium of exchange? And keep waiting?' We could agree with Lietaer that the Martian may leave wondering if there really is intelligent life on this planet (Lietaer, see ref. 28).

Through a number of examples Lietaer explains that there is no need to wait for money. It is our monetary system and its peculiar mechanisms that create a situation where we cannot solve our problems, because there is a lack of money. In other types of systems we could build in the opportunity to create money to do the things that we need to do. In order to avoid the risk of inflation and other risks warned of by economists, we could tie the value of a complementary currency to a fixed value and implement mechanisms of depreciation, like the demurrage that was mentioned in the Austrian example above. Lietaer cautions that the demurrage must be done on a periodic basis and not at every transaction, because the latter would be a sales tax and it would encourage hoarding.

In a note for economists, Lietaer writes that

> One objection to complementary currencies is that their introduction may be economically less efficient for the price formation process than a single national currency. This objection is valid from a purely economic viewpoint. However, the economy is only a subpart of society, and human society a small part of the global ecosystem. Not the other way around. In any system the optimization of a subpart should take into account its impact on the larger system. If your stomach were to optimize its throughput regardless of the impact on the rest of your body, it would kill you.
>
> (see ref. 28)

I bring in an in-depth description of the ideas of Bernard Lietaer because we may need to find new ways to create economic activity in the future. People need to earn a living, even if companies need less and less manual labour in administration and production to produce goods and services. Complementary currencies have been used in the past under circumstances of unusually high unemployment.

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Innovation within the Monetary System Can Create New Work and Sustainable Abundance

Lietaer argues that there will be less and less need for people to work in the future. Among other sources he quotes a UK survey funded by the Department of Education and Employment, which was published by Business Strategies, a consulting company with 'close links to the treasury'. This report concludes that no new full-time employment is to be expected in Britain during the next ten years. The report gives an optimistic forecast for self-employment and part-time jobs, but no new full-time jobs are expected to be created. Similar findings were made by the Cranfield School of Management, which, on behalf of the European Commission, reports a dramatic increase in part-time or fixed-term (up to three months) jobs at the end of the twentieth century. The Cranfield School of Management found the largest increase in the Netherlands, where 70 per cent of all companies increased this portion of employment. In Germany, Italy, Finland and Sweden, 50 per cent of corporations were increasing the share of part-time employment and in the rest of Europe 30 to 50 per cent of corporations were doing it. According to Lietaer (see ref. 28), 'The International Metalworkers Federation in Geneva forecasts that "within 30 years as little as 2 per cent of the world's current labor force will be needed to produce all the goods necessary for total demand".'

Most of us would admit that Lietaer's 'Martian' anecdote above has a substantial ring of truth to it. We know that there are numerous needs that are not satisfied in a traditional economy and that many people who are completely or partially excluded from the economy have time that could be more productively used. Yet complementary currencies are usually not created until unemployment levels get so high that people have both substantial needs that are not satisfied and time on their hands for which they can find no productive use. The available time can

be used to earn money in complementary currencies by baking and selling bread or other household products, gardening, baby-sitting or repairing the neighbour's house, and payment can be made in local currencies. If the community needs maintenance of the streets, as in the case of Wörgl in Austria, this can be paid for in local currency and people can use this same currency to pay other people for goods and services rendered. As long as there is an agreement between two people or between an individual and the community to participate in a transaction, the money needed to pay for the agreed services can be created. We will now look at how traditional currencies are predestined to create competition and how the mechanisms of complementary currencies can be designed to promote cooperation.

Fiat currencies

Our national currencies are called 'fiat' currencies. These currencies are created through a mechanism in the banking system called 'fractional reserve banking'. This mechanism allows banks to create money out of nothing. 'Fiat lux' – 'Let there be light' – were the first words uttered by God, according to Genesis. In real life every piece of money starts as a bank loan. When I mortgage my house for 100,000 dollars the bank creates this money out of nothing, in exchange for some sort of security. The fractional reserve system forces banks to always keep a fraction of the amount that it has outstanding in loans as a reserve. The power to create money is given to the bank by a national government that regulates the circumstances under which a bank is allowed to create money. The fractional reserve mechanism is one that has particular and unavoidable consequences for the monetary system. It creates an economy that can expand dramatically based on a small amount of reserves. It also makes it possible for central banks to gradually expand the amount of money available in the monetary system as our economy expands.

Lietaer shows that the existence of interest, another mechanism of our money system, has the unavoidable effect of gradually increasing the wealth of those who have capital to lend relative to those who need to borrow money. He does this with the help of a tale that he calls 'The eleventh round'.

This tale is about a man in shiny black shoes and a white hat who comes to a small village where people use barter to trade food and other goods between them. The people in the village are happy and they help each other whenever someone has a need that they can't handle on

their own. The man introduces a currency system that is similar to our national currency systems, only that the small scale of the system makes a central point of Lietaer's very clear. There are ten families in the village and the man takes a cow hide and cuts one hundred perfect leather rounds in it. With this accomplished he puts a stamp on each round and hands ten rounds to each of the families. Now the people in the village can trade with the rounds instead of barter between each other.

There is only one catch. The man promises to come back a year later and at that time every family is supposed to bring back eleven rounds. He doesn't explain where the eleventh round will come from, but it is obvious that this represents the interest that is taken by a bank for making money available in our economic system. As every family tries to increase its wealth in terms of leather rounds, competition is introduced in the economy and the inclination of the inhabitants of the village to spontaneously help each other decreases. The man in the tale is similar to a banker, not a venture capitalist. The main role of the bank in our monetary system is to lend money and to receive interest as the reward for this.

The tale explains why the man with the shiny shoes is bound to command a larger and larger part of the economy every year. Every year when the system is in function, one-tenth of the money in the system will be given to him. The tale also gives an interesting perspective on the economic situation that Lietaer predicts for the future. In a case where the economy is growing, a part of the 11th round is created through economic growth. In the type of future foreseen in this book, economic growth will slow down or disappear altogether. In this type of situation a serious strain will be put on the whole system, because interest payments will have to be made from an economy that is not growing. Gradually, the money in the system will gravitate towards the lenders of money. In different parts of the economy there will be borrowers who find it increasingly difficult to pay back their mortgages and pay interest on them. This would be expected to happen, because of the way the system is constructed. Without growth lenders will eventually have the right to most of the money in the system. This is a form of practical 'musical chairs' game where the only thing that most of the people can hope for is to remain in the game as long as possible.

This tale explains in a simplified way why fiat currencies in a system with interest create competition. In a growing economy, there is competition, but there is also room for cooperation between people who see that they can gain an advantage over others by teaming up. In an economy without growth, competition gets fiercer and the advantages

of widespread cooperation become less obvious. The plus-sum game turns into a minus-sum game where somebody's gain is somebody else's loss.

In Lietaer's book there are complementary currencies that are created through the same mechanisms as the national fiat currencies. In the complementary system people do not use the interest mechanism and thus the system does not create competition in the way that national currencies do.

Mutual credit currencies

As opposed to the national fiat currencies, many complementary currencies are mutual credit currencies. This means that transactions can take place between two individuals or between one individual and a company if both parties agree on the terms. In the book-keeping of the system, this type of transaction creates a debit on the part of the buyer and a credit on the part of the seller. The seller, who has earned a certain amount of money in the system, can use this to exchange for goods or services from other members of the system. Transactions need to be cleared in a clearing-house that keeps track of transactions. In practice, each member of the system could be given a certain number of notes at the start of the system, which could be made valid as they were used for payment. As notes change hands transactions need to be reported to the clearing-house, so that this can keep track of the debits and credits of each member and of the volume of money that is in circulation. In a modern system, the clearing could be done in a computer that communicates with members over the Internet. The debit and credit balance of each member is always available to all participants, so that abuse of the system is effectively policed.

One example of a local currency that has come into widespread use is the LETS-System. LETS means Local Exchange Trading System and the idea was created in Canada, where a number of fishing communities in the 1980s experienced high unemployment. In Canada the LETS system is now operated in between 25 and 30 communities and the idea has spread to other countries. In Britain there are some 200 local exchange trading schemes, in New Zealand there are around 50 systems, Australia has 200 and in France there are over 200 networks by the name of 'Grains de Sel' (grains of salt). Lietaer quotes a survey that estimates that 2 per cent of the French population primarily use complementary currencies and that a total of almost 25 per cent use them regularly or occasionally.

Lietaer gives a number of examples of how complementary currencies are used either on their own or in combination with traditional currencies. In one of the examples, one person, Amy, negotiates for a car tune-up, wholewheat bread and a dentist treatment in 'green dollars' as the LETS currency is sometimes called. The car mechanic, the baker and the dentist all participate in the scheme and accept payment in a combination of ordinary dollars and 'green' currency. Before they can participate in the scheme they have to pay a 5 dollar set-up fee and a 10 dollar annual membership fee to cover the cost of running the system, which have to be paid in national currency by the organization that runs it. In the case referred to, Amy received goods and services at a price of 110 dollars in exchange for a payment of only 30 dollars in national currency. After she had contributed some services herself in the system, her outstanding debt to the green dollar system was 40 dollars, to be repaid to members of the system in goods or services in due course.

In some systems the currencies are issued as time-equivalents (i.e. 'Ithaca hours' and 'time dollars') and in some cases they are understood as money-equivalents. There are schemes that have been started to finance small business, community services and elderly care. Some systems are set up to make more leisure activities available in a neighbourhood. A person who knows a foreign language can teach neighbours, and someone else who is a good cook can give cooking lessons. All of this could be paid in local currency, and people who like to bake cakes or do gardening can offer these services in the system.

Lietaer's argument is that it is an interesting observation that these systems seem to work so well in the creation of new economic activity. He sees them as 'early prototypes', which need to be further researched and developed to enable them to be applied on a larger scale in case of future need.

Complementary currencies make for economic activity that otherwise would not occur. It creates new wealth where it is needed in a non-bureaucratic fashion and it doesn't cause inflation in the national economy. These currencies also make it possible for local businesses to flourish and it helps them compete against large businesses. It has been shown that complementary currencies can also be used on a large scale. In Switzerland the WIR system has some 80,000 members and it generates several billion Euros in trade every year and one other system is in place all over the city of Curitiba in Brazil with several million people. Regardless of this Lietaer does not claim that complementary currencies can solve all problems of unemployment and he does

not want to discourage traditional programmes for job creation. Instead, he argues that complementary currencies are a potentially important tool that has often been overlooked in economic debate and that we should pay more attention to this tool than we have done so far.

Based on Lietaer's convincing analysis, and the additional suspicion that we may be closing in on the limits of economic development in a few important respects, delivered in this book, we may be inclined to agree that we need to seek new avenues of economic growth. In other areas of society we debate possible disasters and we develop alternative routes, just in case. Even though Sweden has not been at war for almost two centuries and the Soviet Union has disappeared, Sweden still spends billions of dollars on defence every year and still has a mandatory military service. Fewer and fewer people need to be drafted, but the threat of war is still taken seriously. I spend large sums of money every year on insurance, even though I know that the probability that I will need to claim is relatively low. These are only two examples of fairly small risks that we take seriously in society. Compared to these risks, the threat that electronic business will cause problems and the risk that companies may be close to the limits of business development in some respects seem to have a high degree of probability. It makes sense to take these threats seriously and investigate solutions to these problems if they should occur.

The global economic system and the national currency systems that are linked to it, which most economists believe to be sufficient to guard society against economic instability, have shown a number of weaknesses in the past. They have not proved themselves to be able to bring an economy back into balance or full employment without the intervention of centralized employment initiatives in the more severe cases, of which there have been a number during the twentieth century. Yet we are doing almost nothing to try to investigate the possible weaknesses or limits that this system has, or how these weaknesses can be removed or how the system can be strengthened. Our belief in the economic system seems anomalous in the light of its track-record and it may lead our thought more in the direction of religious worship than in the direction of scientific analysis. Economists sometimes defend the existing national currency system and its virtues unquestioningly in the same way that fundamentalist religious leaders defend their beliefs. It is difficult and disturbing to try to ask important questions and only be offered the answers of economic doctrine and hypotheses that are weakly supported by experience.

I do not argue that we could possibly know that the analysis of the future presented by Lietaer or the contribution that I have tried to make myself can provide us with certainty about our economic future. What I do argue is that we need to take these indications seriously in the light of economic failures of the past.

Why investments are necessary for growth in a system of fractional reserve banking

In the belief of many economists and business people any type of business activity could lead to economic growth. The only necessary activity is that people spend their money instead of hoarding it. Lietaer quotes the Nobel Prize-winning economist Milton Friedman saying that if there is a recession we could get out of it by everybody psychoanalyzing each other.

If we look a little closer at this example, we see that psychoanalysis works to create growth in an economy with fractional reserve banking only if there are also people who need to borrow money. We could think of a whole neighbourhood of people lining up to be psychoanalyzed by one another. The first in line pays fifty dollars to the person who provided the service, and this person is in turn psychoanalyzed by another person, to whom he pays the same amount, and so on. When the fifty dollars have been passed on between fifty persons, the last person in line still has only fifty dollars and nobody else has been able to use any of it or keep it. No new wealth has been created, except that a number of people have been psychoanalyzed, most of them by amateur psychoanalysts. Even if we add another 200 people to the line of psychoanalyzed people, there will still be only fifty dollars in the system.

If fifty people instead divided themselves up so that 25 baked bread and 25 made sausage and each charged 1 dollar for a loaf and the same amount for a sausage something interesting would happen. For each loaf and sausage the producer would need to buy ingredients from a farmer nearby that cost 50 cents. With an initial amount of fifty dollars in the system spread out so that each participant had 1 dollar, the nearby farmer who supplied pork and flour would take in 25 dollars for each round in payments for ingredients. If this farmer runs an ecological farm, where he grows all feed for his pigs on the farm and produces his own seeds for next year's crop, nature would supply him with his raw materials and he would

gradually earn a larger and larger share of the money in the system. In this example, he would have all the money in the system after two rounds. If each baker baked bread for his own and one more family and sold the extra bread to one sausage-maker, none of the bakers or sausage-makers would have earned a cent. Instead, in order to buy bread and sausage next week and ingredients for their own production, they would need to go to the bank to borrow money, but since the wealth of these businesses would never be able to grow in this type of situation, it would be difficult for the bank to lend them money. In this way it becomes obvious that any type of exchange does not create economic growth. The same would be true if each baker produced bread for ten or one hundred families and if each sausage-maker did the same. The wealth of the producers would not grow and the farmer would become wealthier and wealthier. If we introduce competition among farmers, the same would happen anyway. All the money in the system would gradually end up with the farmers.

In order to increase productivity, some of the producers of sausage and bread may start to develop machinery for this production. Since they had spent all their money on flour and pork, they need to borrow money for this development. When they borrow this money, and when other sausage and bread producers also borrow money to buy such machines, growth occurs. The growth occurs not because producers become more productive, but because fractional reserve banking creates new money in the monetary system when people or companies borrow money. It is an interesting conclusion that can be arrived at through this type of simple example, that growth does not occur because of improvement in productivity, but because of the investments that are made. This is contrary to what most people seem to believe. When these investments have been made new growth would occur the next time machinery was developed or when machines needed to be replaced, but in the time between investments, the money in the system would gravitate towards the farmer, who supplied ingredients and towards the bank that supplied the money. The fifty people in this system are not enough to run technology development and production of machines. 150 people from another neighbourhood are recruited for these tasks. In that way the wealth created by the development expands the scope of the economy and the money in the system is spread to more people, but the expansion in itself does not create

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new money. The employment of these 150 people spreads the existing wealth. Growth is created when the newly employed people borrow money from the bank to build a house, buy a car or purchase a yacht.

This increased wealth and all the work required creates a demand for entertainment. People borrow money from the bank to develop movie equipment and some other individuals borrow money to build a cinema. In this way the increasing affluence results in more investments and they need to involve 250 people from a third neighbourhood in technology development, film making and in the running of the cinema. If we introduce a number of well-paid consultants in this system, who work with business development for the firms in the economy, this consultant earns more of the money in the system than the workers and development engineers, who are less well paid. This virtuous circle ends when there is no more need to borrow money to either invest in the development of new machinery or to invest in the purchasing of such machinery or when the citizens do not need to borrow more money for private expenditure. Private expenditure usually decreases when the need to invest in equipment decreases, because of the fear of recession, and people start to hoard money. Then the money in the system no longer increases and loans are gradually paid back to the bank, which reduces the amount of money in the system. At this point the money in the system once more gravitates towards the bank and the farmer. The money held by the better-paid individuals in the system lasts longer than that of the less well paid, but unless the consultants can find new sources of growth in the economy and help the companies to exploit these, there will be no new growth and the economy will gradually 'die'.

The prerequisite for the creation of new money at any point in the above examples is that someone in the system puts money into his or her bank account. This amount could then be used as a reserve by a bank to lend out more than the fifty dollars, and thus new money is created. It is when people or companies borrow money from a bank that new money is created. Lietaer explains that the reverse is true when people pay back their debts to banks. If everybody paid their debts, there would eventually be no money at all left in the system.

Why do people and companies borrow money? Large sums are borrowed in order to invest. When companies need to build

new facilities, develop new products or acquire another company, they borrow money and the economy expands. When people buy a new car, a house or expensive jewellery or borrow money to go on vacation, the same thing happens.

We may view the economy in the light of the previously offered 'grim' view of development in a system where we are only doing the same things that we have done since time immemorial. We have only invested a lot of money in the past to do things faster and faster and cheaper and cheaper. If this is true we will find that fewer companies may need to invest in the future if the opportunities to develop products and services further are starting to become exhausted. Fewer companies will need to pay consultants and buy new business systems if they have already automated their processes to a level where most things can be done in close to no time at a very low cost. Mobile phones and computers may not be developed much further when producers cannot integrate more functions in them or make them smaller or lighter. The limit of development may be reached before products and processes reach the final limit of opportunity. This would be because there may still theoretically be opportunities for further development, but customers will after a certain point find that the developments are so insignificant that they do not merit the purchase of new gadgets as often as in the past.

The main problem with the idea of psychoanalysis, however, is that in a recession people tend to hold on to their money instead of spending it. In a recession people need better reasons to part with their money than they do when everybody has a job and when there is little perceived risk of losing the current job. In the line of people who psychoanalyze each other, somebody in the middle may find that he or she needs to increase their savings instead of being psychoanalyzed, and runs off with the money as soon as he has psychoanalyzed his neighbour. Instead of spending it on psychoanalysis and expensive vacations, people, and companies, in this situation tend to hoard money, because they fear that the situation will get worse before it gets better. Nobody has yet found the basic reason behind the Depression in the 1930s. There seems to have been no inherent lack of investment opportunities or an obvious reason for a decrease in demand for goods or services. Still, the recession occurred. The argument in this book is that there may now arise a decrease in the need to invest and employ people and

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use other reasources, which may have very obvious and clear-cut reasons.

The Depression in the 1930s finally ended when the governments in many countries started to invest in their armies, navies and air forces prior to the Second World War. The Internet boom was a boom because companies invested in electronic marketplaces and other types of Internet sites, internal business systems and process development. The remedy for recessions suggested by the economist Maynard Keynes, by many economists held to be the greatest economist of the twentieth century, was to start public investments that could employ people and increase their purchasing power. One common reason behind recessions is insufficient demand on the part of consumers who hoard money for fear of not being able to pay their bills next month.

Investments play a key role in the economy, and if a number of industries that have been the engines of the global economy in the near past are facing limits to their opportunities to develop new offerings, we need to find new areas of investment relatively quickly.

Complementary currencies are not dependent on investments in the same way as our national currencies are, because they are not based on fractional reserve banking. In such a system money is created in whatever type of transaction people agree upon. Money could always be created to satisfy any needs in the economy, as long as single individuals do not abuse the system by running up huge debts, which could relatively easily be avoided. In a situation where there is a decreasing need to invest, national currencies are at a disadvantage and complementary currencies may work better. The idea of secondary qualities is one way of increasing the need for investments in the traditional economy, which could be one way of creating new growth within this system.

Conclusion

No economic theory can be complete if it does not take into account everything we already know about economic development and consumer behaviour. Existing economic theory, which economists and business people use to forecast future economic development, has as one of its basic tenets that there is an infinite number of business opportunities that can be discovered by companies and investors. It is the main argument of this book that this may not be so. We can no longer take it for granted that people can come up with new business ideas in the future at the same rate as in the past. If we look at development over the past millennia, it seems as if we have mainly made existing activities more efficient and invented few genuinely new activities. This improvement of activities has been sufficient in the past to keep growth in the economy. Now, we are approaching a point where information can be handled and distributed in almost no time and at a cost that comes close to zero. Activities that require the handling of materials, such as production and transportation, are also in many ways approaching a limit of what can be achieved. This limit is, for a number of reasons, not zero, but it is obvious that a production and supply process that now takes two weeks is much closer to the limit than when the same process took 19 weeks. The improvements of efficiency that we have seen in the past will not be repeated and the returns from further reductions in terms of time and cost are diminishing.

There are a number of other aspects related to economic growth that are known but that seem to be insufficiently understood by people who analyse future economic development:

- Economic growth takes place when companies and people borrow money. They do this when they make investments and when they

buy expensive consumer goods. If fewer investments are needed or if people have fewer reasons to borrow money in order to buy expensive consumer goods, travel or do other expensive activities in the future, the economy will find it difficult to grow.

- People have a tendency to hoard money during hard times. Even if consumer spending theoretically could create economic growth, it has been proven over and over again in the past that this does not happen. In the face of an economic decline, people tend to hoard money. Therefore, investments are necessary to maintain economic activity at a high level.
- The economic system is seen by economists and business people as a system that strives towards equilibrium. A recession is swiftly counterbalanced by the economic forces, where people who possess underutilized resources use their creativity to find new economic activity to engage in. This power of the market forces could be doubted. It did not work that way during the Depression of the 1930s. Economic activity grew again through the 'New Deal' package that was implemented by the Roosevelt administration and by the preparations for the Second World War. Similar observations have been made all over the world in times of recession and depression.

The argument in this book is, for the above reasons, that in the future we will face a number of definite limits to business development and economic growth. In some areas we may already have arrived at these limits. In other areas we are likely to come close to them during the next decade. There may be areas where we will never reach the limits. This will make it more and more difficult for companies to find new business opportunities to invest in along the paths of development that have been pursued up until now. Companies will need to find new areas that can provide business opportunity and economic growth. It is also necessary for individuals, governments and all types of organizations to engage in the creation of new economic opportunity.

One of the areas that is explored in this book is the discovery of secondary qualities in products and services. Such qualities are related to aspects of production, ownership of companies or certain desirable or undesirable business practices that customers can identify in companies and attach to their products.

One example of a secondary quality that has already been discovered and exploited is the quality of 'environmental friendliness'. During the 1970s environmentalists found that business activity as it was pursued at the time, caused substantial harm to the environment. It was not

then known which companies were more environmentally friendly than others, but gradually environmentally friendly products were developed. The increasing awareness of environmental issues has spurred the development of environmentally friendly technologies, business practices and products. This is an example of how the growing awareness of a secondary quality can change the way companies behave, their production processes and the content of their products.

Secondary qualities could be identified on a larger scale and the development of such qualities by enlightened companies could become a source of economic growth and new business activity. Customers may be willing to pay a premium for products that are produced by responsible companies, and the time and cost aspects of production, which have been in the foreground in the past few years, may become less important.

People may realize that it is no longer in their own best interest to evaluate products on the basis of price, simply because price is related to the use of few resources, and unless we can find new areas where freed resources can be utilized, we can contribute to economic growth by actually encouraging companies to use more resources in the future. This is an unusual way of looking at development, but it may become necessary to look at it in this way in the future. As we learn more about secondary qualities, customers will be able to better manage their suppliers in a similar way to that in which companies manage their supply chains, and demand behaviour from companies that contributes to stable economic growth.

The second type of new opportunities that are discussed could be created through the use of complementary currencies on a large scale. Such currencies are already in use all over the world, but Professor Bernard Lietaer, who has extensively studied this phenomenon, argues that they do not enjoy the respect of and attract interest from authorities and scholars that they should. Complementary currencies have been used for a long time to create economic activity in times of recession and unemployment. Lietaer argues that we need to study these currencies on a larger scale in order to find out how they can be used to fight unemployment in an economy where computerization and automation take away resource needs. I argue that this becomes even more important in a future situation where companies cannot identify new business opportunities along the traditional paths. Secondary qualities and complementary currencies are two alternative routes to the development of new economic activity in the future. We may find that there are more possibilities than these.

We must not, however, take it for granted that economic development can be indefinitely pursued along the same lines as in the past, and we cannot rely on the market forces, whatever they are, to invent new opportunities. We need to analyse different aspects of the current situation and investigate alternative routes to growth and development. We must not forget that behind successful developments in the past there has often been some supporting activities from governments, universities or other organizations that are not driven by market forces. Much new technology has been initially developed for military purposes. This is true about computers, communication technologies, the Internet, plastics and a number of other technologies. Many developments have been supported by research efforts at universities after the initial development of a new technology. This will need to be done in the future as well, but we probably cannot afford to wait ten years to start this. Economic research, business development and public debate must begin very soon in order to achieve results within the next few years.

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