

13 Summary, conclusions, and topics of further research

13.1 Summary

- 13.1.1 In this thesis we addressed the questions which are arising if companies aspire to create economic value under conditions of far-advanced unpredictable heterogeneity in the market place. Looking at the evolution of value creating from a historical perspective, it was concluded that in the ability to create economic value over time a number of phases could be distinguished. Each of these phases having particular characteristics with respect to the way value in the company is created.
- 13.1.2 From a capacity orientation in the first stage, through an industrial orientation in the second stage, we are now facing the end of the industrial type structure as a mechanism to create economic value. The reason for this limitation arises out of the basic characteristic of an industrial economy: its ability to create economic value by exploiting similarities and converting these similarities into economies of scale. The reuse of knowledge, either in the form products of processes developed as well as in the capital infrastructure, creates a productivity increase which has been the foundation of the wealth in the industrialised countries since the industrial revolution. However, it was reasoned that, under conditions of further increasing wealth as well as changes which have taken place in the differential capabilities of various economies around the world, not the similarities in demand, but the differences in demand between customers in advanced market become dominant driving force for value creation. And it's particularly at this point where industrial structures are not adequate for the creation of economic value. This inadequacy shows in the emergence of complexity cost, which reflects the underlying business processes being used in a way that they have never been intended for.
- 13.1.3 In our industrial economy all activities are a built up of long chains of sequential steps. Optimising the industrial efficiency in one step causes sometimes disproportional costs in other steps of the chain. Hence eroding, or even worse, the full benefits of industrial productivity in the whole of the chain. On the other hand there are ample illustrations where the offering unlimited heterogeneity to the market in the context of a push oriented business concept, leads to an impossible richness of choice at the client's end.
- 13.1.4 As a result industrially structured companies are faced with a paradox. On the one hand markets start to become evermore erratic and unpredictable, whereas on the other hand serving these unpredictable needs destroy the base of industrial productivity and with that the wealth creating capability of the system as a whole. In order to resolve this paradox, we have to look at the way order between functional elements of process chains is achieved. Rather than the centrally organised functional order, which is so typical for the Taylorian way of organising business processes, a different form of order is required. An order which is emergent from the interactivity between the functional elements themselves. However the emergence of this order is by no means automatic, and requires a fairly intricate set of underlying mechanisms, which secure both coherence as well as goal orientation of such networked order. Seen in this way not all networks can be considered as networked order.

- 13.1.5 There are though some very simple interactive structures which display very eloquent emergent order. The ability to create interactive order between functional elements of business processes on the one hand, and the conclusion that free consumer markets are in their own right complex dynamic systems on the other, enables the creation of interfaces between the company and its market that provide a richness of solution space to the individual client, while being not so complex that clients get lost in a swamp of indistinguishable propositions.
- 13.1.6 However, applying such principles to business processes requires a fundamental rethinking of the basic principles on which these processes have been founded:
- Where marketing traditionally has been founded on the ability to segment markets into groups of comparable requirements, this will no longer be valid, at least not at a phenomenological level. Marketing becomes a real-time interactive dialog with individual consumers enabling them to express their needs in, and move around, in a rich solution space;
 - Supply chain processes will have to evolve from the current batch-mode and prediction oriented nature to responsive re-configurable chain of atomised supply chain steps;
 - In this shift almost all processes and process steps will become virtual (information) processes. These information processes are a mirror image of the physical world. In this respect IT architectures will not only be required to be networks, but truly networked systems;
 - In the same way the human organisation of a company will change from a functional hierarchy to a networked organisation in which self-interest and perspective for employees will be the basis of an emergent order, creating coherent and goal-oriented professional behaviour in the company;
 - And finally the role of management will change in a fundamental way. In terms of style, it will shift from 'fatherhood' to 'motherhood'. In terms of role it will change from instructive to coaching. Rather than passing down instructions and decisions from the top to the bottom of a hierarchical, management will be about networked conductivity, equivalence exchange and a definition of (outrageous) goals. Not only the quality of management will change, also the quantity of management will be substantially less. Organising processes will no longer be provided for the management and the power it exercises, but by the self-interest orientation of professional staff itself.
- 13.1.7 Consequently, the company as we now know it will change both in nature and in definition. Networked companies will more and more become living structures in the sense that they have an identity and purpose, which are emergent properties of the networked structure itself. With that companies will become symbiotic coalitions of stakeholders, where shareholders, customers, and employees choose to cooperate, each from well-understood perspective of self-interest. This, in turn, will require the company to create value for all of those stakeholders simultaneously, and rules out company strategies that sacrifice the interest of one group of stakeholders to benefit of other groups of stakeholders. With that the stakeholders become part of the company as a networked structure and growth of the company means extending invitation to customers, employees and shareholders (not being stakeholder yet) to enter a relation with the company. In that sense the aim of the company is not to create profits, but to secure its own continuity and beyond that to achieve a purpose in the society in which it is active. Once it loses its purpose, it will gradually lose the relations with the stakeholders, hence lose its continuity and stop making money.

- 13.1.8 The above summary of reasoning should not be seen as a description of tomorrow's world. Deliberately we have attempted to reason through the nature, structure, and organisation of the company under assumed conditions of extreme and unpredictably heterogeneity in the market place. Some companies will start to enjoy or suffer the consequences of the market developing in that direction already in the short term. Yet, other companies can still continue to operate, maybe even for a long period of time, under the industrial paradigms. Yet, if as a wealthy society we aspire to grow our wealth further, we consider the evolution towards the perspective as described in this thesis as inevitable in the end. Especially for companies that are market leaders in the current world of business, waiting until forced to change the rules may be a dangerous game to play. Their success and continuity will probably more depend on the ability to innovate a change ahead of the game, and thereby reinvent the rules of the business game.

13.2 Conclusions

- 13.2.1 In Chapter 1 we stated the ambition and the problems which we were to resolve in order to fulfill this ambition. Our main ambition (as stated in Chapter 1.5) was to provide at least the beginning of the answers for managers struggling with the increasing unpredictability they are facing. Not by stretching the elastic of current solutions just a little bit further, but by asking ourselves the question what would be the solutions and principles on which companies and business processes were to be based if unpredictable heterogeneity of the market would go to extremes. Hence not an extrapolation of current practices, but exploring new concepts and provide a scientific base for those.
- 13.2.2 The first question was to understand value creation itself. Not from an accounting point of view, but understanding the underlying mechanisms which give rise to the value that is created in companies in such a way that the relation could be established to the underlying business processes. The second problem was to understand which alternatives are available to create meaningful arrangements between functional elements of business process chains. Different from the central procedural Taylorian structure which is so typical for the industrial company. And the third problem we defined was having discovered such new principles of order, how to apply these principles to the core business processes as marketing, supply chain, information and organisation.
- 13.2.3 As follows from the summary above, and more elaborate in the thesis itself, we feel that we have achieved the ambition stated. However, with this thesis neither all of the answers nor all of the questions, have been formulated. Its exploratory nature, aiming to create a perspective rather than a detailed set of descriptions and solutions, leaves a lot to be researched and discovered in the future. However, a new concept of company has emerged, a concept of which fragments have indeed already been described by various authors in the field of management sciences. To our knowledge though, no-one so far aimed to build such notions into a coherent and consistent framework which could identified as 'the new company'. The new company as opposite to the companies as we know them today, based on hierarchical structures and Taylorion labour division. Although many of today's companies have moved away from the archetype version of this company, in the core the key paradigms underlying this archetype are still present in the vast majority of companies today.

- 13.2.4 If we contrast this new company with the existing companies of today, the table below summarises the characteristic differences between these two types of companies.

	Old	New
Logic	Industrial logic	Networked logic:
	• Homogeneity	• Heterogeneity
	• Functional hierarchy	• Process hierarchy
	• Prediction / Planning	• Responsivity
Value creation	Volume-Efficiency and Volume-Differentiation oriented value creation	Differentiation-Efficiency oriented value creation
Stakeholders	Competitive stakeholders / power based	Coalition of stakeholders driven by self-interest
Focus	Focus on position	Focus on speed (dP/dT)
Equilibrium	Equilibrium (decreasing returns)	Stable un-equilibrium (increasing + decreasing returns)
Change	Quantum leap changes / output driven	Evolutionary changes / organisational learning / process oriented
Competition Solutions	Institutionalised competition Solutions (one best way)	Competition for stakeholding Solution space (multiple best ways)
Perspective	Product / portfolio / segmentation-driven push)	Utility (pull)

- 13.2.5 Whereas the logic of existing companies is largely industrial logic, expressing the importance of homogeneity in the business processes, functional hierarchy and the importance of prediction and planning, the new company is based on networked logic. Its key features are its ability to cope with extreme heterogeneity, a process hierarchy rather than a functional hierarchy and the ability to respond interactively, at the level of the execution processes, to changes in the external environment. Whereas, in terms of value creation, existing companies are exploiting the relation between volume and efficiency while pursuing economies of scale or, in the more heterogeneous version of industrial companies, the relation between volume growth and product differentiation, the new companies will in their value creation be very dependent on their ability to increase the distance between the differentiation level and the efficiency level in their business processes. At the level of the company as a whole this reflects the existence of outrageous antagonist goals between the company and the market, and in fact between all of the stakeholder groups. The aim to raise both the price premium level as well as the internal efficiency deployed is the driver for continuous improvement of business processes in relation to the market and the foundation of the organisational learning processes.

- 13.2.6 Existing companies frequently see their stakeholders as competitive. This competition is based on the relative power distribution between those respective stakeholders. The new company, recognising the rivalry and antagonism between the interest of the stakeholders concerned, will in general be a harmonious coalition of stakeholders. Stakeholders which are seen to be driven by self-interest. The ability to overcome hostility by an overriding mutual interests one of the key features of such company.
- 13.2.7 Existing companies, as a result of their industrial logic, focus on the position achieved, be it market share or otherwise. In new companies. Although position will still be of importance, new companies will more and more focus on the speed at which they can change their position. With the dominance of focus on position and the importance of prediction and planning, existing companies are trying to achieve equilibria. This aim both leads to the need for homogeneity (or manageable variety) as well as to the inescapable decreasing returns at the point were it starts to approach that equilibrium.
- 13.2.8 The new company will be characterised by a continuous, but 'stable' un-equilibrium, reflecting an intricate balance between mechanisms of increasing and of decreasing returns. The idea that economic structures could be solely based on increasing returns, as might be wrongfully understood from the work of Brian Arthur, is a misunderstanding. Exclusively positive returns in the end yield only chaos. It is rather the borderline balance between these two feedback mechanisms that create the richness and order that is so typical of complex dynamic systems. In Waldrop's terms: complexity is at the edge between order and chaos.
- 13.2.9 The lack of responsiveness of the existing organisations converts change and innovation into a quantum leap step, whereas the new company will show a continuous incremental and evolutionary change in close interrelation with the changes of its external environment. Whereas quantum leaps can and will be constructed, evolutionary change requires organisational learning, which organisational learning is embedded in the nature of the processes. Only by creating processes that can develop emergent order, the requirements for organisational learning (massive parallel processing, coding recombination and proliferation) can be achieved.
- 13.2.10 Whereas the existing company views competition mostly in the form of rivalry among contenders for the same amount of market value, for new companies competition will be a competition for stakeholding. Only those companies that can effectively build symbiotic and simultaneous relations which shareholders, clients, and employees will be capable to sustain the continuity of the coalition. Hence, the new company is less about 'competing against', and more about 'competing for'.
- 13.2.11 And lastly industrial organisations are based on the thought that a best solution can be found for every segment in the market. They are in a continuous quest to define this best solution and aim to create sustainable competitive advantage out of this ability. The new company, as from the very nature of the working in non-segmentable markets, is treating the individual customer as the market segment and will provide a solution space rather than preconceived solutions. A solution space in which customers will be able to configure their own particular moment specific solutions. A space of possibilities which is vast, but not necessarily, and not likely, be filled with solutions supplied to the client. In much the same way, as in the office tower example (see Chapter 7.7, Figure 7-5), the lawn provides the solution space. Not all the grass will disappear though, as

there will be patterns of use emerging in the lawn. Providing space creates room for clients to define their own particular solution. There is no single best way, each of the clients at each of the moments will define their particular best way. The perspective therefore changes from product orientation and portfolio segmentation in the existing company, to utility at the individual level, created in an interactive process between the new company and its clients.

13.3 Topics of future research

- 13.3.1 We aimed to explore the picture of such new company concept as an integral whole, many questions and problems in parts of our reasoning will require further research and development. Therefore, next to research in management sciences aimed at validating, instrumenting, and further refining of existing paradigms, we believe it to be worthwhile to attack a number of such problems in future research projects. The list of topics below does not pretend to be exhaustive. Even from discussing this thesis, more topics of further research might rise. The topics mentioned below though, represent a view of the major questions to be resolved. However, they also represent areas which, given the availability of knowledge from other areas of science, have a good chance of being resolvable. Provided dedicated energy to be spent on it.

Management of connectivity

- 13.3.2 It has been argued in Chapter 7 that, as a logical consequence to manage the balance between the richness of solutions and the amount of co-ordination energy required, the management of connectivity in the networked environment is one of the prime control mechanisms for management. The work which has been done on rugged landscapes by Stuart Kauffman, Massimo Warglien and Daniel Levinthal represents a good, but still limited and mostly theoretical foundation for both the existence, as well as the basic underlying mechanisms, of such solution landscapes.
- 13.3.3 It is only the work of Bill McKelvey which starts to make visible the importance of the inter-links between networked business processes and the relative continuity of connectivity over the interfaces between two of such networked systems. Yet, we know very little about how to determine the connectivity of such landscapes, how to manipulate them, let alone how to manage them from within a real business context. Providing to limited solution space will under-exploit the differentiation value available from the market, whereas over-stretching a richness of the solution space will turn off the clients or require disproportional amounts of co-ordination energy.

Roots of positive and negative feed back

- 13.3.4 The interface between networked subsystems, any interface, but particularly the market interface, are considered to be of a complex dynamic nature. Complex dynamics, in the sense that they provide a rich variety of solutions, while on the other hand being orderly enough to be usable in the utility exchange process.

- 13.3.5 The previous topic addressed the topological aspect of this interface. Next to this topological aspect there is also the question of simultaneous occurrence of positive and negative feedback mechanisms. To sustain its complex dynamic nature, positive feedback is required, but in the absence of negative feedback loops these positive feedbacks will drive the interface to become completely chaotic.
- 13.3.6 We do know from the work of e.g. Brian Arthur that positive feedback mechanisms and increasing returns do exist in economics, but as yet we fail to understand exactly how these mechanism actually work. In a similar way, as we can see how in the BZ chemical reaction (see Chapter 5), positive feedback arising out of auto-catalyses in the chemical formula, we would want to understand what mechanism underlies the emergence of this dual feedback system between two interacting sub-systems. There is a relation between the nature and topology of the solution landscape, in which the peaks represent attractors, and the emergence of these feedback mechanisms. The work of Arthur also points in this direction. Yet, the governing principles and the conditions under which they occur, as well as the way we might manage the interface for maximum performance, are as yet unclear.

Equivalence systems

- 13.3.7 Next to the topology and feedback mechanisms governing the interface between two subsystems, multiple exchanges of equivalencies take place simultaneously. This is especially the case where more than two subsystems interact, as for example between the various stakeholders in our company model. Including the interfaces between the stakeholders and their environment, and including the interfaces between those subsystems and the management of the company, those equivalence exchange systems form a very complex set of utility interchanges. We have not aspired to describe the full extent of such complicated exchange mechanisms, yet we do believe that a better understanding of how such systems work and might be managed will be required to manage companies of a networked nature.
- 13.3.8 It might also provide a new perspective on the role and place of governments in economic processes concerning the way in which they can catalyse networked structures in the economy to develop in the interest of society as a whole. There are indications that such a role is important. We only need to look at the day-to-day practice of free market economies in the absence of substantial government influence (e.g. some parts of Russia, the former parts of Yugoslavia, or in Africa), to see this.
- 13.3.9 In studying these equivalence exchange systems, the role of pay-off matrixes as reflecting the non-zero sum games between the various subsystems is of crucial importance. And of those pay-off matrixes, Axelrod's work on sequential prisoner's dilemmas, showing how co-operation can overcome hostility under certain conditions, might prove to be very important to gain an understanding of how such systems might work in practice.

Trust and reliability

- 13.3.10 The previous aspect has another implication. If we assume such prisoner's dilemmas to play role in the interaction between a company and its market, then this could explain why losing trust by damaging client's interest has such a devastating effect on the market position of companies operating in international mass markets.
- 13.3.11 The lessons drawn in the past from coping with product failure, have indicated that full and immediate communication (while immediate withdrawing the product from the market and compensate those who suffered damage) is the only way to prevent the brand and its position from becoming severely damaged. Something similar is visible with respect to stock market prices, in situations where a company's performance appears to be deviating from the forecast as previously made by the management. Also in such cases sometimes the damage is not only disproportional to the size of the deviation, but also does it take a long time before that that damage in trust is restored again.

Client need profiles

- 13.3.12 With respect to the marketing processes of the future, understanding the solutions topology will be heavily dependent on being capable to understand and numerically define the utility expression of clients following a certain path through the solution space. As we demonstrated in Chapter 9 this genetic code of the moment has a finite dimensionality (eight to ten dimensions). But as yet the numerical expressions, let alone the meaning, of such paths are not available. Yet understanding the utility code and being capable to assess the gap between the solution space offered and the respective utility requirement, would provide a major driver for both product innovation as well as the solution space configuration. It would provide the basis for incremental product development: product (and service-) development as an adaptive and interactive process, controlled in direct interaction with the client in his manoeuvring through the solution space. In addition to this, it would be worthwhile to extend the work we have undertaken for supermarkets into other areas of business, in order to assess whether (and to what extent) the observed order in supermarket customer behaviour can be replicated in other markets.

Market structure

- 13.3.13 In Chapter 5 we demonstrated that the very simple set of interactive agents can indeed create a rich structure of order. The emergence of this order closely resembles the evolution that can be seen in markets: from infancy, through growth, to maturity and saturation. However striking this resemblance is, there is no scientific ground that connects these two concepts. As yet this analogy is pure speculation.
- 13.3.14 However, if there proves to be a relation between the interactive order arising out of the COLORS programme and the interactions in the market place, the understanding of the mechanism underlying this emergence of order might well help us to understand the evolution of market as a whole and positions of companies within those markets in particular. Even in a much less

heterogeneous and much more predictable world such insights might prove to be worthwhile.

Supply chain stability

- 13.3.15 In Chapter 10 we referred to the problem of networked supply chains, which, because of their non-linear event-drivenness, have the nasty habit to propagate and magnify disturbances upstream in the chain. The overall control of such supply chains requires more consideration. In fact, one could say that such supply chains display an excessive amount of positive feedback, that is apparently not balanced by a appropriate level of negative feedback. Hence the attractor is insufficient to keep the dynamic unbalance within range of affordability.
- 13.3.16 The lack of such stable unbalance causes the necessity to build buffering and slack into in such supply chains. With that, at least part of the benefits that could potentially be derived from event coupled supply chains are destroyed. It is not unthinkable that complex systems theory is capable of both simulating such supply chains performances, and identifying ways to introduce elements of dynamic stability into the chain.

Navigating in infinity

- 13.3.17 Whereas all processes become information processes, not just human agents in networked systems, but all sorts of other entities will have to access information as part of the network of utility exchange. Such users are confronted with unpredictable requirements to find and use information out of an information environment approaching infinity.
- 13.3.18 Current principles, apart from trying to predict user needs, are heavily biased towards the concept of navigation, using search engines and information agents. Yet, by default, navigating in infinity is impossible. It is an infinite process, with an increasingly low probability to yield results. Therefore the question seems to be not how users can find information in this space, but how in an infinite amount of information can find its destination to a finite amount of users. Apart from the fact that controlling connectivity might provide a way to compartmentalise the information space accordingly, reversing the information transport from a push to a pull configuration will greatly help the applicability of information technology in networked system configurations.

Culture identity and mission

- 13.3.19 In recent years both in theory as in practice, much interest, energy and attention has been devoted to the topic of corporate culture, values and the formulation of mission statements as an expression of those. Yet, culture and values are emergent properties of the networked system, and cannot do without at least an implicit and relevant purpose and identity. Those scientists and managers stating or practising culture- and value-change as a constructivist activity might prove to be on the wrong track. If we consider culture, values and identity to be emergent properties, the interactivity with the environment will induce those

aspects of the company to evolve. And if they evolve, management, by governing the interaction mechanisms within the networked structure, will and should be able to influence this evolution. Both in terms of speed as in well as in direction. Yet, where many of the current approaches assume that it is possible to engineer such characteristics, little knowledge and experience is available regarding how to use the emergent nature of such phenomena.

Transformation management

13.3.20 If such properties are largely emergent properties, this leads in the end to the question whether how companies can be changed at all. And with that to the question how to turn an archetype industrially structured company into a 'new company' as described in this thesis. The question of how to transform largely remained unanswered, and in order to start practically applying the principles of this thesis, more answers are necessary to help shape and implement programmes of change. As change in most cases is approached from an engineering rather than from an evolution point of view, our instruments for and understanding of engineered change is considerably better than those of emergent change.

Corporate strategy

13.3.21 Taking these thoughts one step further, we arrive at the question what corporate strategy in the future is going to be. This is almost like asking for a redefinition of the strategic discipline both in management science as well as in corporate practice. If strategy is no longer equal to planning, but on the other hand strategy (in terms of meaningful and purposeful development) is not an automatic process, then guiding and governing the longer term evolution of the company and its business processes requires new answers to new issues. Parts of those issues have been addressed already in this thesis, parts are open questions as mentioned before. Yet the ultimate question, as strategy represents choice, is what choices are open to the management of such companies, and how it should equip itself to make such choices.

13.3.22 Hence apart from the necessity to rethink basic discipline as marketing, supply and logistics, information systems and organisation from the new paradigms upwards, the nature and practice of the strategy itself will require a fundamental rethinking.

13.3.23 And this seems to be where the loop is closing. While looking at the evolution of value creation under conditions of increasingly unpredictable heterogeneity we tried to devise a strategic framework to address and exploit the issues and opportunities arising in such a world. Having developed a concept of the networked company capable of performing in the interest of the stakeholders under such circumstances, we now think it necessary to revisit the question of strategy itself.