TOWARDS THE DYNAMIC PARADIGM OF FUTURES RESEARCH
– How to grasp a complex futures problem with multiple phases and multiple methods

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What are the past, the present and the future? What is the relationship between pro-activity, pre-activity, re-activity and passivity? What is linear thinking and what is non-linear? What in this world of subjective perceptions, subconscious interpretations and socially constructed reality is simple, complicated or complex after all? If the world is a set of logical and universal laws, couldn't we just build software to predict everything at least on a macro level? On the other hand, if the world is random and just a consequence of a set of initial conditions and billions of interactions which cause unpredictable critical trigger points and cascades of bifurcations, aren't we just doomed to be logs in a river? Furthermore, if both of these postulates carry some truth, what does it mean for foresight or futures research? When can we proudly say that we know, when should we admit that this issue is too random or complex for us to understand, and when should we just try a bit harder to reach better foresight? What should a project be like, if we really would like to systematically grasp the complex future? These questions and many more have "haunted" me for years. That is why I entered the field of futures research, and that is why I finally made this thesis.

Retrospectively thinking, it could have been easier and faster to present this broad and complex theme in a monograph in comparison to the article thesis format. However, the wheel of fortune bound me to a certain type of path-dependence in this project. As I didn't receive research funding in the first years of my post-graduate studies, I worked with various FFRC's foresight projects. That gave me new insight to the field of futures research and it helped and financially allowed me to write different types of research articles of the theme which I was deeply interested in. Finally in January 2006, I got a four year position in Turku School of Economics' Graduate School in Future Business Competences (TULIO). By that time I was really able to start working with the synthesis article of the thesis. However, the planned qualitative work turned out to be a much bigger task than I had expected. During 2006-2008, I had many research plans, and I tested many theories, theoretical frameworks and philosophies of science in the position of the article thesis' unifying theory. Naturally such work required constant writing and rewriting of the text, and there were well over a dozen different research titles in total. For the last time, I rewrote the entire synthesis article of the thesis to a whole new structural form in 2008.

CONTENTS

Part I: Summary of dissertation

Part II. Published articles

LIST OF FIGURES

LIST OF TABLES

1   INTRODUCTION

1.1   Research objectives

This study aims to showcase the requirements for the birth of the third paradigm of futures research, to compare the paradigm thus born to four existing research methods and to assess the discoveries and new insight in order to make recommendations for the meta-framework of *Six pillars: futures thinking for transforming*[1], which attempts to grasp the complex future.

More specifically, the research questions are:

i) What are the foundations and the driving factors of the historical, the modern, and the possibly forthcoming third paradigm of futures research?
ii) What are the key requirements that the third paradigm of futures research should adopt to its anticipation and reasoning methodology?
iii) What is the suitability of four currently strong anticipation or proactive influencing methods that have been selected to a testing, from the point of view of the requirements of the third paradigm?
iv) What types of challenges and themes FFRC futurists are attaching to the third paradigm, and what types of practical challenges to grasp the theme appear in the attempts of two selected projects?
v) How can all the discoveries and new insight be attached to the meta-framework of *Six pillars: futures thinking for transforming*, and what kind of new recommendations can be made in order to grasp the complex future?

   Chapter one answers the first research question. The second research question is answered in chapters one and two. The third one is answered in chapters three, four and five, and the fourth research question is answered especially in chapter five, but partly in chapter six as well. Finally, the sixth chapter attempts to grasp the last question.

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[1]   Six pillars is a meta-framework which aims to present an entire process of how one can steer the transformation of the future. It describes six foundational concepts (the used future, the disowned future, alternative futures, alignment, models of social change, and uses of the future), six questions (will, fear, missing, alternatives, wish, and next steps as related to the future) and six pillars (mapping, anticipating, timing, deepening, creating alternatives, and transforming), giving examples and case studies where appropriate (Inayatullah 2008). Six pillars is presented in chapter six.

1.2   Futures orientation in human nature

The human endeavour to be better prepared for the challenges of the future is ages old. It may even be considered as a natural part of human nature. This almost eternal endeavour of the human kind has changed and taken many forms in the past. We may say that the first predecessors of the general futures research paradigm consisted of representatives of the early animism, magic, herbalism, and shamanism. These lines continued in classical antiquity in many forms of predicting the future; classified into inductive prediction (by detecting and interpreting signs of the future) and intuitive fortunetelling orientation (by internally "perceiving" the future). The seeds of the tradition of utopia/dystopia imagination have been sown ever since Plato and they have become inherent in futures thinking as well. This prediction tradition of the classical antiquity contained more than 100 documented methods which are described or represented e.g. in texts by Cicero, Seneca, Aristotle, St. Augustine, and in prophecies by the oracles of Delphi (see Heinonen 1990 and 1999).

The deterministic prediction orientation, where the postulate of the possibility of receiving "knowledge" of the future either inductively or intuitively is valid, has not vanished from our operational landscape. According to some sources, it may even be strengthening in certain areas (e.g. Dawkins 2007). Magical thinking is still common especially among people who have low tolerance for uncertainty (Lindeman-Viitasalo 1995, 18). Once a person believes in supernatural phenomena, it is extremely easy to find signals from the environment which seem to verify the fixed beliefs of the person in question. Supernatural belief systems help people to get the complex and unpredictable world into order (c.f. Durkheim 1912). A structured and predictable world helps certain types of people to make their plans for the future, to make everyday decisions, and to stop worrying about unpredictable incidents. It also helps such a person to save energy as he/she does not have to constantly reason complex phenomena and many sources of information. In many cases, it is too big a burden for an individual to carry all the responsibility of every decision they have made during their lifetime just by themselves. Furthermore, if the phenomena which the person has to deal with are becoming more hectic and complex, it is even more tempting to give up the rational science-based reasoning and select some forms of fixed external explanations. Astrology is a good example here. If the past, present and the future are written to the stars, it is no longer worthwhile to worry about actions or decisions. Following this line of thought, you are no longer responsible (Lindeman-Viitasalo 1995, 18, 23, 34, 54-94.)

Astrology is not the only form of foretelling in the modern days. The deterministic prediction orientation lives strongly e.g. in Tarot cards reading, Nostradamus predictions interpretations, graphology, psychic seeing, automatic writing, Quija board playing, soul map reading, hand or crystal ball reading, and even in animal organs reading for weather prediction purposes (ibid.). For example, the so called "frog-men" give annual weather predictions through Finnish Broadcasting Company YLE, and this is certainly not the ultimate case in the western world. Furthermore, even esteemed publishers seem to be publishing books from these fields, which tells about the overall consumer demand in the markets.

Playing with the supernatural basic instincts of people is a big business in Hollywood productions, too. Hollywood movies and series are constantly pushing supernatural schemes. Sometimes the ghosts and spirits depicted in the shows are real, sometimes the wizards or witches are casting real spells and only fools do not believe in them, UFOs are here or some undercover people are visiting other planets, sometimes there are deterministic predictions or curses which will happen unless a hero prevents the future by a magical intervention. Sometimes psychics are solving present or forthcoming crimes for the police, sometimes people are using time-machines to visit the past in order to change the present or they are visiting the future to know what to do in the present time, and so forth. As presented, these may be entertaining shows, but there is a flip side to the coin. When people constantly see supernatural things happening and solving otherwise tricky problems, some people may get used to such easy explanations. Even if they know that the movies are one thing and the real world is another, such shows may be feeding their basic supernatural instincts and needs in a harmful way. It may lead people to look answers from a wrong direction, to waste their money, to make wrong assumptions and decisions (ibid.), but especially it can be devastating for seriously conducted modern futures research.

It is not to say that, before the modern futures research emerged, the inductive or intuitive prediction paradigm would always have been the dominant and unquestioned way of producing future knowledge. For instance in ancient Greece, the peripatetic school, cynics such as Cicero, and Epicureans were determined opponents of foretellers and oracles. Aristophanes, Demosthenes and Lucian even attempted to reveal the ridiculousness of the entire oracle institution. (Heinonen 1990, 22) Nevertheless, it did not help. Predictions became even more popular and the leaders supported them into a new renaissance.

1.3   Foundations of the paradigms

In his book Structure of Scientific Revolution (1962), Thomas Kuhn gave contemporary meanings to the concepts of paradigm and paradigm shift. As defined by Kuhn, a paradigm refers to the set of practices that define a scientific discipline during a particular period of time. It contains e.g. the following questions: what is to be observed and scrutinized? What kind of questions are supposed to be asked and probed for answers in relation to this subject? How are these questions to be structured? How should the results of scientific investigations be interpreted? In a strict sense, the only real paradigm shift in science took place when the mechanical theory of physics of Newton was shifted to the relativity theory based physics of Einstein.

Thus, as the entire concept of paradigm can be seen in the strict sense, it is not self-evident that there are paradigms in futures research. Furthermore, futures research is not a solid scientific discipline or even a solid field of research. Futures research has been and still is merely a group of different methods, methodologies, interest areas and approaches which are more or less attached to different (normal) sciences or fields of knowledge.

Nevertheless, this thesis argues that futures research can be seen to have paradigms (in a sense that the entire mutual mindset about the objectives, methods and ontology of the research field is changing over time and that this change follows the general development in science and in society). The first paradigm is the ancient but still existing prediction and mystique orientation to the future. The second paradigm is the modern futures research, whose key characteristics and phases will be presented in the following chapters. It is also argued in this thesis that the second paradigm will most likely be followed by a new, third paradigm of futures research[2]. However, it should be noted that I do not see the first or the second paradigms completely vanishing because of the new dominating paradigm. In the future, we will probably see aspects of all three paradigms simultaneously according to the multi-varied nature of post-modernism.

I base my arguments on the three simultaneously existing paradigms of futures research on discoveries, assumptions and common knowledge of general epistemological and ontological differences between different eras, and on my understanding of the increasing popularity of chaos theory and dynamic behaviour as good systemic explanations.

However, it should be noted that these three paradigms are in fact not globally agreed upon. There are many other contending taxonomies or other

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[2]   The probable key characteristics and drivers of this forthcoming paradigm are discussed in chapters 1.7, 1.8, 1.9 and 2.1.

alternative ways to divide or categorise the basic set of practices, objectives, interests of knowledge, futures orientations, approaches, views, or even the epistemology or ontology of futures research. One alternative way to categorise futures research orientations is the way that Olavi Borg (2003, 303-312) uses. He does not divide futures research into all encompassing paradigms. Instead, he focuses on grand areas of futures research that have different research objectives. Borg states that if the ancient prediction orientation and the modern utopia/dystopia imagination are considered as a unified approach, it can be described as the first grand area of research objectives in futures research. That would be: *Creation of interesting future images, visions and scenarios*. The second grand area of research objectives in futures research is its *Ability to support planning and decision making*. Here, its applicability in planning is at focal point. The third grand area of research objectives in futures research is: *Solving the great global questions of all human kind*. According to Borg (ibid.), Ossip Flechtheim (1972) was the pioneer in defining the questions and goals of this third large problem area. Finally, Borg defines a fourth grand area of research objectives in futures research as *Developing applicable interdisciplinary methodology*.

Alongside Borg's categories, the following views can be considered as contenders of the three paradigms: Harold A. Linstone's (2007) division to Technical, Organizational and Personal; Sohail Inayatullah's (e.g. 1990) division to Predictive, Interpretive, Critical and Action learning; Roy Amara's (e.g. 1981; 1984) categories of Possible, Probable and Preferred and his focus areas of expert evaluations, scenario processes, and structural modelling; Ziauddin Sardar's (1993) taxonomy of Colonizing and Decolonizing; Wendell Bell's (2005) categories of Subjectivist, Realist and Critical; and Richard Slaughter's (2008; 2005; 1995) division to Populist, Systems, Critical and Integral.

If we focus on futurists who use the word paradigm, and who claim that there is going to be some sort of a paradigm shift in futures research, one of the most solid presentations is made by Mika Mannermaa (1991; 1992, 72-177, 328). He attempts to divide the research field into three simultaneous and alternative paradigms. His paradigms are: 1. The descriptive paradigm which refers to an attempt to present highly probable predictions that base on observed development in the past. Here, the view towards the futures is both static, and optimistic. The future is believed to be something that can be predicted. The research objective is non-turbulent, the methods are mainly quantitative and the time span is short. 2. The scenario paradigm which refers to an attempt to describe different manual scripts to the futures. The value of scenarios does not base on its ability to predict anything, but to its ability to aid current decision making by imaging what is possible and making

interesting discoveries of the possible development; and 3. The evolutionary futures research paradigm which refers to an attempt to describe and understand the futures in the turbulent world more accurately and basing on evolutionary laws. It bases mostly on the discoveries of complexity research and the acknowledgement of the evolution in general. The background of this division lies in the suggestion by Roy Amara (1984, 402) that futures research should attempt to focus on expert evaluations, scenario processes, and on structural modelling, which mainly refers to Ilya Prigogines theory and the work that has been done in GERG (General Evolution Research Group[3]) since 1984. Ervin Laszlo (e.g. 2003) has been one of the key figures behind the idea of evolutionary approach.

Alongside the paradigms, Mannermaa (1992, 23-9) has located two grand approaches in future research which are technocratic orientations whose origins are in military, technology foresight etc, and humanistic orientation whose origins are in the futurology etc. of Flectheim (1972).

The presentation of Mannermaa is a valuable comment in the discussion about different futures orientations, especially as it explains the orientation shift during the 60s and 70s, but its third paradigm is a problematic one. During the past 16 years, it has not become a dominant set of research practices as Mannermaa predicted. In contrary, after the 1980s and early 1990s the popularity of the evolutionary has decreased in futures research. Many reasons can be found to explain why futures research did not adopt the ideas of evolutionary to its methodology and philosophy as such. Already in 1989, Eleonora Masini (1989, 159) predicted some key reasons[4] why e.g. the ideas of evolutionary thinking will not be utilized in the research field. More reasons for the lack of adapting these new ideas are discussed in the forthcoming chapters, but a brief conclusion of various reasons can be given here.

Adopting evolutionary approach to futures research is difficult and time consuming. It ultimately challenges the existing principles of foresight. Establishment of new methodological tools require financing which hasn't been available sufficiently so far. And finally, the promoters of evolutionary futures research in 1980's and in early 1990's couldn't develop models which would have attached the discoveries of complexity research to futures research.

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[3]   http://www.thedarwinproject.com/gerg/gerg.html
[4]   The reasons which Masini presented are discussed in a sub-chapter under 1.5: The current state of the futures research.

To continue the discussion over alternative paradigms, Eva Hideg (2002) suggests that there are two alternative and rival new paradigms in futures research. The paradigms are rival in relation to her criteria that include the role of the human being as subject, the role of interpretation and differences in methodological premises. In her division, the first alternative new paradigm is the evolutionary futures research, which echoed the work of GERG, Laszlo and Mannermaa by stating that current futures research is not satisfactory because its subjects are simplified and its theories, applied methodology and methods are not adequate to explore reality in constant change or its future conditions. The second alternative paradigm is critical futures research which states that the future can be interpreted not only as something that will materialize as time passes, but also as something that already exists in the present in people's thoughts and emotions (e.g. Slaughter 1995, 1999, 2005, 2008; Inayatullah 1998b, 1990, 2008, 1998a). Hence, according to critical futures research, such future affects the present and forms an organic part of the rules of life. It evokes expectations, objectives, plans and the scheduling of future acts, and is therefore not only a peculiar form of cognitive interpretation but an emotional attitude (optimism, pessimism, hope or fear), too. In other words, at the present level of human development, thinking about the future and having a notion of the future can no longer be regarded as separate forms of thinking (Hideg 2002, 287). Furthermore, critical futures research provides many methodological approaches which help one to reveal e.g. the deep world views and commitments behind surface phenomena or behind the litany of a certain policy[5].

1.4   First paradigm of futures research

As already presented in the introduction, the first paradigm of futures research is an ancient one, as thinking about the future has always been part of human culture. In a sense, it has never vanished from our functional environment. The deterministic prediction and mystique orientation has just found new methods as an adaptation to the modern world. It can be called the first paradigm of futures "research" because:

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[5]   Compare to the Jürgen Habermas' emancipatory knowledge interest and the objective of critical science, whose purpose is to facilitate emancipatory transformation. Its projected outcome is to attain more rational social institutions and relations, so that unnecessary domination and exploitation are removed (Habermas 1986, 1984, 1987; Willmott 2003, 95).

- Firstly, it bases on a dogma which states that the future is deterministic or already existing, and can therefore be seen in advance if the methods are correct.
- Secondly, it bases its research on many specific mystical methods and rituals which can be done correctly only by professionals.
- Thirdly, it ranks people according to their abilities to do futures research. There are laypersons who can mostly just wonder and ask, there are professionals who can see the future such as pythias, witches, fortune tellers, soothsayers, shamans, astrologists, graphologies, psychics, and then there may be the highest rank of professionals, such as the highest priests, prophets or astrology books writers, who work as the "gatekeepers" of the proper research in the "discipline". They are telling what is the right or wrong way to predict the future, and they are also able to change the "methodology" if necessary (c.f. Heinonen 1990).

Thus, in this sense the deterministic prediction and mystique orientation can be seen to contain the key elements of a paradigm as it defines what is to be observed and scrutinized, what are the kind of questions that are supposed to be asked and probed for answers in relation to this subject, how these questions are to be structured, and how the results of scientific investigations should be interpreted.

1.5 Second paradigm of futures research

The dominance of the first paradigm was challenged during and after the tough lessons of the Second World War. The war taught the human race the value of good planning, strategies, calculations, management of complex situations, trade, and treaties. It also showed the destruction powers of fundamental ideologies and modern weapons. The era after the Second World War was also a golden time of belief in strong economic growth, technological development, humanities, global politics, abilities to solve global problems etc. (Masini 1989, 153; 1993).

Modern futures research has basic paradigmatic characteristics, which form the second paradigm in contrast to the first one, and they can be described as follows:

- Firstly, modern futures research rejects the idea of predicting the future as the future is not there yet. It is constantly forming in many complicated interactions. There are various sources of futures

knowledge, but the future itself is indeterministic except in some very limited fixed or law like causal areas. Thus, futurists tend to speak of possible futures knowledge and possible future images or making the future by pro-active provocations instead of seeing the future (c.f. Amara 1981, 25-29; Godet 1993; Kuosa 2007a).

- Secondly, it bases its understanding on empirical knowledge that is produced in all other disciplines, and on all human cultural knowledge. It also attempts to follow the basic scientific rules of research such as open debate, objectivity, self-correction, possibility to falsification, iteration and accumulation of knowledge.

- Thirdly, the futures research is value-rational, unlike normal sciences. It takes its stance on different alternatives and describes its own desired futures images, instead of aiming to value neutralism. It attempts to explicate the possible prospects and consequences of different decisions in order to question or promote certain values or procedures. It claims that even values can be rationally discussed and studied. (Malaska 2003a, 13.)

- Fourthly, it has a broader scope of research than the normal sciences as its research objective does not exist in an empirical sense, because it is contingent and undefined by nature. However, as this does not mean that we could not get relevant futures knowledge from our present environment, in the same way as we can get e.g. history knowledge, it has led the research field into a unique epistemology. According to Malaska (2003a, 10-12), modern futures research has three unique areas as epistemology of knowledge: **Syntax**, which contains the methods, such as scenarios, Delphi, and Futures Wheel, that all are characteristic for futures research. **Semantics**, which contains the value-rational substance areas of the field. These interest areas are e.g. the global issues, late-industrial crisis, information society, technology trends, climate change, etc. **Pragmatics**, which contains the deeds and actions of futures research. What kind of strategies, policies, planning, design, empowerment, or provocations are relevant in order to cause desired effects?

- Fifthly, (late) modern futures research may divide people to non-professionals who do not know the research methods, questions or principles[6]; to professionals who have relevant education or have at least adequate knowledge of the methods and are able to produce relevant futures knowledge; and to "gatekeepers" who are

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[6]   Besides the more or less frequently demonstrated methods such as scenarios or Delphi, futures research methodology is not so well-known to the academia.

"responsible" for the quality control and education of futurists, develop methods or methodologies, or debate methodological issues in international arenas such as futurist conferences or journals. The collective "gatekeeping" of futures research is organized under WFSF, WFS, and Futuribles. However, there still is a lot to do with the quality control of futurists, research, education, and consultation, due to the blur definitions and standards and overall fragmentation of the field.

1.5.1   The 1940's - 1950's phase of modern futures research

The 1940's - 1950's was a golden time of planning, quantitative methods, positivism, global trade and financing. It was an era of emerging potentials of ICT, space travel, economic growth, urbanisation, industrialisation and globalization (Masini 1989, 153). In this futures boom, there was an increasing demand for organised long-range planning, trend-extrapolations, and technological foresight and assessment in general. The key actors in launching this modern foresight or structured, "problem based" futures research methods were think tanks and research units of the US military. The most famous of these units was a mutual project of Army Air Corps and Douglas Aircraft Company, established by General H. H. Arnold. The project employed researchers such as Olaf Helmer, Norman C. Dalkey, Bernie Brown, and Herman Kahn (1967; 1976) who worked in close co-operation with their contemporary futurists e.g. Theodore Gordon and Wendell Bell (1974). The name of the project was RAND (Research ANd Development) and later on it became the leading futures research organisation in the world. (Bell 2005, 29.) The methods that RAND and its network developed include Delphi, scenario writing, technology forecasting, systems analysis, decision/relevance trees, trend extrapolation, and operations research (Riner 1987).

1.5.2   The 1960's to 1970's phase of modern futures research

The first futures research period after the Second World War was followed by an era which run from the 1960's to the 1970's. It could be described as the second phase of modern futures research. Bell (2005, 39) calls it an era of international futures research movement, as that was the time when futures research went beyond the US military researchers. The mid-1960's was a time when the field of futures research grew due to increasing awareness of the long-term consequences of population, economic growth, social movements, threat of nuclear war, and energy crisis. Due to the international concern of the

mid-1960's, e.g. The Commission on the Year 2000 was established in US, Bertrand de Jouvenel's Futuribles group was established in France and de Jouvenel also published his classic book The Art of Conjecture (1967), The Club of Rome and World Futures Studies Federation (WFSF) were established, Mankind 2000 group had its first conference, Rachel Carson published her environmentally alarming book Silent Spring (1962), and Ossip Flechtheim introduced his ground breaking book Futurologie (1972). Flechtheim had already introduced the ideas of his book in 1943, but the book itself could be seen as the key player in launching the idea of modern "soft, visionary or idealistic" futures research.

In his book (1972) Flechtheim stated, that futurology should attempt to solve the following great problems of all human kind: 1) preventing the wars and guarantee peace, 2) preventing famine and poverty, 3) preventing oppression, 4) enhancing democracy, 5) ending extortion of nature and enhancing conservation of nature, 6) fighting against alienation, and 7) creating the new Homo Humanus.

Thus, during the 1960's and 1970's, a more holistic and visionary approach, which was also considering the interrelationships between neighbouring fields of futures research, was gradually adopted to futures research (Gordon 1989; Mannermaa 1992; Malaska 1991). Alongside gaining new foundations for futures research, the second phase was also a time of great breakthroughs. At the edge of the great oil crisis, Shell introduced its six (odd) scenarios[7] which could make the difference in oil crisis (1972). Due to this pro-active planning work, the company was able to rise into dominant position at the oil markets. This success proved the world the value of futures research. Another milestone of futures research was a report called Limits to Growth (Meadows et. al. 1972) for the Club of Rome. It introduced many scenarios for the globe. Only one of the scenarios was a real doomsday scenario, but it was this particular scenario which made the work famous to the world audience.

The era of the second phase of futures research was also a time of strong method development. Former or current researchers of RAND project kept developing methods for futures research, but there were also many new futurists introducing their method work by that time. Riner (1987) highlights cross-impact analysis, computer simulations, long-cycle research, global modelling, and social impact analysis as the new key methods of the time. Glenn & Gordon (2004) continue the list of methods developed during the second phase with methods like trend impact analysis, environment scanning, the futures wheel, structural analysis, systems perspectives, decision

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[7]   See the Shell scenarios reports from: http://www.shell.com/home/content/aboutshell/ our_strategy/shell_global_scenarios/dir_global_scenarios_07112006.html

modelling, technology sequence analysis, relevance trees, interactive scenarios, participatory methods, text mining, genius forecasting, agent modelling, field anomaly relaxation, and road mapping.

1.5.3   The current state of the futures research

There have not been many new methods or methodology development during the latest phase of the futures research, from the 1980's to the present time. Only one fifth of the methods in Futures Research Methodology (Glenn & Gordon 2004) have been developed during the latest phase of the second paradigm (Aaltonen & Sanders 2006). It is much less than what was expected during the 1960's. (e.g. Amara 1989; Gordon 1989.)

In 1989, Eleonora Masini (1989, 159) estimated that from then on, futures research will stick to the existing methods, and the method development work will mostly just present small variations to the existing methods. The meaning of world models is decreasing, scenarios will be used more alongside with strategy work, Delphi will still be used in many fields, environmental analysis is increasing in general, and strategic planning is increasing in both public and private sectors.

So far the estimation has been quite correct. Only a few (completely) new methods such as Backcasting, Critical futures research in general / Causal Layered Analysis / Four-quadrant mapping, SOFI index, Molitor Forecasting model, Futures Signals Sense-making Framework (FSSF) etc. have been developed (see Chapter 3). Some new variations or combinations of existing methods e.g. ASA model, and Dissaggregative Policy Delphi have also been tempted[8]. There are a few new methodological principles such as macrohistorical analysis, multi-causality and six pillars introduced as well. However, the futures research itself has not stagnated during the third phase. Only the methodological development has been more or less stagnant, and it has relied on too few developers.

The latest phase has also been a time of stabilising the research field. According to the WFSF, in 2003 there were over 40 tertiary education units such as the University of Hawaii at Manoa, the University of Houston-Clear Lake, Tamkang University in Taipei, Finland Futures Research Centre's Finland Futures Academy (FFA), the University of the Sunshine Coast in Australia, which were providing studies related to futures research. In 2008, there are around 20 doctoral dissertations which are related to futures research in Finland alone, and more than 50 in the world. The amount and size of

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[8]   See e.g. (Tapio 2002).

futures research units in the world has been steadily growing during the last phase. For instance, the number of staff in Finland Futures Research Centre has grown from 2 in 1992 (the year of its establishment), to 8 in 1998, and to 50 in 2008 (it has more than doubled in every four years period). The number of members in the Finnish Society for the Futures Studies has been stabilised to around 1000 members after its rapid growth period during the 1980's. There are various quite recently established futures oriented think tanks around the world, e.g. Club of Paris, Club of Amsterdam, and Demos. In addition, there are several annual international futurists' conferences. The biggest international futurist organisations WFSF (World Future Studies Federation), WFS (World Future Society) and Futuribles in the French-speaking world, have stabilised their work. A new futures conference arena has been launched in Lucerne where the fourth European Futurists Conference was arranged in October 2008.

1.6   Main reasons behind the fragmentation of the second paradigm

As presented in Chapter 1.3, modern futures research can be said to be a fragmented group of different methods, methodologies, interest areas and approaches which are more or less attached to different (normal) sciences or fields of knowledge. Concepts strongly related to futures research, like scenarios, have sometimes got established meanings, but there are also many concepts such as foresight or weak signals, which seem to mean different things in different contexts or in different geographical areas. People who call themselves futurists are a very heterogenic group. They may vary from serious scholars of certain discipline and self-maid consultants to "common village fools".

There are various reasons for such fragmentation of the research field. The four biggest reasons or general drivers behind the fragmentation trend may be summarised as follows:

i) The first grand driver behind the fragmentation trend is related to the fact the world where we are living has not only globalised but it has become more hectic, dynamically non-linear, interlinked, inter-depended and full of loose information[9]. It has been said that in the 17th century an average person got

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[9]   This refers to the increasing complexity and dynamic non-linearity in functional environment of a human being (how a human experiences the world in his/her level). The complexity and dynamic non-linearity in molecule level or in universal level doesn't necessarily change at the same time. A key reason for this human level experience can be found from the theory of autopoiesis (Maturana & Varela 1992; Luhmann 1990a) which explains why dynamic organisation must (even exponentially)

the same amount of information in their whole lifetime about their world as we get from a single newspaper everyday (see Scholte 1996; Waters 1995, Cvetkovich & Kellner 1997). The amount of information flowing constantly around us is huge, but only a small fraction of it is useful or valid for us as such. Not so long ago information and knowledge were scarce and therefore very valuable. Nowadays, most information is free and easy to access, but a rapid understanding of it is rare (Weick 2001, 9-11). For futures research, foresight, or any strategy work, this means that we need to accept that no-one can steer, determine or even predict development beforehand, and it is very difficult to get all relevant information on time (Cilliers 1998). Furthermore, in such an environment, an actor cannot rely on a single strategy and single method anymore (Nicolis and Prigogine 1989, 65-75). Thus, appropriation of the change and proactive strategies require ever faster, broader and more in-depth understanding of general transformations (Luoma 2006), and this cannot be accomplished without proper methods of observing, reasoning, understanding and influencing the complex processes (e.g. Snowden 2002). All this is a huge challenge for all who want to anticipate or understand the transformation of the world. This challenges the principles of futures research, its methods, methodologies, philosophy, and the futurists themselves. This is also a huge challenge for all other disciplines that pursuit to understand the world, the societies, organisations or the logic of the overall transformation process. (Kuosa 2009.) In other words, this means that the understanding of the dynamical nature of most social organisations is about to be recognized and utilized, not only in societal planning and anticipation, but in all scientific disciplines. Furthermore, if current mechanical or organic paradigms are replaced in systems thinking by new dynamical paradigms, it may lead to fundamentally new kind of thinking which enhances unpredictable implications for organisational studies (see Appendixes A, B and Chapter 2.1).

ii) Secondly, it should be noticed that the modern futures orientation is really not "owned" by futures research alone which leads to fragmentation. Practically all disciplines, fields of society and forms of applied research have their own interests towards the future. They have their unique ways of producing knowledge that is beneficial in the future from their own point of view. Many enterprises, organisations, universities, ministries, development centres etc. have their own planning, development, design or strategy units that are producing futures knowledge in a structured way. Despite the obvious similarities, this planning or research work is not often called futures research.

increase its information production and two-way transfer when it grows in size or becomes more complex.

Thus, the second source of complicatedness in the field comes from the fact that futures orientation is penetrating all processes of the whole society. This is especially visible in Finland. (Kuosa 2005; Kuosa 2007b.) In other words, futures research is a penetrating view and an interdisciplinary theme area which has never got any solid academic discipline statuses or solid top down planning nor steering. Therefore, the field has grown and reorganised itself merely bottom up, basing on various personal interests, organisational demand, available external funding, or other coincidences.

iii) The third grand driver of the fragmentation of futures research is the futurists own search of adjacent possible. As the research field has become more complex and mature, it has become more difficult for the futurists to be distinguished from the group, and it is also more difficult to be a generalist in this field. Even if one decides to be a generalist, it is almost necessary to select one or just a few niches or views to the whole research objective. Therefore, some futurists have focused on weak signals (Elina Hiltunen 2006; 2007), some on megatrends (John Naisbitt 2004), some on Delphi analysis (Osmo Kuusi 1999, and Rafael Popper), some on scenarios (Michel Godet 2000), some on the abilities of artificial intelligence (Ray Kurzweil 1999), some on Wild cards (Karlheinz Steinmüller and Ian Miles), some on non-linearity in strategic thinking (Mika Aaltonen 2007), some on wild imagination (Pearson & Lyons 2003) or pure sci-fi (Arthur C. Clark), some on time adventures (Rolf Jensen 1999; 2003), some on system dynamics reasoning (Pentti Malaska 1991a), some on trend extrapolation (Simo Rouvinen et. al. 2007) and so forth.

iv) The fourth grand driver towards the fragmentation is the immanent lack of inductive (software based) reasoning in futures research. Therefore, many type of search engines, text or data mining tools, self-organising maps, environment scanning tools and agent based modelling tools have recently been developed at the fringe between futures research, business consulting and ICT software development (Kuosa 2007a). This, however, does not mean that the problem of studying the non-existing future of complex phenomena would be solved. Merely, the maturing of modern futures research has meant specialising in research and the disciplinary fragmentation.

1.7   How is the futures research challenged and why?

The previous chapter presented the four most crucial drivers and reasons that are causing the fragmentation of the modern futures research. Alongside with such trend-like processes, six large emerging challenges[10] that the futures research may need to face at least in the long run, and five additional decisive areas of change in understanding the future of futures research (Inayatullah 2002), can be presented.

The six emerging challenges are presented first.
I.) The first emerging challenge that futures research may need to face is related to the rapidly developing ICT, software, and search engines. If we are allowed to do a simple trend extrapolation here, we may say that, according the Moore's Law "the number of transistors that can be put to a certain area is doubling every 18 months". This Law has come true quite accurately from the early 1970's to the present time[11] (cf. Pearson & Lyons 2003, 3-14.) If this trend continues to the future, and if that development is directly transferred to PC users, it means that in year 2030, our PCs or laptops are able to be 32 000 times more efficient compared to year 2008 (c.f. Kurzweil 1999). Despite the probably increasing speed in ICT and search engine development, there will simultaneously be increasing demand for holistic or generalist abilities to qualitatively sense-make complex world, complex phenomena, multi-causal situations and to imagine and do better future. Thus, from this point of view, there is a large niche for futures research and its methodological development ahead of us.

II.) The second large emerging challenge that the futures research may need to face is related to the overall increase of non-linearity, dynamicity and complexity in societal phenomena that the futurists should attempt to study (Cilliers 1998; Mitleton-Kelly 2003; Kuosa 2009). This refers both to the actual change in the nature of social organisations and especially to the new

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[10]   The previous trend-like processes that are driving the field into fragmentation, and this chapter's emerging challenges, and the areas of change, which need to be faced within the futures research, are parallel in some parts. For instance the challenge of the complexity and non-linearity is discussed in several places, as well as the futures research's lack to do (software based) inductive reasoning and its ability to execute pattern management type of foresight. Furthermore, the six major emerging challenges of this chapter are neither solidly independent parts, but merely intertwined to many other aspects in the context.

[11]   Back in 1981 the state-of-the-art desktop computer was Apple 2. It was already capable of running sophisticated programmes. If its microprocessor were rebuilt in 2003, using Pentium 4 style lithography, it would be less than 0.15 mm across, and with clock speed of 2.8GHz it would be over 1000 times faster than the original. Furthermore, the 6502 processor in 1976 had just 9000 transistors and run just at clock speed of 2.5MHz. If its microprocessor were rebuilt in 2010, it would be possible to make 6520s less than 0,1mm across, and it would cost only 2 cents. (Pearson & Lyons 2003, 3-14.)

understanding of such organisational systems. Therefore, it may be said that futures research should adopt a new way of thinking and start to re-create its methodology. Otherwise consultation companies may prevail in the competition, and futures research may shrink to be a tiny branch at the marginal.

III.) The third large emerging challenge that futures research may need to face is related to its methodological relationship with futures signals analysis and reasoning of knowledge. Futures research should develop some inductive or deductive methodology which allows systematic data gathering, analysis, sense-making, and also synthesizing (as already indicated in the previous chapter). This thesis strongly encourages that the principles of pattern management and the discoveries of the complexity research (Snowden 2002; Kuosa 2007a and 2009) are acknowledged and utilized in the methodology development of futures research. This development work cannot be left for ICT software development and for business consulting alone. It needs to be addressed in futures research. Otherwise the field may lose its credibility and the touch with the real world.

IV.) The fourth large emerging challenge that futures research will probably need to face is related to the understanding of the organic/open nature of organisations. Whereas the second emerging challenge discussed the need to understand the dynamic nature of social organisations, the fourth challenge emphasises the need to understand the organic/open side of social organisations. Organisations may contain many types or processes simultaneously. Especially the idea of autopoiesis suits not only to explain the dynamical organisations renewal but also to explain the "organic living" and renewal of social organisations. The idea of understanding and viewing social organisations from an organic / biological point of view is explained by Kauffman (2003; 2000, 159-209) Maturana & Varela (1992, 47-52); Luhmann 1990a) and the idea is discussed more thoroughly in chapter 2.1.

V.) The fifth large emerging challenge that futures research may need to face is related to the acknowledgement of the laws of life in complexity. In his article (2003), Kauffman discusses the underlying laws behind complexity and life. Why does the complexity exist and increase? Kauffman says that he has located four possible general laws which together allow emergence of complexity, but there is much neat science to be done before these laws can be confirmed as the laws behind all life (Kauffman 2000, 159-209).

VI.) The sixth emerging challenge that futures research may need to face bases on Stuart Kauffman's (1995) theory which identifies three basic types of environments where systems can operate: Chaos – Edge-of-Chaos – Order. For a system, it is very exhausting to operate long periods of time in a chaotic environment. On the other hand, it is very dangerous for a system to stay very long periods of time on the side of order, as it does not test or prepare the system for sudden environmental changes or competition. The best environment for systems, autonomous agents, entities or organisations is the edge-of-chaos, as it is an environment of constant search for adjacent possible and adaptation to co-evolutions, but whilst at it, it allows the system to maintain its orderly structure, establish internal gating mechanisms, and reproduce itself according to the challenges.

The basic principles of adaptation, co-evolution, autopoiesis, self-organisation, search for space of possibilities, internal gating mechanisms, and the attempts of the system or organisation to create more complex structures seem to be at least intuitively understood in various societal theories (Arthur 1990; 2002, Malaska 1990, Luhmann 1990a; 1990b c.f. also Kuosa 2005a and 2009). The principles seem to be at least intuitively understood in some business consulting literature (Collins 2001). However, even in these theories the understanding and use of these principles appears to be neither structured nor encompassing. Hence, there are plenty of aspects and law-like tendencies which should be acknowledged during the development work of the methods or anticipation principles of the third paradigm of futures research.

The six previously presented emerging challenges of futures research can be supplemented with Sohail Inayatullah's (2002) five decisive areas of change in understanding the future of futures research. These five additional aspects of required change in futures research are:

a) Forecasting to anticipatory action learning – this refers to the need to move from single point forecasting to scenario planning and further to action learning based organisations.

b) Reductionist to complex – this refers to the process of deep questioning which moves the field away from a reductionist view of the future to a complex multi-factorial, layered, multi-worldview of the future, where the hypothesis of chaos and complexity are merged to general systems theory.

c) Horizontal to vertical, which refers to the need to understand the layered nature of the world and the phenomena.

d) Return to history – grand narratives, which refers to the need to seek and understand the grand patterns of social change. Thus, creation of local

solutions and focus on narrow parts of large issues should be replaced with a holistic view.

e) Scenario development to moral futures – this refers to the need to use scenario processes to produce ethically alternative futures, in order to open the spectrum of possible value based paths, and show the various assumptions that values are nested to.

1.8   Emerging features of the third paradigm

The overall framework of the possibly forthcoming paradigm of futures research has been presented in the two previous chapters. Chapter 1.6 presented the four main reasons / drivers behind the fragmentation of the current paradigm, and Chapter 1.7 presented the six emerging key challenges and the five areas of change that futures research may need to face at least in the long run. Thematically, most of the drivers and challenges which form the framework for the third paradigm can be said to arise from the new understanding of dynamic organisations and the laws of life and nature, from the overall increase of non-linearity in societal phenomena and global trends, from the new understanding of the usefulness of the holistic view and the discoveries of complexity research, from the rapidly developing ICT, software, and search engines, and from the needs to locate patterns from various forms of futures signals and data.

Alongside the previously presented drivers and challenges, there are at least three additional aspects which can be considered as key emerging characteristics of the forthcoming third paradigm of futures research. These three aspects are 'rising virtualisation', 'new allowance of imagination', and 'pursuit to experience the future'.

i) Rising virtualisation refers to the opportunities of the digital age which again bases on the probably strong ICT and software development. The virtualisation refers also to the popularity of social on-line computer games (such as World of Warcraft) and virtual worlds (such as Second Life or Habbo Hotel). Such social and virtual worlds represent the modern equivalent to utopias or dystopias. Hence, the human can always be seen to be interested in imaginary worlds (Heinonen 1990), but the latest rise in the popularity of the virtual worlds alongside with the general rising of the digital age justify the statement that virtualisations belong to the core of the third paradigm of futures research (Castronova 2003).

ii) The new allowance of imagination is argued to be the second key characteristic of the third paradigm of futures research. The argument is mainly based on the probable effects of the rising interest towards the utopias

or dystopias of virtual and imagined worlds. As indicated in Chapter 1.4, the imagination was and still is an important part of the first paradigm of futures research. The second paradigm rejected and bordered the idea of the "wild" imagination outside the scope of the modern futures research[12]. This drawing of the line was understandable as the time after the Second World War was emphasizing positivism, quantitative and structured research, and behaviouralism. Therefore, as presented in Chapter 1.5, in order to get research status, it was necessary to strongly differentiate modern futures research and especially foresight from the prediction paradigm, which also meant smaller roles for the "creative" imagination.

However, at the edge of the digital age, the positivistic arguments no longer determine the accepted scope of futures research. The modern long-term extrapolation approaches and e.g. the one-trend-in-one-trend-out type of foresight, which are a natural legacy and an outcome of the positivistic and mechanical research ideals, no longer suit well the research and sense-making of the world and phenomena that are more and more dynamic complex, non-linear and hectic. Furthermore, as the ICTs data breaking abilities and the search engines are simultaneously becoming better and they are gaining more influence in life and in research, there are two types of needs emerging which cannot be answered by the linear approaches of traditional futures research.

Firstly, there is an emerging need for better strategic intelligence which means that people need more up-to-date scanned and reasoned, and clearly expressed, reliable information of the complex and rapidly changing world (Kuosa 2007b). Answering this need requires utilization of the understanding of the complexity research, utilization of the understanding of the laws of the life, and use of the principles of pattern management.

Secondly, the need to better imagine the probable or wished for futures is emerging. As the future is formed in dynamic co-evolution of interactions between complex adaptive systems, it cannot be predicted and very often not even anticipated with any kind of accuracy. Thus, in many cases the long-term future is fully unpredictable and talking about any probabilities is useless. Nevertheless, proactive decision-making requires useful visions and the scanning of possibilities. Due to the complex and non-linear nature of the change, the visions should preferably be non-linear, creative or sometimes even wild. Therefore, in the third paradigm of futures research, the imagination and "showing the future" will, not only be accepted, but also widely encouraged.

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[12]   Visionary leadership, and utopias or dystopias in futures images and in scenarios are at the scope of the second paradigm of the futures research. Thus, alternative futures vision are discussed and studied. Here, the rejection of the "wild imagination" refers to the FR's quite strict borders with sci-fi or seeing the future e.g. from a crystal ball.

iii) The pursuit to experience the future is argued to be the third key emerging characteristic of the third paradigm of futures research. This argument bases on both of the previous arguments. Firstly, people are more and more interested in imaginary worlds and the virtualisation of the digital age establishes new ways to experience utopias, dystopias or any other imaginary worlds of futures. Secondly, the need to imagine "wild or creative" non-linear futures increases in companies and other organisations, in strategy work, in entertainment business, and in life in general. It will not only be much cheaper and faster to test new prototypes in a virtual world in contrast to the real world. It will also be much more entertaining and attractive to experience new ideas and possible futures situations in such visually uplifting test environment.

In conclusion, futures research should be able to produce strategic intelligence to the complex and non-linear world where information ages very fast. If futures research is able to fulfil that need in the third paradigm, it will establish new kind of credibility for itself, which would allow futures research to focus simultaneously on virtualisation, creative imagination and experiencing the futures. Would futures research only focus on the imagination, it would undermine its credibility in the long run. On the other hand, futures research could also focus only on the pattern management, but that would leave the long-term visioning and proactive aspects out of its scope. Therefore, the third paradigm of futures research should limit the use of linear foresight, and aim towards the issues of strategic intelligence, influencing the system from the inside, and enhance "creative" imagination.

1.9 Summary of the third paradigm of futures research

Futures research should be able to produce strategic intelligence to the complex, dynamic and non-linear world where information ages very fast. If futures research is able to fulfil that need in the third paradigm, it will establish new kind of credibility for it, which allows it to simultaneously focus on virtualisation, creative imagination and experiencing the futures. Futures research could focus just on the imagination side, but it would undermine its credibility in the long run. On the other hand, futures research could also focus only on the pattern management side, but it would leave the long-term visioning and proactive aspects out of its scope. Therefore, the third paradigm of futures research should limit the use of one method based linear foresight, and aim towards the understanding of the nature of dynamical organisations, the issues of strategic intelligence, enhancing the abilities of influencing the system from the inside, and enhancing "creative" imagination.

In conclusion, my understanding of the forthcoming paradigm is a mixture of a) the various types of challenges and opportunities which futures research should address in the forthcoming years (the four drivers, the six emerging challenges, the five areas of change, and the three emerging features = 18 viewpoints in total), b) the need to adopt the idea of dynamical nature of social organisations, and c) the necessity to use many forms of methods simultaneously in an anticipation process in order to grasp the contradictive systems logics in a single process (the mechanical, open, dynamical etc. processes are overlapping, competing and networking inside most systems)[13]. How all this can be attached to the meta-framework of *Six pillars: futures thinking for transforming*, and how the process of grasping the future can be strengthened further, is discussed in Chapter 6.

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[13] b) and c) are partly included in a). The foundations of b) and c) are more thoroughly discussed in the next chapter.

2   THEORY

The theoretical framework of this research is the methodological and philosophical transformation of futures research which evolves both in time and in societal context. The focus is in literature which discusses the transformation in futures orientation, in four currently strong anticipation methods evaluation, as well as in two different but complementary presentations of paradigm shifts in futures orientation. The meta-framework, to which all discoveries and new suggestions are attached according to the research objectives, is the project description of *Six pillars: futures thinking for transforming, which is presented in chapter six.*

2.1   Foundations of dynamical paradigm

The dynamical paradigm bases mainly on two paradigm divisions. The first was formed by Mika Mannermaa He has divided the paradigms of futures research into: descriptive (prediction), scenario (possibilities), and evolutionary (evolution) orientations, as presented in Chapter 1.3.

   The second division, by Pirjo Ståhle, divides paradigms into: mechanical/closed, organic/open, and dynamic/unstable. The following presentation focuses especially on her third dynamic paradigm as its understanding is crucial in the context of this thesis. The presentation of the dynamic paradigm also contains brief discussion on the theory of self-organisation (Nicolis & Prigogines 1989), and autopoiesis theories (Maturana & Varela 1992; Luhmann 1990a; 1990b). The key terminology related to complexity research is defined in Appendix A, and terminology related to the dynamical systems, chaos, attractors etc. is defined in Appendix B.

   After the principles of the dynamic paradigm are presented, the contribution of the paradigm divisions of Mannermaa and Ståhle is summarized from the viewpoint of the research objectives. Finally, the difference between Mannermaa's / GERG's / Laszlo's evolutionary paradigm and my dynamic paradigm is discussed.

2.1.1   Change in systems thinking

According to Ståhle (1998), systems theories were developed in the twentieth century on both sides of the Atlantic, although they have received greater emphasis in Europe than in the US. In the late 1940s there were two main schools of systems thinking which provided the foundation for the development of systemic thinking and systems theory up to the present day. The first one, G*eneral systems theory* was founded by Ludwigh von Bertalanffy in 1920s, and focused on open systems that function as constant chains of input-throughput-output feedback loops. The other one was *cybernetics*, whose pioneer was Norbert Wiener. Cybernetics was originally very much dominated by the *Newtonian paradigm*, which means that systems were viewed mainly as ingenious machines. Ståhle has described the change in systems thinking in the following way:

> "From the 1960s onwards, systems thinking began to change. It was still mainly founded on the theory of open systems, but the main focus of attention began to shift to the complexity of systems and their innate capacity for change. This led to the emergence of new concepts and patterns of systems thinking, including Forrester's system dynamics*,* Checkland's soft systems methodology and Senge's learning organization. (…) These three branches of systems thinking (systems dynamics, soft systems and learning organization) highlighted a new research interest: the attempt to *understand change* and its manifestations from a systemic point of view. Forrester, Checkland and Senge represented a new way of thinking, but initially they were still quite firmly anchored either to the discourse of open systems or cybernetics. However at the same time (in fact starting from the 1960s) a whole new systems theory discourse began to evolve and to gain ever-increasing recognition". (Ståhle 2008; 1998.)

This novel paradigm was the *dynamical systems paradigm*. According to Ståhle (1998), it grew out of three main sources: 1) a new understanding of non-linear behaviour, basing on complexity and chaos research, 2) Prigogine's self-organizing systems (1967 and 1984); and 3) Maturana and Varela's autopoietic systems (1992).

The chaos and complexity perspective produced three fundamental changes to the earlier systems views of open and closed systems (Ståhle 1998). These changes concerned the conception of a system, possibilities to influence the system and the focus of research interest:

1. *The conception of the dynamics of systems.*   The focus shifted from equilibrium, stability and continuity to imbalance, change and discontinuity. In contrast to earlier beliefs, the continued existence of a system was not dependent on the maintenance of equilibrium. Chaos

was not a disruption or aberration in the system, but on the contrary often a prerequisite for existence and development.

2. *Conceptions of how systems could be steered and influenced.* The interest was no longer in manipulating or controlling the system. Instead, the system could be understood and it could be steered and influenced from within through involvement and participation in the system, i.e. interaction. In order to glean information about the system, people had to be actively involved in the system. Objective, external observation was merely a delusion.

3. *The focus of research interests.* Whereas researchers were earlier interested in searching for general laws, principles, symmetry and harmony, their interest now turned to understanding the nature of change, the unfolding of changes and processes of radical renewal.

2.1.2   The paradigms of closed, open and dynamical systems

According to Ståhle (2008), there is no such scientific point of departure as "systems theory", and it is therefore meaningless to refer generally to "systems thinking" or "systems theory" (as is often the case in research literature), unless the research is explicitly anchored to a specific systems paradigm or at least to a systems tradition. Yet, every analysis always involves certain tradition or perspective on systems, i.e. a systems approach can refer to various theories on systems. Hence it is crucial to understand the paradigms and the different – even contradictory – prerequisites behind the respective systems.

From this point of view, Ståhle (ibid.) has divided systems thinking into three paradigms. These paradigms describe comprehensive beliefs and mental models that are employed in the design and implementation of change processes as well as in the management and leadership of organizations. She also emphasizes that this division may help us to understand the sometimes hard-to-resolve conflicts that arise between decision-makers and the people responsible for implementation.

Firstly, the closed or mechanical paradigm (Ståhle 2008) refers to systems that are controlled by universal laws, regularities and stability. Research under this paradigm aims to explain and define laws and principles and to predict events on a theoretical basis. The theories of the closed systems paradigm view systems as machine-like entities that obey predetermined laws. Their foundation is rooted on classical Newtonian physics, which is the paradigmatic basis of western science. This idea of Ståhle [TKu] can be clarified by stating that even though systems can be divided into equilibrium

and non-equilibrium systems (from boiling water to dynamical social systems), the closed or mechanical systems paradigm is attempting to explain all types of systems with a same kind of theory.

The second paradigm is based on general systems theory as developed by von Bertalanffy (Ståhle 2008). In this paradigm, systems are not regarded as closed or mechanical machineries, but on the contrary as constantly evolving, open organisms communicating and changing with their environment and the changes of their environment. The paradigm emphasizes both the interaction of the system with its environment and its alternative, open paths of development. Open systems are in a constant state of controlled change, yet all the time striving for a new steady state, and permanent chaotic dynamics would lead to system breakdown. The intra-system process is supported and maintained by input-throughput-output feedback cycles, which are regulated by the system from within. This idea of Ståhle can be clarified by stating that open or organic systems, which are the core of the second systems paradigm, can also be defined as dynamic steady states, which, in turn, are a form of non-equilibrium steady systems [TKu]. These systems maintain their integrity and their function while constantly burning up energy and churning out wastes (the entropy), and such systems are ubiquitous (Ball 2004, 128). Thus, open systems can be organic or biologically living systems like a living bacterium or biologically living but dynamically functioning as a human brain (see Kauffman 2003 in the previous chapters) or otherwise open but non-living such as a whirlpool.

According to Ståhle (2008), the third paradigm of systems thinking focuses on the internal, autonomous dynamics of a system. Here, the system is looked upon as a highly complex entity that is in a state of inherent disequilibrium and chaos. The paradigm emphasizes a) the capacity of the system for self-organization and renewal; b) the discontinuity and non-determinism of the system; and c) the non-locality of the system. *The main interests of the third paradigm lie in the self-renewal and self-organization of the system, and its capacity for radical change.*

Table 1   The paradigms of systems thinking

Paradigm	Origin	Characteristic	Research interest	Objective
I Closed systems	Newton	static, deterministic, mechanical	principles, rules, laws	prediction, control
II Open systems	von Bertalanffy	balanced, near equilibrium equifinal, living	feedback processes, changes, adaptation	control, maintenance, development
III **Dynamic systems**	Lorenz Prigogine Maturana Varela	imbalance, far-from-equilibrium, uncontrollable, complexity, chaos	self-organization, self-renewal, intra-systemic dynamics	understanding/exploiting system dynamics, radical change, innovation

The key theories which Ståhle labels in table 1 (Ståhle 1998, 43) as the origins of the dynamic paradigm are the discovery of self-organisation (dissipation and creation of new structure through cascade of bifurcations) (e.g. Prigogine 1989), chaos theory (dynamic system, attractor, strange attractor, fractals) (Lorenz 1963; Mandelbrot 1977), autopoiesis in biological systems (Maturana & Varela 1992), and autopoiesis in social organisations (Luhmann 1990a)

2.1.3   Dissipative self-organisation as the sudden emergence of new structures

Ilya Prigogine (1917-2003), a Russian born chemist who worked in Brussels, has studied and discussed the dissipative self-organisation / dissipation of old structure and creation of new structure through a cascade of bifurcations from various views. Later on such dissipative self-organisation has been called emergence (see Appendix A). Prigogine published his revolutionary discoveries in 1967, and he received the Nobel Prize for chemistry in 1977. In his theory, Prigogine suggests that systems were capable of self-organization without any external control (see e.g. Nicolis & Prigogine, 1989, Prigogine & Stengers, 1984); this marked a radical departure from general systems theory. Prigogine showed that self-organization was not in fact an exception, but on the contrary quite a common systemic characteristic for non-equilibrium

systems[14]. Once the driving force of a non-equilibrium system is increased beyond a bifurcation point, it can force the system into dissipative state which produces a cascade of bifurcations that switch the system to another steady state. In other words, when a critical point is reached, a bifurcation offers two equivalent choices of steady state. A critical phase transition that leads to a novel non-equilibrium steady state may include many branching points, and at each point the options are well-defined but the choice is determined by random fluctuations. (Nicolis & Prigogine 1989, 72, see Appendix A). In her description of dynamical systems paradigms, Ståhle calls the discovery of Prigogine (and the chaos theory which links to it) as the first type of dynamical systems self-renewal.

2.1.4   Autopoiesis as the slow renewal of dynamical systems

The other type of self-renewal of a dynamical system can be explained by the concept of autopoiesis which was introduced by Maturana and Varela in the early 1970s. It refers to slow self-production, self-maintenance, self-renewal, and self-definition of the existence of a system via exclusion of areas that do not belong to the system (*autos* = self, automatic, *poiein* = to do, to produce, to maintain existence, to do again, to conceptualize). For instance, almost all cells in the human body are replaced over a period of two years, yet people can still be identified throughout their life. Thus, both incremental change and stability are simultaneously present in autopoietic systems (c.f. Ståhle 2008). The concept of autopoiesis was originally coined in the field of biology to describe the capacity of cells for self-reproduction. Autopoiesis, as defined by Maturana and Varela (1989?), belongs to the category of new emerging paradigms dealing with spontaneous phenomena and the self-organization of physical, biological and social systems. (see. Maturana & Varela 1989, 43-52.)

   Niklas Luhmann, a German sociologist, has expanded this theory and applied it to social systems[15]. He is convinced that social systems are autopoietic, and the foundation of their existence and continuity lies in communication. By communication, Luhmann refers to activity or to an event rather than the spoken language of communication. Communication is based on contacts that are constantly created and renewed by the network of interaction and that cannot exist outside of the network (Luhmann 1990b, 3,

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[14]   All systems which are not in thermal equilibrium, such as biologically living, structurally open, dynamically chaotic etc systems, are non-equilibrium systems.

[15]   Maturana and Varela (org. 1984) expanded the theory of autopoiesis to social systems well before Luhmann, but Luhmann expanded the theory further.

14). Basing on the discoveries of autopoiesis, Luhmann even argues that there is a need for a conceptual revolution in sociology.

The following paragraph summarizes Luhmann's theory of autopoiesis in society. In his book Ecological communication (1990a), Luhmann states that a society is a co-evolutive and indeterministic system which has no dominating centres. The society contains several simultaneous autopoietic systems which all have only one function. The whole society self-organises itself through interactions between these function systems. The complexity may emerge to the function systems / sub-systems of society only if communication in the society sets boundaries and rules that define them as sub-systems. The actual process of complexity increase follows the principles of autopoiesis where all elements of a system are reproduced in a communicating network interaction of the same kind of elements. Such autopoiesis is a functionally isolated self-referring process which means that all operations in the system are explained by referring first to something outside its own sub-system, and then referring back to its own operations. Hence, for Luhmann, autopoiesis in society is a way to describe how the sub-systems are strongly dependent of the combined performance of the other sub-systems and are therefore co-evolutive and self-referring, to describe how sub-sytems are self-reproducing in such autopoiesis, and to explain how these processes together increase the overall complexity and interdependency of the society. In other words, Luhmann's theory explains how a society defines itself, how it renews and reproduces itself through communication, how it does certain work cycles, how it adapts to evolution, and how it establishes internal gating mechanisms.

2.1.5   Summary of dynamical systems paradigm

I understand the links and difference between dissipative self-organization and autopoiesis in social context, and the contribution of dynamical systems paradigm as follows: In modern thermodynamics, there are two types of phase transitions - conservative and dissipative. Conservative self-organisation means the phase transition of reversible structures in thermal equilibrium, such as the growth of snow crystals, which can revert to water or steam if the temperature is changed. (Nicolis & Prigogine 1989, 14, 50-52) Dissipative self-organisation is the phase transition of irreversible structures far-from-thermal-equilibrium. Macroscopic patterns emerge from the complex non-linear cooperation of microscopic elements when the energetic interaction of the dissipative (open) system with its environment reaches some critical value. (Nicolis & Prigogine 1989, 51; Mitleton-Kelly 2003, 41; Mainzer 1997, 4). Both of the types of self-organisation can happen through many different types

of processes - conservative self-organisation through e.g. exogenously oriented (reversible) phase transition, shape transition, autocatalysis, or complex branching of growing colony types of transformations, and dissipative self-organisation through e.g. a cascade of bifurcations, thorough irreversible phase transition, or autopoiesis (see Appendix A, B and C).

All non-equilibrium systems, especially biologically living or otherwise dissipative / dynamical / CAS, can simultaneously undergo many types of conservative or dissipative transformation processes. The components of such systems can also be very heterogenic, containing mechanic/closed, open/organic, and dynamical/unstable elements and processes simultaneously. However, before the dynamical paradigm, the scientific paradigms allowed us merely to view social systems as something that constantly seek just balance and stability through feedback loops and through just a few simple or mechanical processes. The new dynamic paradigm allows us to accept numerous simultaneous processes, as well as unbalance, change, sensitivity to initial conditions, and non-linearity as natural parts of any non-equilibrium, dissipative or social system. This explains why dynamical systems can only be influenced from the inside, and why it is important to understand the different characteristics of transformation (cf. Ståhle & Kuosa, 2009).

Further, in my understanding, the two key types of renewal of non-equilibrium steady state / dissipative dynamical systems are: dissipative self-organisation and autopoiesis. The first one is radical and takes place rarely, but due to the laws of thermodynamics, it is a necessary part of all such systems. A non-equilibrium / dynamical system is able to maintain its order as long as energy flows through the systems and the system is able to remove its internal entropy to the outside world. For example, a human being is able to live as long as it is able to consume food and heat and to excrete the wastes its internal organisms produce (including surplus heat) – blocking any of these processes would cause its death. Furthermore, a human body is an open/organic, non-equilibrium steady state system, but a human brain can be considered as a dynamic system which can also undergo dissipative self-organisation and chaotic processes. This means that a human body cannot undergo dissipative self-organisation processes where the old structure is radically broken and a new order is created through a fast cascade of random bifurcations without dying, but a human brain can (this refers to the process in nerve system).

Yet, autopoiesis as the other type of dynamical systems renewal takes place both in organic/open processes and in dynamic/unstable processes. However, it does not take place among mechanical or fully chaotically dynamic processes (sensitivity to initial conditions causes randomness if there are no rules or attractors causing order). I consider autopoiesis as a certain type of

social fermentation process which happens through communication. It is a process taking place in a biological cell when its components are both communicating the borders of the cell and renewing the cell through constant communication and constant transactions. The same process takes place in market economy when the players of the economy are both communicating the territory of the economic system in the society as a whole and renewing the economic structures in their constant communication and constant transactions. As a fermentation process, autopoiesis is something more than its parts combine. It is a constant renewing process which requires full participation from all of its stakeholders. A mechanical or chaotic system can turn into autopoiesis if the various components of the system establish a strong network, accept new mutual goals, and start very dense transactions and constant communication. In autopoiesis, the players or the particles of the system arise together to the next level of co-operation and behaviour. In the next level, the players or the particles cease to function as individuals in a network, and start to function as sub-systems of the whole by adapting new social rules and objectives. Autopoiesis is a non-radical self-renewal process which may emerge for a short period of time or for very long time periods. In a societal context, autopoiesis as a process strongly resembles biological life, but as a structure, it is too immaterial to be considered a living system.

2.1.6 Dynamical paradigm vs. evolutionary paradigm

From the viewpoint of this thesis, the contribution of Mika Mannermaa's presentation of the evolutionary futures research paradigm lies in its ability to raise issues that question the legitimacy of current scientific ideals and current foresight in a societal context. Mannermaa (1992, 179, 328) states that complexity and unpredictability used to be the fundamental characteristics of human existence, world explanations, and human behaviour before the Age of Enlightenment. Due to enthusiasm to physical discoveries and new mechanical world explanations of Galileo Galilee (1564-1642) and Isaac Newton (1643-1727), systems like the human brain, social behaviour, the weather, and everything that used to be explained via supernatural reasons, "complexity" or unpredictability, were suddenly explained via the mechanics of clockwork, pendulum or solar orbits and trajectories (Ball 2004, 19-40; Danzin 1985, 154-155). Thus, Aristotle's generalist and holistic approaches as scientific ideals were replaced with a mechanical approach, in which the world is divided into small pieces which should be studied as independent, deterministic and tangible entities by specialized experts. According to Mannermaa / GERG / Laszlo, such mechanical / atomistic ideals of science are going to be replaced

with open, evolutionary, systemic, and holistic ideals and approaches, and futures research should follow this change by adopting e.g. the idea of evolution, non-linearity, and multiversality (complex nature of the research object) into its research.

From the point of view of this thesis, the key contribution of Pirjo Ståhle's analysis of systems paradigms is in its ability to argue the importance of understanding the difference between systems thinking paradigms.
Another key contribution of the analysis (Ståhle 2008) is the well realized division between mechanical/closed, organic/open, dynamical/unstable paradigms, and especially the description of the characteristics of dynamical paradigm, and the potential meaning of its utilization in management, research, insight, and in foresight.

Hence, both Mannermaa's third evolutionary paradigm of futures research and Ståhle's third dynamic paradigm of systems thinking are merged in this thesis into a theory of the third dynamical paradigm of futures research.

The difference between my own and Mannermaa's three paradigms of futures research can be summarized as follows. My first paradigm describes the entire human prediction and foretelling orientation which is ancient old, and which still continues in our world in many forms outside the area of futures research. My second paradigm describes all[16] modern futures research and foresight practises, including scenarios, Delphi, trend-extrapolations, road mappings etc, which all have been obtained after the Second World War and which are usually meant to strengthen the scientific status of the field. Mannermaa's three paradigms describe the methodological differences in modern futures research, in effect excluding all the other types of future oriented practices and traditions.

Mannermaa (1992, 238-258; 1991) briefly describes six postulates which futures research should obtain in the coming years in order to follow the overall change in science. These are: i) breaking the time symmetry, ii) there are stable stages and breaks in transformation, iii) evolutionary progressing, iv) systems' tendency to increase complexity, v) new system levels keep emerging, vi) obtaining multiversality in research objectives. Thus, Mannermaa's third evolutionary paradigm has some elements which were described as characteristics of both Ståhle's organic/open paradigm and dynamic/unstable paradigm, but it does not establish any coherent pictures of new systems thinking. Especially the case example in which Mannermaa attempts to show, how Checkland's (1985) soft systems methodology functions well as an open/multiversal system, resembles attempts to describe how an open/organic systems idea is better in foresight and in consultation in

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[16]   The methodologies which are better described by the first or the third paradigm are excluded from the second one.

comparison to the mechanical/closed systems idea. Again, however, Mannermaa does not explain the difference between open systems which attempt to maintain their structures, and open systems which are sometimes dissipative or even chaotically dynamical. In fact, he does not explain the concept of dynamic systems. Further, he does not discuss the idea of renewal in these types of systems, nor the meaning of obtaining different paradigms in decision making or anticipation. Instead, Mannermaa seems to be simply stating that there are some good ides in the new science of complexity, like these six ideas that should be adopted to futures research. Therefore, Mannermaa's paradigm could be considered as a good starting point for describing open/organic paradigm for the futures research, but from the point of view of systems theory, it still would not be a coherent package/paradigm unless all the dynamical or unpredictable elements would be cut off from it.

In comparison to the evolutionary paradigm of Mannermaa, I attempt to describe a paradigm that can be defended both from the point of view of systems thinking and from the viewpoint of the co-evolution of futures research and technological, ideological and scientific developments of the surrounding society. The dynamical paradigm discussed in this thesis allows us to accept numerous simultaneous processes, unbalance, change, sensitivity to initial conditions, and non-linearity as natural parts of any non-equilibrium, dissipative or social system. As already stated, dynamical systems may have parts which can be explained mechanically, and can thus be predicted. They can have parts which are merely open non-stable systems which can strongly be anticipated through the laws of thermodynamics, and they may be only occasionally sensitive to initial conditions. Such period of chaos may lead the dynamical system into dissipative self-organisation of new structures, to self-organised criticality which leads to the balance of the system or to full chaos. Dynamical systems can be fully chaotic for long periods of time, or alternatively they can renew, redefine, and re-organise themselves in a continuing autopoiesis process.

Once the idea of dynamical paradigm is adapted to anticipation, it means that one accepts unpredictability and chaos as vital parts of the development of dynamical systems. One accepts that dynamical systems cannot be predicted and can only be influenced from within and not from the outside unless one has an opportunity to influence the energy supplies of the system or manipulate its partners in co-evolution. Even if one is able to influence a dynamical system, the outcome of the manipulation remains random. The ability to anticipate changes in a dynamical system is limited only to the parts which are functioning mechanically, or which are behaving as open/organic systems. The fully chaotic phases are beyond reliable foresight, and the outcomes of such processes cannot even be understood afterwards. However,

the mass of numbers is still valid in attempts to locate the insight of the current state of a dynamical system, and the tendencies of the system to evolve (pattern management, power laws etc.). The laws of nature are still valid benchmarking views especially in attempts to foresee the development or behaviour of open stable structures (complexity research, laws of thermodynamics etc.). Furthermore, as chaos theory tells us, one can attempt to anticipate even the results of a chaotic process by trying to answer the question "will the dynamic system settle down to a steady state in the long term, and if so, what are the possible attractors?", or the fractal nature of their development can be studied, but one cannot rely on the anticipation outcomes of such chaotic systems as they are very sensitive to initial conditions and random fluctuations.

In practical sense, the dynamical paradigm raises the importance of methods which enhance the abilities to understand/anticipate/reason or, alternatively, to imagine the possible outcomes of the dynamical system. Here, the understanding / anticipation / reasoning refer to the approaches and principles presented above. The imagination of possible development refers to methods which help one to sense-make, experience, utilize, and imagine the possible futures in a novel, virtual, and exiting way, as presented in Chapter 1.8.

2.2   Hermeneutical and explorative philosophy of this research

The philosophy in this thesis follows hermeneutical and explorative principles (cf. Habermas 1986; 1984, 135; Kuusisto 2004, 25-7; Willmott 2003, 95). In theory, this means that I have set a desired abstraction level which I want to achieve in the development work of anticipation and reasoning frameworks for the dynamic world. In order to achieve this, I have not been able set any fixed hypothesis or procedures for the research process in advance because I admit that, prior to the research process, I have not been aware of the kinds of analysis methods, principles, angles and theories that will eventually produce vigorous discoveries and elements.

As the new requirements of the third dynamic paradigm of futures research establish an interdisciplinary, co-evolving, and still mainly undiscovered research area, I believe that the hermeneutical and explorative philosophy, which is in practical terms executed in the forms of theory triangulation and interdisciplinary comparative studies, may provide a true opportunity for heuristic and novel discoveries in the development work of anticipation and reasoning frameworks. In order to achieve novel discoveries and the desired

abstraction level, the research strategy has been organised in a way which allows

a) changing the research strategy, questions, and aims when necessary in the process;

b) letting new hypothesis, linkages, discoveries, and conclusions to emerge during any phase of the study if they help to achieve the research objectives;

c) testing a selection of current research methods in different types of comparative studies, macrohistorical analysis, idealistic and proactive endeavours, future oriented policy planning, and also in theoretical methodology development work, as it is not self-evident which types of method or methodology tests can produce vigorous discoveries;

d) triangulation between different theories and thematic areas (autopoiesis, self-organisation, foresight, futures research paradigms, systems thinking paradigms etc.) and circulation and testing (comparative studies) around different current approaches and methods in order to develop my own personal understanding, and especially to make cumulative and interdisciplinary tested conclusions to the *Six pillars: futures thinking for transforming*.
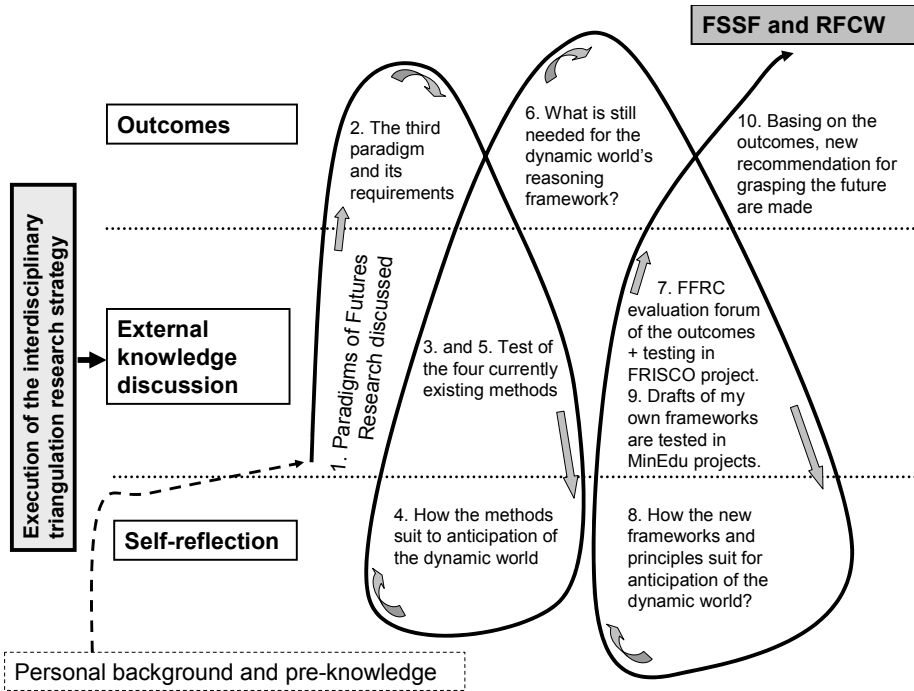
Figure 1   Hermeneutical and explorative philosophy of this thesis

The philosophy behind this thesis is presented in Figure 1. It follows the hermeneutical and explorative principles which appear here in a form of hermeneutical circles. The phases of the circulating process can be followed from the numbers 1-10 in the figure. My personal background and my pre-knowledge of the futures research principles, methodologies, its current usability, and its current renewal needs are the natural starting point of this research – the point zero. The first phase of this circulating process is to discuss and clarify the historical and modern paradigms of futures research (1). This is the first time when the process meets, analyses, and discusses the external knowledge – the futures research literature. It is followed by the second phase (2), where the main reasons behind the fragmentation of the second paradigm of futures research and its current trend-like challenges are discussed and concluded into a presentation on the foundations of the third paradigm of the research field and the requirements related to it. The second phase is partly an outcome of the first phase and partly an independent synthesis.

The third phase (3) is a test of current futures research methods. It is also the first triangulation work between theories and thematic areas related to the future of futures research.

The fourth phase (4) is a self-reflection of the current (tested) methodologies of the futures research, and it is also a self-reflection of the process which is used here in order to test the different methods. The fourth phase attempts to discuss how the tested methods suit to the anticipation of the dynamic complex world, and what can be learned from this test (see Chapter 5).

The fifth phase (5) is a return to the tests of current futures research methods and triangulations between theories and thematic areas that are related to the future of the futures research. Both, the third and the fifth phases are discussed in Chapter 4 which presents the summaries of the published articles.

The sixth phase (6) concentrates on the discoveries and new insight of the published articles and attempts to conclude what is still needed for the reasoning framework of the dynamic complex world. The main outcome of this phase is discussed especially in the Chapter 5.

The seventh phase (7) of the process is a public evaluation forum of the outcomes. The evaluation forum was organised during the development days of Finland Futures Research Centre (FFRC) in Svartå / Mustio Manor, Finland in September 8th 2008. The participants of the evaluation were the entire staff of FFRC which meant 41 informants. I presented the principles of the first and second paradigms and the reasons why I believe that there is going to be a paradigm shift in futures research. I also gave them an overview of my beliefs of the important principles that should be embedded to the anticipation frameworks of the dynamic complex world. The presentation was followed by a general discussion. After the discussion, the staff was asked to comment the key ideas through four questions: *a) Is there going to be any paradigm shift in futures research? If yes, indicate the year when it happens in average? b) Are we still talking about futurists in year 2050? If yes, indicate the issues and methods they are working with? c) If you believe in any paradigm shift, what issues you would like to attach to the next paradigm, or what issues would you not like to attach to it? d) What kind of means or actions futures researchers should obtain in order to answer the challenge raised by various consultants?* The results are presented in Chapter 5.2.

The second part of the seventh phase is: ii) *FRISCO (Foresight Intelligence System for National Competence and Competitiveness)* project planning work. As the name of the FRISCO indicates, the aim of the project was to develop a foresight and intelligence system for national purposes. The project was meant to use various quantitative trend data sources, and qualitative evaluations and roundtable think tank materials, as well as web mining, data mining and text mining applications. By the time of the theoretical testing, the FRISCO project was not in progress yet. Therefore, the ability of the futures signals sense-

making framework to work as a meta-framework within the various data sources was only theoretically tested.

The eighth phase (8) is a return to self-reflection. This time the reflection focuses on the suitability of the new draft of the framework for the anticipation and sense-making of the dynamic complex world.

The ninth phase (9) is a test of a draft of futures signals sense-making framework in the project *Liberal education and competence in labour markets 2030* funded by Finland's Ministry of Education (MinEdu) and European Social Fund (Aalto et. al. 2007 and 2008). This phase is embedded into the *mapping* part of Chapter 6, and it is more thoroughly presented in Appendix D.

Finally, basing on the outcomes of the entire research process, the tenth phase (10) attempts to answer the sixth research question of this thesis, by making new recommendations for the meta-framework of *Six pillars: futures thinking for transforming*. The six pillars attempt to comprehensively grasp the complex future which makes it a suitable meta-framework for the third dynamical paradigm of the futures research. The tenth phase is discussed in Chapter 6.

2.3   Self-reflection of the pre-knowledge

According to hermeneutical philosophy, it is important to discuss the personal pre-knowledge and background of an author in order to understand his/her world view and the context behind the philosophy and research strategy (see Kuusisto 2002, 20-35). Therefore, the point zero or the natural starting point of this research is my personal background and my pre-knowledge on futures research principles and methodologies, its current usability, and its current renewal needs.

The presentation of my starting point can begin by saying that my educational background is in political sciences, sociology, societal politics, economics, futures studies, and philosophy. I have worked primarily as a futurist for over seven years, mainly in Finland Futures Research Centre, and in its CID-LAB research group, in projects funded by various customers, such as the Finnish Ministry of Education, The Finnish National Board of Education (FNBE), Confederation of Finnish Industries (EK), Safety Technology Authority (TUKES), Haaga-Helia University of Applied Sciences, and the European Union. The work has included the planning and carrying out of multiple research and consulting projects and processes, which have given me a lot of experience on various methods, principles and approaches within futures research. My primary research topics have been

related to anticipatory education planning, in which my own concepts are: 40 years horizontal qualifications model, (modular degrees for life-long-learning), Alive Networks Model as a part of a new educational paradigm, critical action scenarios (together with Jari Metsämuuronen from FNBE), and the forthcoming concept: Evolution of competence (together with the CID-LAB group). My other key research topics have been related to the competence foresight of labour market sectors, and methodological and methodical development for futures research purposes – especially merging the weak signals analysis to another kind of ontology which follows the principles of pattern management, societal transformation modelling and sense-making, Delphi-analysis – especially Disaggregative policy Delphi, various types of scenario work, futures wheels etc. During these processes, I have learned a great deal about the strengths and weaknesses of futures research and about the limits of its applicability. At the same time I have been increasingly interested on what the complexity research and the understanding of the laws of life could offer for futures research and social studies.

2.4   Theory triangulation and interdisciplinary comparative studies

As already presented, the hermeneutical and explorative philosophy of this research is executed in practical terms in the forms of theory triangulation and interdisciplinary comparative studies. In other words, the research strategy bases on these two principles.

The comparative study refers to the test use of a selection of current research methods or approaches, such as macro-historical analysis, idealistic and proactive endeavours, explorative scenario thinking in policy planning, and the theoretical pattern management development work. The comparative study compares different methods or methodological approaches in various research cases. Here, the concept of interdisciplinarity refers to the fact that comparative study takes good use of methods or approaches from different disciplines, research areas or transdisciplinary areas (such as organisational complexity research, futures research, social studies). Therefore, the interdisciplinary comparative study tests various current methods relating to futures research or its neighbouring disciplinary areas in order to locate their strengths, weaknesses and suitability in relation to the requirements of the third paradigm of futures research.

The other key part of the research strategy is theory triangulation. The metaphor of triangulation comes originally from geometry, trigonometry, navigation and military strategy. In a process of triangulation, one uses multiple reference points to locate the exact position of an object, calculate

distances or measure topographical elevations. If one starts with the basic principles of geometry, multiple viewpoints allow for greater accuracy. In the same way, social scientists are able to avoid bias and improve the accuracy of their judgements by collecting different kinds of data bearing on the same phenomenon (Jick 1979).

In social, economical and educational studies, triangulation has been used as a loan word for many purposes. Norman K. Denzin (1978, 292-5, 301-2) distinguishes between four types of methods in one of the earliest outlines to the use of triangulation as a research strategy.

In contemporary research handbooks and in methodological literature (see e.g. Johnson & Christensen 2004, 408-431, Cresswell, 2003), the most often presented and reviewed form of triangulation appears to be the methodological triangulation which leaves the other four types of the method into its "shadows". In this context the methodological triangulation is more often understood as a synonym to mixed method research where quantitative and qualitative methods are merged in one way or another (Berg 2001, 5). For instance, in his book *Social Research Methods,* Alan Bryman (2004, 454-6) presents the logic of triangulation as a set where "results of an investigation employing a method associated with one research strategy are cross-checked against the results of using a method associated with the other research strategy". Bryman continues his definition of triangulation with a reference to Martin Hammersley (1996) who states, that such multi-strategy research can contain three alternative approaches: a) Triangulation = the use of quantitative research to corroborate qualitative research findings or vice versa, b) Facilitation = approach that arises when one research strategy is employed in order to aid research using the other research strategy, and c) Complementarity = approach that occurs when the two research strategies are employed in order to enable the dovetailing of different aspects of an investigation.

The same strong focus on methodological triangulation also seems to steer the critics as well as the philosophical discussions around the triangulation method. For instance, Wendy Olsen has discussed the value and usability of triangulation from various philosophical angles in her article *Triangulation in Social Research (2004).* She points out that triangulation is merely a pluralistic approach of deepening and widening understanding instead of just being a validation approach. She also discusses different reasoning approaches that may be used in triangulation, and concludes empiricist, constructionist and realist attitudes towards the method. Nevertheless, her discussion benchmarks the dimensions of methodological triangulation, but not of the other possible types of triangulation. Very much the same can be said about all the critique towards the triangulation method. For example, Alexander Massey has gathered relevant arguments against the use of triangulation in social sciences

in his article *Methodological triangulation, or how to get lost without being found out* (1999). His first critical argument focuses on the inappropriate adaptation of the term triangulation in social sciences. He states that none of the practices carried out in multiple method research - such as ethnography under the name of methodological triangulation - are in fact triangulation at all, but that they are simply unique techniques to construct unique kind of data or information.

Secondly, Massey emphasizes that the mistake of those social researchers who have retained the term triangulation is that they have stretched the metaphor too far, taking it too literally and believing that they can reach the same kind of certainty about social reality as land surveyors can about physical reality. And finally, it is hard to see how completeness could be achieved without the existence of a fixed social reality. Even if there was such a thing, how could one know it had been achieved? Furthermore, what could count as a workable definition of completeness? (ibid; Saukko 2003, 23-5)

The burden of the concept of triangulation is recognized in this thesis. Especially the difficulty of the pursuit of methodological triangulation towards completeness in fixed reality is something that I have wanted to avoid in my research strategy (see Saukko 2003, 25). I understand the reality and the logic that is studied in this thesis merely as a construction which may vary and be understood in different ways in different contexts, instead of a fully fixed object which could be understood and mapped as it really is. Therefore, I am more interested in the similarities and deviations between different angles and theories, and the possible usefulness, cross-fertilization and new understanding that the discovered analogies and lawfulness allow than in establishing a fixed truth. Thus, the research strategy is an explorative and not a hypothesis driven construction.

Despite the fact that methodological triangulation has its obvious pitfalls, and therefore could not be accepted as a research method or strategy for this thesis purpose, I considered some value in the original principles of triangulation (Denzin, 1978) and wanted to keep a reference to it in the research strategy. Especially the idea of theory triangulation interested me as it seemed merely to be a pluralistic approach of deepening and widening one's understanding instead of being just a fixed conclusion validation approach (Olsen 2004). Furthermore, theory triangulation embeds an idea of comparative study and cross-checking between "rival" theories. It also allows refining, broadening, and strengthening conceptual linkages inside a study. (Berg 2001, 4-6.)

Therefore, triangulation is compatible with the hermeneutical and explorative philosophy of this thesis and it can also be seen to enhance out-of-the-box thinking in a research process. I also believe that an idea that

encourages unconventional ways to combine different kinds of things or approaches may lead to "the Medici effect" (Johansson 2004). Basing on these arguments, I am convinced that both the metaphor of triangulation and the principle of theory triangulation suit well to the research strategy.

Here, theory triangulation, the other key part of the research strategy, refers to circulation between various aspects that are possibly related to the requirements of the third paradigm of futures research. Hence, in this thesis, the pluralistic aim of the theory triangulation is to attempt to merge unconventional aspects and theories to the anticipation and reasoning frameworks that are prepared for the use in the third paradigm of futures research. According to this principle, if there are aspects that should theoretically be merged to the framework development work, or, basing on the comparative studies, if there are aspects that are lacking in the current methods, then such aspects should be refined and attempted to be merged to the framework development work. Thus, the interdisciplinary comparative study is a process which tests current methods of futures research, and the theory triangulation is a process which refines different theoretical aspects into a new kind of a methodological solution or paradigm.

3   RESEARCH METHODS

The methods or methodological approaches discussed and tested in this research are macro-historical analysis, explorative scenario thinking in policy planning, idealistic and proactive approach in futures planning, and pattern management as a complex issues reasoning approach. The aim of the tests is both, to increase our knowledge of the general applicability of each one of the four test methods in anticipation, and to theoretically evaluate the suitability of the methods for the third dynamic paradigm of the futures research as indicated in the third research question:

iii) What is the suitability of four currently strong anticipation or proactive influencing methods that have been selected to a testing, from the point of view of the requirements of the third paradigm?

   The four test methods or methodological approaches are selected to the corpus of the tests of this research based on my own belief of the methods' good applicability in anticipation of the second paradigm, on my own research interests, and on my beliefs of the testing needs related to the third paradigm. The selection criteria base on the explorative philosophy of this research. Naturally, there are various other methods or methodological approaches which could have been tested instead. For instance, at least the following methods or approaches may be considered as relevant for further testing or even potentially suitable for the needs of the third paradigm as such:

> i) Backcasting method (Elise Boulding, 1995), which bases on the imagination of the desired state of the future. Once the future is imagined, one tries to set the milestones that must have been passed in order to reach the preferred future. Once the milestones are set, the process moves towards strategies and timelines.
> ii) Graham T.T. Molitor's (2003a) Forecasting model for plotting the patterns of change, possibilities, opportunities, and emerging issues before they become unwieldy and expensive.
> iii) Futures wheel (Jerome C. Glenn 2003) which attempts to reveal the interrelations, path-dependences and co-effects related to a certain phenomena.

iv) Causal Layered Analysis (CLA) (Inayatullah 2008, 12-15; 1998, Wildman & Inayatullah 1996; Slaughter 2005) which attempts to deepen the future by exploring the different levels of an issue or problem bringing the many discourses that create the real.

v) Four-quadrant mapping method, which attempts to deepen the future by developing inner dimensions for the CLA (Richard Slaughter 2005; Ken Wilber 2000).

v) Computer simulations and agent-based modelling to map the evolvement of a complex phenomenon (John L. Casti 2003; 2002).

v) International Risk Assessment and Horizons Scanning methodology and its software (expert network of the government of Singapore, IRAHS methodology CD, work of David Snowden).

Many of these methods are already in use in the meta-framework of this thesis – *Six pillars: futures thinking for transforming* (see the description of the framework and the related discussion in Chapter 6).

3.1 Macrohistorical analysis

The first of the four test methods selected to be tested in this thesis is macrohistorical analysis. Its key questions are: what are the shapes of historical processes – or more objectively; is the change linear, progressive, cyclical or spiral-like, or does it follow some sort of a contraction pattern, and how do the stages emerge from previous stages etc. (Inayatullah 2008, 11; 2004, 1; 1998; Galtung and Inayatullah 1997)? Furthermore, macrohistory can be understood as a construct in (or of) social reality – as memetic complex or topologically knotted cycles. Like a complex atom, holding in an implicate order the variations of historical possibility in which the variations of higher "atomic weight" may remain to be detected (Judge 2004, 9; Dator and Seo 2004). Hence, as Inayatullah (2004, 1) puts it, macrohistory by focusing on different theories of change, from different epistemes, approaches and perspectives, forces us out of our own tunnel visions of the future.

The macrohistorical analysis is applied in two articles of this research. Both of the articles test different macrohistorical approaches in comparative studies between "rival" theories. The first article where the macrohistorical analysis is conducted is Kuosa (2005a). It is an article where Pentti Malaska's futures research based theory of societal change is compared to seven other more well-known theories of societal change. This published article tests the following five macrohistorical framework analysis categories in its evaluation work: continuity, time, evolution, coherence and development.

The other article that applies the macrohistorical analysis is Kuosa (2007b). It compares Malaska's theory to Brian W. Arthur's theory, to John Naisbitt's theory, and also to theories which base on the laws of thermodynamics in the complexity science framework set by Eve Mitleton-Kelly (2003). The macrohistorical analysis tested in this article deviates from the categories used in Kuosa (2005a). Instead of dissecting the theories' fundamental transformation logic with questions like "is the future linear, cyclical, spiral like etc.?", Kuosa (2007a) tests societal transformation theories from the point of view of complexity science which has discovered various "law-like" tendencies of transformation. The evaluation categories that are used here base mostly on Mitleton-Kelly's (2003) research areas and generic principles of complexity science, and my own discoveries that I have wanted to add to her categories. Here, the theories' fundamental transformation logics are dissected with questions such as "is the societal transformation / self-organisation / emergence in the theories merely autopoietic, path-dependent, self-organised criticality, co-evolutionary, autocatalytic, chaotic etc.?"

Both of the evaluation categories, the one in Kuosa (2005a) and the one in Kuosa (2007a), can be seen as my suggested extensions to the "key evaluation categories" which are discussed e.g. by Inayatullah (2008, 2004, 1998) and Galtung and Inayatullah (1997).

3.2   Explorative scenario thinking in policy planning

The second test method discussed in this thesis is explorative scenario thinking in policy planning. Its basic principle is the pursuit to discuss the change from the present day towards the possible futures (Godet 1993). Thus, the explorative scenario work usually starts with some sort of an environmental scanning process which attempts to map all relevant and knowable factors of the present that affect the futures forming process. There are certain existing trends, drivers, believes, values, needs, and deeds that are setting the overall main frame for the explorative scenario work. In other words, the beginning of an explorative scenario work is grounded to the real[17] current world.

Once the first, current phase and the overall main frame of the futures process are sense-made, the second phase is to discuss the path that the development will probably follow in the near future. As the scenario work keeps penetrating further to the future, more factors with uncertain logic and

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[17]   Here, the "realness" of the current world is the interpretation of an individual researcher about the social constructions of the world and trends at a certain time and in a certain context.

outcomes start to emerge. This may lead the process to a necessary bifurcation point, which means that after a certain point the scenario has two alternative tracks, instead of just one. After the first bifurcation point, both two tracks of the scenario keep penetrating towards the futures. Again, as the more distant future has new uncertain factors on the way, the two tracks may have to be divided into four alternative tracks. Now the process has produced four scenario tracks which are leading towards different directions. Eventually, the four scenarios will produce four very different futures images.

The basic value of using the explorative scenario method in policy planning comes from its ability to open up alternative futures which are all possible and systematically argued. Once the alternative futures are opened, the suitability of current policies and decisions can be evaluated from the point of view of the different futures scenarios. Here, the evaluation questions are: do the current decisions and policies promote the desired futures development, do they jeopardize something, are they relevant both in the short and the long term even if the future has some unconventional aspects, and what should be changed in the current decision making in order to steer the development towards the desirable futures? In this thesis, such method has been tested in article Heinonen & Kuosa (2005).

3.3   Idealistic and proactive approach in futures planning

According to Olavi Borg (2003, 304), futures research has obtained a broad understanding of interests of knowledge. As futures research accepts to its corpus, not only the idea of deepening the futures awareness, but also the idea of really creating the future, it strongly embeds all three knowledge interest: technical, hermeneutical, and emancipatory (see Appendix). In other words, as Roy Amara (1981, 25) puts it, futurists tend to define their research objects in a way that combines probable, possible and wished for futures. Therefore it may be said that both normative-idealistic aspects and proactive elements are very important parts not only in futures research's knowledge interests but also in its practical futures planning work.

In this thesis, the idealistic and proactive approach in futures planning has been selected to be tested as a method. The methodological approach has been theoretically tested in a published article by Keskinen & Kuosa (2005), which discusses and idealistically speculates the possibility of citizens-oriented decision making in the globalising and more technically oriented futures society.

3.4   Pattern management as a complex issues reasoning approach

Pattern management (PM) is a fairly new concept. One of the first developments was an article by Kamran Parsaye (1999), where he drew a line between Data management and Pattern management. According to Parsaye, when recent data is put into operational system and merged with historical data gathered over time, we have Data management. When all this data analysed over time is being merged with historical *patterns* we have Pattern management. Thus, PM is not Knowledge management, data mining or construction of knowledge-based systems. PM deals with patterns after they have been discovered by data mining. Parsaye gives a simple analogy, "consider data as grapes and patterns of knowledge as wine. Data mining is then the wine-making process, (…) and the data mining tools are like wine-making equipment".

Parsaye's definition of PM is accurate from the point of view of managing knowledge, but it is possible to have a more versatile approach here as well. David Snowden (2002) has discussed the management of patterns as a more anticipatory and proactive process. From Snowden's point of view, patterns may even be seen as something more tangible than knowledge, understanding and beliefs alone.

> "We need to identify the early signs of pattern formatting and disrupt those we find undesirable while stabilizing those we want. If we are really clever then we seed the space to encourage the formation of patterns that we can control. These patterns are, to use the language of complex adaptive systems theory, emergent properties of the interactions of various agents. By increasing information flow, variety and connectiveness either singly or in combination, we can break down existing patterns and create the conditions under which new patterns will emerge, although the nature of emergence is not predictable" (ibid, 107).

It may be said, that Pattern management is, above all, a common logic of observing, reasoning and understanding our surrounding world. The theory of Pattern management is not a closed and sophisticated collection of methods and procedures or a strict system description. It involves various forms of inductive, hypothetic-deductive, abductive, analogy or case-based reasoning used within various fields of everyday life and science. Pattern management can be seen as one form of Strategic intelligence, which is an emerging field of business consulting. Strategic intelligence aims to undertake the task of revealing large, complex or complicated issues of transformation in a more understandable form.

The theory of Pattern management and its applicability for the purposes of futures research has been selected as the fourth theoretical method tested in

this thesis. The theoretical test has been carried out in an article by Kuosa (2009) which focuses especially on the forms of reasoning the emerging patterns of various complexly organised data sources simultaneously.

4   SUMMARY OF THE PUBLISHED ARTICLES

This dissertation contains five international referee articles. The following chapters will shortly present the overall themes, ideas and aims of each article. The five articles are presented in full length in Part II of the dissertation: Articles.

4.1   Study on Logics on Society's Macro-level Transformation

> Kuosa, Tuomo (2005a): Study on Logics on Society's Macro-level Transformation: A Macro historical Comparison of Pentti Malaska's Theory of Societal Change Compared to Other Theories of Transformation. *Journal of Futures Studies* (JFS). Vol. 10 Nro. 1, 2005. ISSN: 1027-6084. pp. 15-30.

This chapter is a summary of the themes, process, and overall contribution of the article Kuosa (2005a). The main role of the article in this thesis is to test one application of macrohistorical[18] analysis methodology in a study which compares macro-level theories of societal change. The aim of this test is, firstly to increase the overall knowledge of the used macrohistorical evaluation categories' suitability for the theoretical evaluation of societal theories, and secondly, to evaluate the suitability of the macrohistorical methodology for the third paradigm of futures research.

Another role of the article (ibid.) is to discuss the methodological contribution of different theories which attempt to explain the logic of societal transformation. The purpose of this second task is to locate the relevant common denominators which could be utilized in the development work of anticipation frameworks[19]. Both, the discoveries of the suitability of the macrohistorical methodology to the third paradigm's requirements[20], and the

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[18]   The macrohistorical analysis methodology is presented in Chapter 3.1.

[19]   The new anticipation and futures reasoning frameworks are suggested in the main Chapter 6. As the first main purpose of the tests of the four methods is to get knowledge of the methods' or methodologies suitability for the third paradigm, the other purpose is to get macrohistorical knowledge of the transformation logic which could be utilized in the framework development work.

[20]   The third paradigm of futures research and its arising requirements are discussed in Chapters 1.6, 1.7 and 1.8.

possible contribution of the discussed theories for anticipation frameworks, are discussed in Chapter 5.

Method test in this article

Theoretical test questions: a) Do the evaluation categories *continuity, time, evolutionary, coherence and development* suit macrohistorical analysis which aims to locate the macro-level societal development theories' fundamental logic, and why or why not? b) Does the macrohistorical methodology also suit the requirements of the third paradigm of futures research discussed in Chapters 1.6, 1.7, 1.8 and 2.1, and why or why not? The methodological discoveries and the conclusions of these tests are discussed in Chapter 5.

4.2   Ecological Realities of Telework in Four Different Futures

> Heinonen, Sirkka & Kuosa, Tuomo (2005): Ecological Realities of Telework in Four Different Futures - Living, Working and Travelling in New Knowledge-Intensive Communities. Inderscience Publishers Double Special issue. *Progress in Industrial Ecology – An International Journal,* Vol. 2, Nos. 3/4, 2005. ISSN: 1476-8917 (print), ISSN: 1478-8764 (online). pp. 329-357.

This chapter is a summary of the themes, process, and overall contribution of the article Heinonen & Kuosa (2005). The role of the article in this thesis is to test one methodological application of explorative scenario thinking in a process which aims to enhance the policy planning related to ecological realities of telework. The purpose of this test is, firstly to increase the overall knowledge of this foresight method's suitability for such policy planning endeavours, and secondly, to evaluate the method's suitability for the third paradigm of futures research. The methodological discoveries of the test are discussed in Chapter 5.

Method test in this article

Theoretical test questions: a) Does the used application of foresight method explorative scenario thinking suit policy planning that is related to ecological realities of telework, and why or why not? b) Does such explorative scenario thinking based foresight method suit the requirements of the third paradigm of

futures research, and why or why not? The methodological discoveries and the conclusions of these tests are discussed in Chapter 5.

4.3   Citizen-oriented Decision Making

Keskinen, Auli & Kuosa, Tuomo (2005): Citizen-oriented Decision Making. *Encyclopaedia of Developing Regional Communities with Information and Communication Technology.* Section C. Edited by Stewart Marshall, Wal Taylor and Xinghuo Yu. http://itira.cqu.edu.au/encyclopedia/index.htm UTA/ISI, Idea Group Reference www.idea-group-ref.com, Aug. 2005, USA. ISBN: 1-59140-575-0 h/c, eISBN: 1-59140-791-5. pp. 96-102.

The role of the article Keskinen & Kuosa (2005) in this thesis is to test one methodological application of idealistic and proactive approach in a project which aims to discuss the aspects of a more citizens-oriented democracy and contribute to the futures planning work related to it. The purpose of this test is, firstly to increase the overall knowledge of the method's suitability for such societal futures planning work, and secondly, to evaluate the method's suitability for the third paradigm of futures research. The methodological discoveries of the test are discussed in Chapter 5.

Method test in this article

Theoretical test questions: a) Does the used application of idealistic and proactive foresight method work as a futures planning approach, and why or why not? b) Does such application of idealistic and proactive foresight method suit the requirements of the third paradigm of futures research, and why or why not? The methodological discoveries and the conclusions of these tests are discussed in Chapter 5.

4.4   A Few Extensions to Path-dependence and Emergence in Complex Social Systems

Kuosa, Tuomo (2007a): A Few Extensions to Path-dependence and Emergence in Complex Social Systems. *Emergence: Complexity & Organisations* (E:CO). Issue Vol. 9. No. 4. 2007, pp. 3-16, ISSN 1521-3250.

This chapter is a summary of the themes, process, and overall contribution of the article (Kuosa 2007a). The main role of the article in this thesis is to test one methodological application of the macrohistorical analysis in a project which aims to discuss and suggest extensions for Eve Mitleton-Kelly's (2003) fifth category of complexity research. The purpose of this test is, firstly to increase the overall knowledge of the used second set of macrohistorical evaluation categories' suitability for the theoretical evaluation of societal theories, and secondly, to evaluate the macrohistorical methodology's suitability for the third paradigm of futures research.

Another role of the article is to discuss the methodological contribution of different theories attempting to explain the logic of societal emergence. The purpose of this second task of the article is to locate the relevant "law-like" complexity science based aspects which should be considered in the development work of anticipation frameworks. Both, the discoveries of the macrohistorical methodology's suitability to the requirements of the third paradigm, and the discussed theories' contribution for anticipation frameworks, are discussed in Chapter 5.

Method test in this article

Theoretical test questions: a) Do the evaluation categories based on complexity science suit a macrohistorical analysis which aims to locate the macro-level societal development theories' fundamental transformation logic, and why or why not? b) Does the macrohistorical methodology suit the requirements of the third paradigm of futures research, which are discussed in Chapters 1.6, 1.7 and 1.8, and why or why not? The methodological discoveries and the conclusions of these tests are discussed in Chapter 5.

4.5   Different approaches of Pattern management and Strategic intelligence

This chapter is a summary of the themes, processes, and overall contribution of the article (Kuosa 2009). The article itself is approved by both reviewers, but the theme issue for which the article is suggested has, at the time of writing this thesis, not been published yet. The article has five main roles.

Firstly it attempts to map the objectives or the "truths" that are looked for with reasoning processes (the ontology of patterns – when a pattern is emerging, existing, changing or invented). Secondly, it aims to map the methods that are used when one attempts to reason "patterns of change" (the forms of reasoning). Thirdly, it attempts to merge the relationship between the objectives of reasoning and the method of reasoning into a new kind of category of approaches of Pattern management (Empirical calculation (EC) is common especially in enterprise consulting, Theory proving with observations (TPO) is common especially in natural sciences, and real combining (RC) is common especially in qualitative research and in narrative). The article also discusses the relationship between Pattern management and Strategic intelligence. Strategic intelligence is an emerging field of business consulting, which aims to undertake the task of revealing large, complex or complicated issues of transformation in a more understandable form. Pattern management, however, can be seen as one field or one approach of Strategic intelligence. Fourthly, it attempts to theoretically test the suitability of a new Pattern management methodology for the theoretical evaluation of societal theories, and also its applicability for the third paradigm of futures research. Finally, the fifth main role of the article is to discuss or locate the relevant "law-like" aspects of reasoning which should be taken into consideration in the development work of anticipation frameworks (see Chapter 6). Both, the discoveries of the suitability of the new Pattern management methodology to the requirements of the third paradigm, and the discussion of the methodology's contribution for anticipation frameworks, are presented in Chapter 5.

Method test in this article

Theoretical test questions: a) What kind of reasoning methods and ontological aspects should be considered in processes which attempt to reason phenomena of the complex world? b) Do the new categories of pattern management suit the requirements of the third paradigm of futures research discussed in Chapters 1 and 2, and why or why not? The methodological discoveries and the conclusions of these tests are discussed in Chapter five.

5   SUMMARY OF DISCOVERIES

Chapter 4 presented the contribution of five articles which dealt with the anticipation of societal change from different angles. Each article had practically two roles. Firstly, they introduced a specific field, a piece of hindsight, or an approach of anticipation which is highly relevant inside the second paradigm of futures research. Secondly, they introduced the idea and the practical use of at least one relevant anticipation research method. In this article, I call this second role of the articles, alongside the work in Chapters 4 and 5, as the theoretical test of a method. The theoretical test questions of each method's suitability for the needs of the third paradigm, the test objectives, and the criteria for the evaluation of the methods' overall contribution are concluded in the end of each articles' summary in Chapter 4. The actual discussion of the selected four currently strong and already existing anticipation methods' suitability to the demands of the third paradigm, and the methods general usability, is discussed in Chapter 5.2.

Alongside the method test "package" of the four currently strong and already existing anticipation methods, as introduced in Chapter 4, there is another method test "package" which plays an important role in this thesis. This testing "package" focuses on my own methodological attempts to grasp the challenge of the third paradigm. According to the philosophy of this research, its role is to contribute to the phases 6 - 9 of Figure 1. This second test "package" contains three separate works. The first of these works is discussed in Chapter 5.2, and it attempts to answer the following research question: *"iv) What types of challenges and themes FFRC futurists are attaching to the third paradigm, and what types of practical challenges to grasp the theme appear in the attempts of two selected projects?"*

The second work discusses the experiences and discoveries of FRISCO project planning work, which attempts to establish a national foresight system for grasping the complex world. The idea, aims and the difficulties are presented in Chapter 5.3. The third work maps the outcomes of the foresight project of Finland Ministry of Education which specifically tested the Futures signals sense-making framework in a loose information sense-making process. The outcome of that test is presented in Appendix D.

Before going to the results of the paradigm shift evaluation forum of the FFRC, and the FRISCO project and MinEdu project discoveries, I present a brief summary of driving factors and probably emerging features of the third

paradigm, as a summary of the introduction chapter. The primary meaning of that summarization is to present the background for the forthcoming chapter of the FFRC evaluation forum, and the FRISCO project.

5.1 Summary of the paradigm shift drivers

Four main reasons and drivers behind the fragmentation of the current dominating paradigm, additional key six large emerging challenges, five areas of change, and three emerging features that the futures research may need to face at least in the long run can be located. Together, these eighteen views are challenging the legitimacy of the dominance of the current second paradigm, and therefore a paradigm shift, or at least a slow but strong change in dominance, is expected in this thesis. Thematically, most of the drivers and challenges which form the third paradigm's framework are suggested to arise from the new understanding of dynamic organisations, laws of the life and nature, from the overall increase of non-linearity in societal phenomena and global trends, from the new understanding of the usefulness of the holistic view and discoveries of the complexity research, from the rapidly developing ICT, software, and search engines, from the needs to locate patterns from various forms of futures signals and data. Alongside with these core drivers and challenges forming the research interests in the society in general, at least three additional aspects have been presented that can be considered as other key emerging characteristics of the forthcoming third paradigm of futures research. These three potentially emerging aspects are arising virtualisation, new allowance of imagination, and pursuit to experience the future. However, this thesis does not focus on these three potential aspects of the forthcoming paradigm.

5.2 Conclusions of the four methods suitability for the third paradigm

This chapter concludes the discussion of the selected four currently strong and already existing anticipation methods' suitability to the demands of the third paradigm. Alongside the discussion of the theoretical suitability of the methods, the following chapter discusses the methods' general usability as well. Each method is presented in a separate subchapter.

5.2.1 Macrohistorical analysis

As presented in Chapter 3, there have been two different types of tests of the macrohistorical analysis in this thesis. The first (Kuosa 2005a) attempted to compare and evaluate the basic characteristics of eight different theories of societal change, and the second (Kuosa 2007a) to compare Malaska's theory to Brian W. Arthur's and John Naisbitt's theories, and also to theories based on the laws of thermodynamics in a complexity science framework set by Eve Mitleton-Kelly (2003). The macrohistorical analysis tested in the latter article deviates from the categories of the earlier article (Kuosa 2005a). Instead of dissecting the theories fundamental transformation logic with questions like is the future linear, cyclical, spiral like etc., it tests societal transformation theories from the point of view of complexity science which has discovered various "law-like" tendencies of transformation.

The basic principle of macrohistorical analysis bases on the idea of evaluating grand shapes of historical processes through selected macro-categories. Hence, it may be considered as a framework flexible enough to allow a researcher to focus on any aspects that are linked to the requirements of the third paradigm that arise in this thesis. As already tested (see Kuosa 2007a), the macrohistorical analysis allows one to use the laws of life and nature as test categories in research that attempts to evaluate the basic logic of transformation theories. In addition, it allows one to evaluate the alleged increase or decrease of non-linearity in theories that attempt to explain societal phenomena and global trends, as well as to utilize the new discoveries of the complexity research in any attempts to draw grand shapes of historical processes. It also suits the evaluation of the role of technology in different phases of history. Furthermore, the strongly emphasized pursuit to locate patterns from various forms of futures signals and data can be said to be inherent in macrohistorical analysis.

As a conclusion, macrohistorical analysis works alone as an evaluation method of the third dynamic paradigm, and alongside with other anticipation methods or principles as a macro-level anticipation method which helps one to formulate the general logic of transformation in any demanding futures research process. In this sense, the objectives of macrohistorical analysis can be compared to the objectives of the branch of mathematics which deals with the long-term qualitative behaviour of dynamical systems from the viewpoint of the chaos theory. The chaos theory oriented mathematics does not attempt to answer precisely what the points of a dynamical system that converge the orbit towards stable manifold or what the points that diverge from it are. It merely attempts to answer questions like: "Will the dynamic system settle down to a steady state in the long term, and if so, what are the possible

attractors?" Alongside chaos theory, macrohistorical analysis has some methodological similarities with the objectives of complexity theory as well, as both attempt to reason the macro-level logic of transformation. For example, thermodynamics attempts to state what the determined outcome of energy and matter transfer in a system is. In the same way, macrohistorical analysis attempts to state the "law-like" tendencies in certain type of processes.

Furthermore, the chapters above explained how macrohistorical analysis can capture the holistic delicacy that is familiar to complexity research and chaos theory. In contrary, one can argue that macrohistory can easily explain chaos and complexity. Hence, both can capture each other.

5.2.2   Explorative scenario thinking in policy planning

It may be said that, instead of being a specific set of methods, the scenario approach is a way of thinking the future. As discussed in the introduction chapter, scenarios have been and they still are popular. There are various applications and methods that follow scenario thinking in traditional futures studies, consultation business and in research in general. Due to the number of different applications, only one application of the scenario approach, the explorative scenario thinking in policy planning, could be selected to a full scale test in this thesis. Nevertheless, this thesis presumes that the selected application represents the spirit of scenario thinking well.

The basic principle of the explorative scenario thinking in policy planning is based on the idea that the alternative futures and the explorative scenarios leading to these futures are opened and seriously argued first. Once the alternative futures are opened, the suitability of current policies and decisions can be evaluated from the point of view of these different futures scenarios. The evaluation questions that were used in Heinonen & Kuosa (2005) were: do the current decisions and policies enhance wished for futures development, do they jeopardize something, are they relevant both in the short and in the long run even if the future has some unconventional aspects, and what should be changed in the current decision making in order to steer the development towards the wished for futures?

Basing on the experience of the test of the method, it can be said that the explorative scenario thinking in policy planning suits well both to Borg's first grand area of modern futures research: *Creation of interesting future imagines, visions and scenarios*, and to the second grand area of modern futures research: *Ability to support planning and decision making,* as it is a good method for evaluating current policies from the futures scenarios perspective

(see Chapter 1.3.). Therefore the method supports the needs of the second paradigm well, but how well does it suit the purposes of the dynamical paradigm is a more complicated question. It does not utilize the discoveries of complexity research, nor increase the abilities of a researcher to produce inductively reasoned or empirically more reliable futures signals or data management.

However, the explorative scenario method can be seen to provide a framework where the implications of the rapidly developing ICT, software, and search engines can be thoroughly discussed and evaluated. In addition, it enables the use of "wild imagination" in futures research. It works as a method which helps one to imagine the theoretically potential outcomes of chaotically dynamical processes which are extremely sensitive to initial conditions and are therefore non-linear. Yet, the explorative scenario method is not the best possible method for enhancing imagination. Once there is a need for structured imagination methods of unpredictable and dynamical processes e.g. the normative scenario method can be seen to work better. The normative scenario method is especially suitable for producing wild cards which go beyond disruption periods, or "black horse" scenarios, which makes the method even more useful for dynamical systems foresight in comparison to the explorative approach. Thus, the method suits the third paradigm, but does not bring much methodological novelty.

5.2.3   Idealistic and proactive approach in futures planning

The basic principle of the article by Keskinen and Kuosa (2005), *Citizens-oriented Decision Making* was to argue the general abilities to enhance democracy in the modern society, and to discuss the opportunities and possible benefits or pitfalls of the use of citizens-oriented decision making. In this sense, the practical objectives of the article suit Borg's second grand area of modern futures research, the *Ability to support planning and decision making* well. On the other hand, the objectives of the article are also quite idealistic and there can be seen a strong proactive pursuit as well. The authors of the article are suggesting new tools and principles for democratic practices, in order to obtain more citizens oriented decision making. Therefore, it may be said that the article also suits Borg's third grand area of modern futures research, *Solving the great global questions of all human kind*, and partly also the fourth grand area, *Developing applicable interdisciplinary methodology* (see Chapter 1.3.).

From the viewpoint of this research, the key objective of the test was to evaluate the applicability of one idealistic and proactive approach that is at

least occasionally used in futures research. The idea was to theoretically test the applicability of the approach both in a modern context and in the context of the forthcoming third paradigm. As already mentioned in the previous paragraph, the approach suits the objectives and grand areas of modern futures research well. Nevertheless, it does not bring much new applicability to the demands of the third paradigm. It does not constitute a new kind of understanding of the laws of life and nature, the usefulness of the discoveries of complexity research, attempts to locate patterns from various forms of futures signals and data, the implications of the increase of non-linearity in societal phenomena and global trends, nor the implications of the rapidly developing ICT, software, and search engines. However, the basic idea in the idealistic and proactive approach still functions in the third paradigm. It promotes the organised use of "wild imagination" in proactivity, and it may help to promote pursuits to "experience the future" or to "utilize the applicability of new virtualisation". Hence, the idealistic and proactive approach is still a valid method in the third paradigm, although it does not bring much novelty to organised anticipation or mapping.

5.2.4   Pattern management as a complex issues reasoning approach

Kuosa (2009) discusses the existing forms of pattern management and complex issues strategic intelligence in science, in consultation, and in life in general. As discussed in Chapter 4.5, the article itself has five main objectives. Firstly it attempts to map the goals or the "truths" that are searched for through reasoning processes (which refer to the ontology of patterns – what are emerging, existing, changing or invented patterns like)? Secondly, it discusses the methods that are used when attempting to reason "patterns of change" (which refer to the forms of reasoning). Thirdly, it attempts to merge the relationship between the objectives of reasoning and the method of reasoning into a new kind of category of approaches of Pattern management (see EC, TPO, and RC in Kuosa 2009; 2007b). Fourthly, it attempts to theoretically test the suitability of the new Pattern management methodology for the theoretical evaluation of societal theories, and also its applicability for the third paradigm of the futures research. And fifthly, the article attempts to discuss or locate the relevant "law-like" aspects of reasoning which should be considered in the development work of anticipation frameworks.

   The article's discussion of the forms of patterns reasoning from complex data sources suits well to the arising themes of the third paradigm. Its main focus is at the core of the third paradigm's objective to locate patterns from various forms of futures signals and data, and it promotes one's abilities to

acknowledge the implications of the increase of non-linearity, complexity, and autopoietic behaviour in societal phenomena. In this sense, it helps one to reach a good holistic or generalist understanding of global or local trends or emerging phenomena, which base strongly on evidence, data, and inductive or abductive reasoning. On the other hand, PM does not promote organised use of "wild imagination" in proactivity, it does not enhance the use of virtual worlds, nor does it help us to experience the future. Yet, PM has much to offer for the forthcoming third paradigm, and especially for anticipation practices.

5.3 Discoveries of FFRC paradigm shift evaluation forum

According to the hermeneutical and explorative philosophy of this research, the seventh phase of the process is a public evaluation forum of the paradigm shift, as indicated in Figure 1 in Chapter 2.3. The evaluation forum was organised during the development days of Finland Futures Research Centre (FFRC) in Svartå / Mustio Manor, Finland in September 8th 2008. The participants of the evaluation, a total of 41 informants, consisted of almost the entire staff of FFRC. I presented the principles of the first and second paradigms and the reasons why I believe that there is going to be a paradigm shift in futures research. I also gave them an overview of my beliefs of the important principles that should be embedded to the anticipation frameworks of dynamic complex world. The overview was a summary of the previous chapter. The presentation was followed by a general discussion. After the discussion, the staff was asked to comment the key ideas through four questions (a-d). The questions are followed by my summaries of the answers.

a) Is there going to be any paradigm shift in futures research? If yes, indicate the year when it happens in average?

There were 22 answers provided to this question. Eleven people considered a significant paradigm shift in the future self-evident. The estimations of the eleven informants of the year when the shift takes place varied between 2012 and 2040, and their median answer was the year 2023. Three people considered that there will be a steady but obvious transformation process ahead of us which cannot be called a paradigm shift. Eight people rejected the whole idea of paradigm shifts in the future. They suggested that the great methodological shift has already taken place in futures research. In these answers, the years when it had taken place varied between 1904 and 2000. The median of these eight answers was approximately during 1950's.

b) Are we still talking about futurists in year 2050? If yes, indicate the issues and methods they are working with?

There were 23 answers provided to this question. Only three people considered that there will be no talking about futurists in year 2050. The other people provided a broad variation of issues the futurists will be working with. Many of the issues were traditional, but there were some non-traditional themes and professions suggested for the futurists of the future as well. The suggested future professions of futurists were: personal futures trainer, good life planner, political futures agent for political parties, and strategy & risk management planner for corporations. The themes the futurist of the future would work on were: virtual & biological emotions consulting, political interventions, operating in interactive networks, network construction and co-ordination, retailing the foresight methods for corporations and for different disciplines.

c) If you believe in any paradigm shift, what issues you would like to attach to the next paradigm, or what issues would you not like to attach to it?

The answers to this question varied broadly. The question was answered by 18 members of the FFRC staff. In the answers of these informants, the working with non-linearity was especially emphasized. The informants were expecting a methodical change and a change in world views which would contain e.g. the allowance of imagination and visual expression, the higher importance of responsibility, and the utilization of virtual technology. Only one informant wanted to tell an issue he/she would not like to attach to it. That unwanted issue was the return of humbug.

d) What kind of means or actions futures researchers should obtain in order to answer the challenge raised by various consultants?

There was much variation in the answers. There were 29 answers provided to this question. Many informants wanted to emphasize the essence of improving the scientific quality in research. The importance of building holistic understanding that cannot be easily copied was a topic in many of the answers. Some of the staff emphasized method development and proactivity as well. Finally, some of the informants stated that it would be important to adopt the language, marketing skills, and working methods consultants use in their work.

5.4   Discoveries of FRISCO project planning

By the time of writing this thesis, only the first prototype of *FRISCO (Foresight Intelligence System for National Competence and Competitiveness)*, FRISCO 0.1, was being preliminary test in five countries. The prototype has been developed in co-operation between prof. Pirjo Ståhle from FFRC and European Training Foundation. FRISCO version 0.2 is meant to be developed for country level competence foresight for educational administration, and version 0.3 is meant to be developed for national competitiveness foresight for companies and industrial politics. The author is meant to be the key researcher in FRISCO 0.2 and 0.3. Currently, versions 0.2 and 0.3 are applying for funding, and there are no tangible outcomes of version 0.1 available at the moment of writing this thesis. Therefore, the conclusions of the methodological requirements for anticipation and sense-making of the complex and dynamical world, basing on FRISCO, base only on theoretically set plans for the project. Because of practical reasons, only the main idea of FRISCO is presented in this chapter.

FRISCO is meant to produce real time knowledge and understanding of the trends and drivers which are forming the future. The knowledge is meant to be organised into three levels: hindsight, insight and foresight in order to serve industrial or educational strategy work or decision making related to R&D or financial investments.

The FRISCO methodology is meant to rely on the automatic use of various quantitative trend data sources (domestic, sectoral, corporal and international), qualitative evaluations, and international experts' and companies' mutual roundtable think tank materials, as well as self-organised mapping tools, and web mining, data mining and text mining applications. FSSF framework and MRA are meant to be used as a framework to outline and sense-make the heterogenic raw material (see Figures 2 and 3 in Chapter 6). The work of outlining, analysing and synthesizing is meant to be organised in many levels in order to cumulate well sense-made and visual strategic intelligence to strategic and operational decision making.

5.4.1   Discussion of challenges related to FRISCO and societal anticipation

The idea of FRISCO is very close to the idea of Pattern management. The change of large factors of transformation, as well as the emergence of minor seeds of change are reasoned from various and heterogenic data sources. A single signal, source, or logic of change should not be trusted in such

reasoning process of change, because any significant change is believed to be signalising in many ways.

Pattern management is a good and reliable way to reason the insight of change, but the challenge is to go further to the future. This challenge is set by the dynamical nature of social systems, and the complex world. Dynamical systems are unstable and potentially sensitive to initial conditions. This means that their sensitivity to initial conditions vary in time. Sometimes the attractors are able to maintain stable orbits and fluctuations, but sometimes the dynamical systems are very sensitive to initial conditions, which means that during such periods the systems undergo chaotic phases[21]. The forthcoming moment of chaos is difficult to predict, and the final outcome of the chaotic period is impossible to predict. Only guesses or wild cards can be given for the time after the chaotic period (see Appendixes).

The following presentation links the key terms to the real world, and gives an example of the sensitivity of societal systems to initial conditions.

The societal system is dynamical, which means that it can maintain its (existing) attractors for very long time (path-dependence of trends = change is quite linear), or it can obtain new attractors which start to form different types of futures (sensitivity to initial conditions). The transformation of societies is full of "triggers" which may become radical seeds of change, or they may fade as well (compare to favourable time / social demand). To give a contrafactual example, if Adolf Hitler would have died accidentally before he established the Nazi party, or if he would have been selected to Vienna art school, to which he applied but was not selected, the Second World War WWII would have been totally different. Or to give another example, after the WWII, paranoid Joseph Stalin was sure that the West will start the WWIII. In order to win the war, he believed that Soviets should make the first nuclear strike. However, Stalin was poisoned[22] with warfarin in March 5th 1953, and he suddenly died to a hemorrhagic stroke. If Stalin would have lived a few more years, or if Hitler would have died earlier or been selected to Vienna art school, the world we see today would be very different.

In the previous story, the triggers (Stalin's death etc.) were initial conditions which suddenly pushed the systems into a chaotic period. After a while, the chaotic systems obtained new attractors, the path-dependence was cut, and a new era started to emerge. In futures research such triggers are called wild cards. We can guess or invent wild cards which go beyond the chaotic period, but we can not know such real triggers beforehand.

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[21] Some types of dynamical systems are constantly chaotic, some are able to maintain (stable) structures for most of the time, most vary somewhere between.

[22] The poisoning is not officially confirmed

As FRISCO relies on a pattern management type of an approach, it is a good way to obtain reliable insight of path-dependence or already emerging change, but it still cannot tame the dynamical nature of society. Furthermore, it is lacking in its ability to grasp the complex future. Even if it provides tangible insight and proactive elements to the foresight, it still remains unable to enhance individuals' abilities to imagine the wished or feared for futures, to merge the pulling and pushing drivers with the weights of the history, to create alternative futures, to "experience and visualise" the possible / alternative futures, to reveal the macrohistorical and unconscious elements effecting our decision making everyday, and to provide tangible methods for transforming the desired futures.

The next chapter attempts to merge all these elements to a futures transforming program which suits the forthcoming dynamical paradigm.

6   RECOMMENDATIONS FOR GRASPING THE FUTURE

This chapter attempts to answer the thesis' last research question: *v) How all the discoveries and new insight can be attached to the meta-framework of Six pillars: futures thinking for transforming, and what kind of new recommendations can be made in order to grasp the complex future?*

One may ask, whether Six pillars is an independent conceptual framework, a part of the new Dynamic paradigm or a contender of the paradigm. In this thesis, the Six pillars: futures thinking for transforming is used as a meta-framework to which the new discoveries and insight of this research are benchmarked, as I consider that it is currently the most suitable framework for grasping the emerging challenges of the forthcoming third paradigm of futures research. This means that I consider The Six pillars as a methodological principle, which can be obtained both within moderninistic paradigms and the more demanding Dynamic paradigm. It is not a contender of any paradigm, but a practical program which can be utilisized in attempts to grasp the complex future, and it can be embedded to different types of paradigms. Thus, the Six pillars can help one to run a futures project when one's mindset accepts the non-linearity, complexity and chaotic dynamics as the way the world functions, and it can help even if the mindset is linear and mechanical. Whereas paradigms are mindsets towards the different systems logics and beliefs behind research methodologies and explanations, meta-frameworks are ideas on how projects should be steered to obtain some objectives within a certain paradigm.

Before presenting my new recommendations and my standing point, I present the general idea of Sohail Inayatullah's (2008) framework of the six pillars.

The Six pillars framework integrates and builds on a variety of futures studies' concepts, ways of thinking and techniques and integrates them into a new approach, which aims to promote people to recover their agency, and help them to create the world in which they wish to live.

The Six pillars framework describes six foundational concepts (the used future, the disowned future, alternative futures, alignment, models of social change, and uses of the future), six questions (will, fear, missing, alternatives, wish, and next steps as related to the future) and six pillars (mapping,

anticipating, timing, deepening, creating alternatives, and transforming), giving examples and case studies where appropriate.

In other words, Six pillars is a meta-framework which aims to present an entire process of how one can steer the transformation of the future from step or level A (= what we think of the future) all the way to the step or level Z (= where the future has been narrowed towards the preferred one and the required actions are taken). Such analytical and critical all encompassing (multi) approach is required because the world we live in is increasingly complex and heterogeneous and all social phenomena seem at a first glance to be an unstructured mess where everything is equally interlinked. All this is of course a huge challenge for futures research. Inayatullah (2002) has discussed this challenge from the point of view of the five decisive areas of change in understanding the future of futures research. These five aspects or areas where change is needed in futures research are presented in Chapter 1.7. When these five areas of change are merged with the four drivers, six emerging challenges and three emerging features of the introduction chapter (TKu), we get a full picture of the reasons why Six pillars is produced, and how it could be further developed.

The pillars (Inayatullah 2008, 7) base on six futures questions:

> 1. What do you think the future will be like? What is your prediction? More and more progress and wealth? Wealth for the view? A dramatic technological revolution? Environmental catastrophe? Why?
> 2. Which future are you afraid of? Random acts of violence? Do you think you can transform this future to a desired future? Why or why not?
> 3. What are the hidden assumptions of your predicted future? Are there some taken-for-granted assumptions (about gender, or nature or technology or culture, or . . .)?
> 4. What are some alternatives to your predicted or feared future? If you change some of your assumptions, what alternatives emerge?
> 5. What is your preferred future? Which future do you wish to become reality for yourself or your organization?
> 6. And finally, how might you get there? What steps can you take to move in toward your preferred future? "As it says in ancient Buddhist texts, much of the solution to the challenge of life is simply in being pointed in the right direction".

Inayatullah summarizes the futures questions as follows: will; fear; hidden assumptions; alternative futures; preferred future; and next steps.

The actual six pillars of the futures transformation process are: *mapping, anticipating, timing, deepening, creating alternatives, and transforming*. The pillars may be considered as a step by step program for changing organization or corporate cultures towards plausible futures thinking and collective proactivity.

Because I attempt to showcase the entire spectrum of the challenges faced by futures research, and because I attempt to discuss the general idea of the dynamical paradigm in the context of futures research, there are new issues that I would like to attach to the Six pillars. In order to modify it to suit the purposes of the dynamic paradigm better, there should be one more pillar available – Analysis of environment type. This seventh pillar should be placed before mapping as the first step of the process.

Alongside with the new pillar, I suggest two new analysis frameworks (FSSF and MRA) to be utilized in the Six pillars as well. FSSF is recommended as an extension for the mapping, and MRA is suggested as an extension for anticipation. These two extensions are recommended because I consider that it is important not only to reveal the underlying drivers and to change the organisational practices to be more futures oriented, but also to bring new practical ways to outline and reason the loose information of the complex world if we want to create a more tangible program for grasping the future.

All these three recommended new parts for the six pillars, as well as a few minor additions, are discussed in the following chapters. Otherwise I consider that the futures grasping project description of Six pillars is a valid program for the dynamic paradigm of futures research.

6.1   Analysis of environment type as a new pillar of grasping the future

In order to grasp the complex world within the Dynamical paradigm mindset, I suggest the following new pillar to be added to the six pillars meta-framework. The key reason why I believe it is important to have this pillar is the new understanding that arises from the logic of dynamical/unstable systems.

Firstly, we function in an environment where we are in constant co-evolution with systems that are more or less either in chaos, in edge of chaos, in order, or anywhere between (Kauffman 1995; 2000; 2003).

Secondly, the systems that we are facing vary between mechanical/stable, organic/open, and dynamical/unstable (Ståhle 2008).

Thirdly, the ways these three types of systems renew themselves are heterogeneous. i) The (stable) mechanical self-renewal takes place according

to a mechanical/closed logic, but we may consider that the conservative self-organisation is another way how mechanical self-renewal takes place. This kind of (mechanical type of) conservative self-organisation can proceed e.g. through: exogenously oriented (reversible) phase transition, shape transition, other chemical reaction of gases, autocatalysis, or complex branching of growing colony types of transformations (e.g. Ball 2004). ii) The organic/open self-renewal follows the laws of biological life – the laws of thermodynamics in particular – and autopoiesis (e.g. Maturana & Varela 1992). For instance, a human body is an open/organic, non-equilibrium steady state system which is able to maintain its order as long as energy flows through the systems and the system is able to remove its internal entropy to the outside world (see Chapter 2.1). iii) The dynamical/unstable self-renewal can follow at least three different types of logic. It can follow a) the logic of a chaotically dynamic system where is no structure, b) dissipative self-organisation which takes place through e.g. a cascade of bifurcations and thorough irreversible phase transition, and c) it can follow the logic of autopoiesis, at least occasionally, and in particularly in some parts of the system which are in order. However, it should be noticed, that a complex system can have simultaneously all of these self-renewal processes going on[23].

6.1.1   Conclusion of the analysis of environment type:

The analysis of environment type as the first step of a complex futures grasping process should contain the following three analyses / phases:

1. Environment: Chaos - Edge of chaos - Order
Which type is your functional macro-level / (eco)system? Chaos = undergoing random fluctuations, very sensitive to initial conditions, the outcomes of the interactions cannot be understood even afterwards. Edge of chaos = there is a strong co-evolution going on, the actors are simultaneously competing, co-operating, and forming alliances. Order = the system relies fully on path-dependence, there seem to be no needs for changes or significant motion, the system may be even fully stagnated.

2. System: Mechanical – Organic – Dynamical
Which type is the system you are in or co-operate with?

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[23]   This is a new idea even for the previous prented idea of dynamical paradigm, see Chapter 2.1 and Ståhle 2008.

3. Self-renewal: Chaotically dynamic – Dissipativelly self-organising – Autopoietic
What is the dominating type of self-renewal in the system you are in or co-operate with? Are there many self-renewal processes going on simultaneously or is the dominating self-renewal processes going to be changed to another?

6.2   FSSF framework and other extensions for mapping

The mapping is the first pillar of Inayatullah's (2008) six pillars meta-framework for grasping the future. I would prefer to call it the second pillar, as emphasized in the previous subchapter. In order to present my recommendations for developing this first (or second pillar), I present the original version of mapping first.

According to Inayatullah (2008, 7-8), past, present and future should be mapped in the mapping pillar. By mapping time, it becomes clearer where we have come from and where we are going. Therefore, he suggests the following approach for starting the mapping.

"The method ''shared history'' consists of having participants – in a futures workshop – write down the main trends and events that have led up to the present. A historical time line is then constructed to the present. Shared history asks: what are the continuities in our history, what is discontinuous? Has change been stable or have there been jumps in time? This opening tool creates a framework from which to move to the future." (ibid.)

In order to carry out the futures mapping, Inayatullah suggests three specific tools. The first tool contains three specific forces: *pull of the future, push of the present, and weight of the history*, as described bellow.

Inayatullah states that there are five archetypical images of the future which *pull* us forward: Evolution and progress (some people have a man centred world view - more technology and rationality is required), Collapse (some people have the world view that we have reached the limits), Gaia (some people believe that the world is a garden and culture is its flower), Globalism (some people have a world view which states that we need to crash the borders and come closer), and Back to the Future (some people feel that we have gone too far, and need to get back to the basics). (ibid.)

Along with images, there are the *pushes of the present*. These are quantitative drivers and trends that are changing the future. An aging population is one such trend. We are living longer and having fewer children. Which future will this trend push us to? (ibid.)

There are also *weights*. These are the forces of barriers to the change we wish to see. Each image has differing weights. Those who imagine a

globalized world are weighed down by nationalists and the brutal fact that while capital may be free to move, labour is still tied to place. The Gaian image is weighed down by the dominance of hierarchy – male, empire or expertise. (ibid.)

The second tool is *the futures triangle* which analyses the interactions of these three forces, and helps us develop a plausible future somewhere between the different forces. (ibid.)

The third tool is the futures landscape which helps one to audit where our organization is. "The landscape has four levels. First is the jungle, a dog-eat-dog competitive world, wherein the goal is to survive. Second is the chess set, where strategy helps us enhance our effectiveness – we succeed by being clear about our goals and creating more responsive organizations. Third are the mountain tops – these are the big pictures, the broader social contest we find our organizations in. Finally is the star, the vision. Is your organization engaged only in day-to-day survival, or is it using strategy to move forward? Has it developed scenarios of alternative futures, different assumptions of how the world might be? Does it have a vision?" (ibid.)

Because I want to bring new ways to outline and reason the loose information of the complex world, I recommend the Futures Signals Sense-making Framework (FSSF) to be used alongside with the previously presented three mapping tools. The new "mapping + loose information sense-making" tool is presented briefly in the next sub-chapter.

6.2.1 Futures signals sense-making framework as a start-up tool for mapping

FSSF (Fig. 1) is a framework for outlining and sense-making any type of futures oriented research material or loose information. The main reason why I developed the FSSF was my frustration with the blur concepts and definitions related to the observation or anticipation of transformation. As discussed earlier, weak signals, in particular, could refer to any idea or observation related to change in general (c.f. Hiltunen 2006, 2007). Pulling and pushing drivers, demands and seeds of change have been hopelessly mixed together too frequently. Larger trend-like processes have been packed under one label despite the fact that some paths or trends form like-minded clusters (mega-trends), some contradictive factors (anti-trends) and some trends feature both elements at the same time. Some trends are driven by indeterministic social factors such as values, and some are driven by natural law-like process such as self-organisation, autocatalysis and autopoiesis, etc. Again, some trends have both qualifications. Furthermore, there are some factors which are blocking

otherwise probable emergences, renewal, or change. Thus, I firstly wanted to establish a framework which helps one to dissect one's own understanding and belief of relevant future knowledge. Secondly, I wanted to establish a framework for the third paradigm of futures research which allows the structured use of pattern management in futures signals and knowledge analysis.

Hence, the Future signals sense-making framework (FSSF) can be considered as an alternative philosophy towards futures signals, weak signals, emerging issues, raw data, plain observations, interpretations of observations, drivers, trends, etc. in contrast to the traditional, single signal extrapolation approach. This philosophy bases on the principles of both environmental scanning and pattern management. It also has some characteristics in common with Strategic early warning systems and Issue management (see Appendix D).

At first, in order to address these problems, I developed a weak signals evaluation framework (Kuosa 2005b) which had four categories: fully unexpected, partly unexpected, partly expected (it is related to a driver), and fully expected (related to a trend) futures signals. As it was not sufficient for separating the different types of driving forces and trends, I started to plan a framework which would be able to better separate these things as an analysis tool. The outcome of this process was FSSF (Fig. 1).

The levels of futures knowledge		
A. Weak signals	**1. Any observation which is totally surprising, amusing, ridiculous, or annoying to you** (Do you find something novel in your observation? Could it be a weak signal of emergence?)	**2. Any observation which tells about change and makes sense to you** (Observations which convince you that something is increasing or decreasing)
B. Drivers	**3. Your understanding of a potential seeds of change** (The pushing drivers - What are the issues which may start emergence?)	**4. Your understanding of demands of change** (The pulling drivers - What is needed, socially, politically, technically, economically `etc´ and therefore can be expected)
C. Trends	**5. Your understanding of blockers of change** (Factors which slow down or prevent the otherwise emerging change - Laws, values, interests, bureaucracy, taboos, borderlines, technical necks of bottle etc)	**6. Your understanding of inevitable large change processes** (The flowing river of change - Megatrends, path-dependence, auto-catalysis etc.)
	Disrupters / non - linear	**Promoters / linear**
	The fundamental nature of information	

Figure 2   Future signals sense-making framework

The FSSF analysis framework can be used as such (inductively) or it can be utilised through one particular theme which the observer is interested in. If one wants to study, for instance, the potential change related to certain taboo, value or consumer demand, the alternative categories of FSSF can be used as a (PRE) gathering, analysing, sense-making and categorising tool. Here, all pieces of information that are relevant to the theme under research should be placed to the six categories. If one is able to place the piece of information to one or two of the categories, it means that the person has been successful to locate certain fundamental aspect of the theme. This categorising work can be demanding as it forces one to consider ontological and epistemological aspects of each piece of information from many angles. It can also help the person to better identify the visible conditions of change, the hidden exogenous and endogenous key factors that are forcing the change to happen and factors which are slowing down the potential change etc. in order to conclude a more all-encompassing view on the change of the phenomenon.

There are three levels of futures knowledge in the framework: weak signals, drivers, and trends. These three levels can be seen to represent a scale from tacit / subjective to explicit / objective. The three levels of knowledge are further divided into two types: 1. a disrupting type of information which

brings up non-linear implications of, e.g., the immergence (fading) or emergence of new structures, trends, phenomenon, processes, values or cultures, and 2. a promoting type of information which enhances our understanding of linear development in the future.

The A level is meant to be used for analysing any gathered observations or groups of observations that may be related to change within the theme of interest. Hence, on the A level one has to decide which type each of the observed signals at hand is. Are they true weak signals – non-linear or interrupting information (category 1) – or are they alternatively less surprising, but still relevant information which strengthens one's understanding of the fact that something is changing within the theme (category 2). The third alternative decision is to decide that the observation at hand is not a weak signal or a relevant signal of change at all and can therefore be ignored. In practical terms, once a person makes an observation, he should decide whether it can be attached to an existing but changing trend, phenomenon, etc. If this is possible, the observation represents a (linear type of) promoting of information on the theme (category 2). If this is not possible, it is a disrupting, non-linear type of information, and because of this, it may be necessary for the person to change his understanding of the trend, phenomenon or the theme (category 1).

On the B level, one has to make sense of causalities that are related to the theme under research. If one is able locate some types of factors such as pushing drivers, these issues fall under the third category. A pushing driver may be any seed of change, novel idea/meme, threat, opportunity, emerging technology, etc., which has the potential to be the trigger of change. Alternatively, if one is able to locate any expectable pulling drivers that are relevant to the theme, such as strong demands on something, such issues go to the fourth category. For instance, if we know that the population is ageing, it is highly probable that there will be a linear type of increasing demand for services for the elderly as well.

The C level is for sense-making the largest and most crucial trend-like conditions from the functional environment. Thus, the trend-like conditions which are sense-made in level C should be something relevant to the theme studied. On the C level, the issues which can be located in the fifth category should contain issues that can be reasoned as large size disrupters of the potential structural or value change or otherwise something trend-like that prevents or slows down potentially emerging change. Finally, the issues that can be located to the sixth category (category 6) can be something that one is able to identify as the linear "flowing river of change". These issues can be traditional trends or megatrends (globalisation), cyclical issues (shifts in economic growth), obvious path-dependence processes (membership in EU leads to new things), or self-organisation, autocatalysis or the autopoietic

process (spread of fashion or procedure), which are very difficult to influence or terminate.

I have piloted FSSF in the research project "Liberal education and competence in labour markets 2030", which shed light to the methods usablility in research (see Appendix D). Furthermore, I have piloted FSSF in Palmenia's half-day workshop "TRICOM IV Communication management PD" in February 2009 as well. As a result of the workshop piloting, it may be said that this method can help people to organise their thoughts and observations if they are familiar with their subject, but if they are not, the method can confuse them even further. Hence, it may be said that the use of this method requires some form of expertise, and there should be enough time to introduce the principles and reflect the analysis in any workshop with this method.

6.3   Categories of reasoning the "truths" as tools for anticipation

The second pillar of the meta-framework is anticipation. Inayatullah (2008, 8-10) attaches two specific methods to this pillar: i) Emerging issues analysis (Molitor 2003b) / Forecasting model for plotting the patterns of change (Molitor 2003a) which seeks to identify bell-wether regions, where new social innovation starts. It also seeks to identify issues before they become unwieldy and expensive, and ii) Futures wheel (Jerome C. Glenn & Thodor J. Gordon 2003) which attempts to reveal the interrelations, path-dependences and co-effects related to a certain phenomena. Futures wheel can focus on hindsight, insight or foresight, and it attempts to separate the primary, secondary and tertiary impacts of certain phenomena.

I recommend the following "*Methodologies of Reasoning Answers*" (MRA) as an extension for the methods in this anticipation pillar.

MRA in Figure 3 combines two approaches of futures knowledge production. First dimension bases on the previously presented Future Signals Sense-making Framework (FSSF) which introduces the different levels of futures knowledge: A: *Weak signals* level which refers to the level of interpretations of perceptions; B: *Drivers* level which refers to the cumulative reasoning of the causalities or effective factors of change, and C: *Trends* level which refers to the reasoning of trends, phenomena, cluster or patterns from various sources of information.

Second dimension of the MRA is constructed from the three general strategies of pattern management which are suggested to be the archetypes of reasoning the "truths", answers, or futures knowledge. These archetypes are

Empirical Calculation, Theory Proving with Observations, and Real Combining (see Chapter 4.5; Kuosa 2009; 2007b).

When these two dimensions are put together, we get the following vertical categories of reasoning the "truths": X, Y and Z. These three categories represent independent and alternative ways to handle the entire anticipation process. One can select any of these three categories, basing on the objectives, methods and the type of phenomena currently being worked with.

Categories of futures knowledge: A, B and C			
A. Weak signals	Classification of raw data – automatic exploration of hidden interrelations, common denominators and co-variations.	Search of useful information – some information may offer evidence for certain hypothesis.	Making own interpretations of weak signals – some observations are early warnings or meaningful information.
B. Drivers	Classification of patterns – are there causal relationships within the patterns of change?	Falsification of given causal drivers through new evidence, establishing new hypothesis that could explain a certain change better.	Inventing drivers – some underlying visions, interests, beliefs, needs and values may be explanations or drivers for a certain type of change.
C. Trends	Time series analysis for classified data – how do the patterns, peaks, drivers and clusters change over time according to empirical evidence.	Conclusion of the best explanation for the observed issue – one explanation can be verified by the empirical evidence.	Inventing futures trends, scenarios or phenomena basing on one's own interpretations. Here the environment is too complex for empirical modelling.
	X: Empirical Calculation Conclusion through automated and self-organised data-anaysis	**Y: Theory proving with observations** Hypothesis <-> falsification -> conclusion	**Z: Real Combining** Subjective and constructivistic conclusions

MRAs (Methodologies of Reasoning Answers): X, Y and Z

Figure 3   Use of futures knowledge in the three MRAs

In all categories, the anticipation process starts with the use of FSSF, and continues in MRA by selecting one of the three categories. When a category is selected, the reasoning runs, inside the category, from level A (weak signals / perceptions) to B (drivers / causalities), and then from B to C (trends / concluded "truth" of phenomena or pattern)[24].

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[24]   The role of the three levels (A, B and C) is different in each of the methodologies (X, Y and Z), as can be seen from the presentations.

X: Empirical Calculation

X suits quantitative, statistic and software based analysis. The answer that is searched for is a snapshot truth which is true for that particular moment only. Therefore, it is accepted that the answer or truth is changing over time. In level A, one should gather all relevant raw data or perceptions. The interpretations are made according to statistic rules. In level B, knowledge is cumulated and causalities are searched for – the proximate and ultimate drivers and their interrelations should be revealed. In level C, the discovered snapshot paths, peaks or trends located in level A and the causalities discovered in level B (interrelations and drivers) are mapped. Thus, in level C, all conclusions of the levels A and B are combined and basing on that, one can extrapolate how trends or phenomena may change over time. Such extrapolation in X may follow e.g. time series analysis or multi-causal analysis.

Y: Theory Proving with Observations

Y suits e.g. natural sciences, forensic and medical research, history, engineering, astronomy or any other type of research where the expected outcomes are believed to be more or less permanent truths or answers to certain questions. For instance, basing on all the evidence, there must be a planet in a given solar system, person x must be the murderer, all swans can not be white, there must be an unknown virus causing this illness etc. In category Y[25], the three levels of knowledge (A, B and C) are merely different sides of one research process, not independent research phases as is the case with X and Z. In Y, the role of A is to map the evidence, the role of B is to carry out the abductive research, and the role of C is to conclude the final answers to the research questions.

Z: Real Combining

Z suits qualitative research, social sciences, humanities, arts, and any holistic, synthesizing, or constructivist reality or discourse building (Potter 1996;

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[25]   In other words, in category Y, the loose information / perceptions / evidence, which originate from level A must be attached to available hypothesises in level B. In level B, existing hypotheses are falsified and new hypothesises are abductively invented until there is only one hypothesis left which can not be falsified anymore. Level C is merely a collection of the discovered truths. Sometimes the researchers are happy with the discoveries – "we got the murderer" – and sometimes the discovery is only one step in a long chain of research – "we found the RNA which effects this reaction". That is the way cumulative science works.

Fairclough 1992). All users of Z usually realize that the outcomes of the process are more or less subjective (or collective) interpretations. Thus, the concluded "true" answer, the discourse, the futures knowledge, or the extension or existence of a phenomenon – whatever it is that is looked after – is understood as something that is genuinely invented or constructed. In other words, the users of Z, as well as the general audience, should both realize that some other person, some other research group, or some other culture, would end up into another set of conclusions from the same research material. Here, the expected outcomes of the reasoning are always approximate, subjective, or even completely invented. Z, and especially the methodology behind it, can be seen to have similarities with the idea of fuzzy logic, where answers are not precise and solutions vary somewhere in the grey zone, being almost never black and white. According to fuzzy logic, if a network or structure is large enough, there are always many alternative ways from one point to another. In practice, this kind of an approach makes e.g. a corporate strategy, an electric network, as well as a washing machine more robust in comparison to single solution approach. To go back to the use of the levels of knowledge in Figure 3, Z starts with the mapping and interpreting of the subjective discoveries or believed qualitative characteristics, discoveries, weak signals, tacit knowledge etc. of certain phenomena in level A. In level B, believed causalities and drivers behind the complex phenomenon or a trend are qualitatively reasoned. In level C, all the evidence and the subjective conclusions are combined in order to get a holistic view over the complex, large or relativistic issue or phenomenon.

Table 2   Conclusion of the characteristics of the archetype
                 approaches of reasoning

Methodologies	Data / evidence	Reasoning / method	Objective / answer
X: Empirical Calculation	Mostly quantitative and statistic raw data.	Mostly inductive. Calculation, statistic, variable or factor analysis, correlations, modelling.	Snapshot "truths" that constantly change alongside with the data. The objective of reasoning is a quantified answer[26].
Y: Theory Proving with Observations	All relevant data and perceptions can be equally used as evidence. The objectives determinate the required or relevant data sources.	Abductive. Can utilize any form of reasoning. Test sets or comparisons. Creation of new hypothesis and falsification of existing hypothesis as long as necessary.	Reasoned and "undeniable truth". The objective of reasoning is a tangible and permanent answer. "Virus x causes this illness"[27].
Z: Real Combining	Mostly qualitative, perceptions, literature, talk, tacit knowledge, weak signals, intuition, wisdom, interpretations, social agreements.	Mixture of all forms of reasoning e.g. analogies and case-based reasoning. Creating linkages, possible causalities and synthesis. Holistic and autopoietic[28] sense-making.	Invented "truths". Fuzzy logic. Subjectively or socially constructed [29] answers to complex or relativistic issues. The objective of reasoning is to understand very complex issues[30].

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[26]   E.g. IBM uses several methods, such as Public Image Monitoring, OmniFind, Web Fountain (IBM 2006), to pinpoint the rise or fall of interest on discussion topics from the Internet or for drawing the most interesting Internet sites from up-to-date download statistics. In addition, Google uses its own database, which is collected from Google's own search service, in order to make sense of the changes in topics people are interested in nationally or internationally. Or, basing on statistics, people who buy baby diapers, buy baby food and baby toys more often than the other customer groups.

[27]   Or person x must be the murder (forensics), or the dinosaurs were killed by a giant asteroid (natural sciences, geology, evolution studies, history), or gene x must effect on this protein production (medical research), or there must be a black hole in that galaxy (astronomy). Quite recently (Hubblesite 2006), the astronomers of Harvard-Smithsonian institute proved the existence of dark matter by locating its "finger print" from a location they called 1E0657-556.

[28]   Autopoietic social learning through communication, self-referring processes, and constant endogenous "negation of complex system's frames" is presented in Chapter two.

[29]   The idea of social constructivism (the relativistic "truth" of reality), and the role of discourse (the socially manufactured / negotiated "truth" of reality) in social change are discussed more thoroughly in e.g. (Potter 1996; Fairclough 1992).

[30]   E.g. some theorists claim that we are entering a postmodern era, or alternatively an age of conscious machines, or reflexive modernisation, or age of intangible needs, or global age, or network society, or dream society etc. (cf. Kuosa 2005a).

6.4 Timing, deepening, creating alternative and transforming the future

Inayatullah's (2008, 10-11) third pillar is timing the future, for which he suggests macrohistorical analysis tools to be used. Basing on my experience of that methodology and its applications, I fully agree with the recommended approach (see Chapters 3.1, 4.1, 4.4 and 5.2).

Inayatullah's (2008, 12-14) fourth pillar is deepening the future. For this phase, he suggests two methods: Causal layered analysis and Four-quadrant mapping. I can say that I fully agree with these methods and I have no extensions to be added to this phase.

Inayatullah's (2008, 15-18) fifth pillar is called *creating alternative futures*, for which he suggests two important methods. The first method, named *nuts and bolts,* consists of undertaking a structural functional analysis of the organization and then finding different ways of doing what it does. The second way to create alternative futures is via scenarios. According to Inayatullah, scenarios are the tool par excellence of futures studies. They open up the present, contour the range of uncertainty, offer alternatives, and even, help predict better. Basing on my experience of explorative scenario work, I can fully agree with these methods (see Chapter 3.2, 4.2, and 5.2), but I would like to recommend a few additional methods to this phase. First one *is new allowance of imagination*. Chapters 3.3 and 4.3 as well as on of the research articles (Heinonen & Kuosa 2005) have presented an idealistic and proactive approach in futures planning, but I believe that the acceptance of imagination should go even further in this phase. Sci-fi type of imagination should be accepted or encouraged here[31]. Second suggested addition is *utilization of the 'rising virtualisation'*, and third is *experience the future*, as presented in Chapter 1.8.

Inayatullah's (2008, 18-20) sixth pillar is transforming the future. In this pillar the future is narrowed toward the preferred - which future do individuals desire? The preferred future can result from scenarios. It can also be created by a process of questioning. The preferred future can also be discerned through a process of creative visualization. In this process, individuals are asked to close their eyes and enter a restful state. According to Inayatullah (ibid.), the three visioning methods – the analytic scenario, the questioning and the creative visualization – are then triangulated to develop a more complete

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[31] Three visioning methods have been suggested in the sixth pillar, but imagination could be a key part in this phase as well.

view of the future. The vision can then be backcasted and a transcend method can be utilized. I agree with these operationalization methods, but I would like to emphasize the imagination more in the fifth pillar, and strengthen the sixth pillar's operational side. Otherwise, I believe that all the pillars work very well together.

6.5   Conclusions

This study aims to showcase the requirements for the birth of the third paradigm of futures research, to compare the paradigm thus born to four existing research methods, and to assess the discoveries and new insight, in order to make recommendations for the meta-framework of *Six pillars: futures thinking for transforming*, which attempts to grasp the complex future.

The study contains five research questions and six main chapters. Chapter 1, "Introduction", answers the first research question *"i) What are the foundations and the driving factors of the historical paradigm of futures research, the modern paradigm, and the forthcoming third paradigm?"* Chapter 1 discusses the foundations of Kuosa's three paradigms, and suggests that the dominating second paradigm of futures research is going to be replaced by the dominance of the third dynamic paradigm. However, the three paradigms will most likely co-exist in some form according to the nature of postmodernism. Furthermore, the chapter discusses the relationship between the three paradigms and contending taxonomies.

Chapter 2, "Theory", presents the framework, the philosophy, the self-reflection, and the research strategy of this work. In addition, it attempts, alongside with the discussion in Chapter 1, to answer the second research question *"ii) What are the key requirements that the third paradigm of futures research should adopt to its anticipation and reasoning methodology?"* Here, the main argument is that futures research should adopt a new type of systems thinking, "Dynamical paradigm", to its core, its ontology and its epistemology.

Chapters 3 and 4 answer together the third research question: "iii) What is the suitability of four currently strong anticipation or proactive influencing methods, that have been selected to a testing, from the point of view of the requirements of the third paradigm?" The role of Chapter 3 is to introduce the four methods that are meant to be tested from the point of view of the requirements of the third dynamic paradigm. These methods are macrohistorical analysis, explorative scenario thinking in policy planning, idealistic and proactive approach in futures planning, and pattern management as a complex issues reasoning approach. All of the methods have been developed during the dominance of the second paradigm, and they are selected

to the test according to my own interests and beliefs of the testing needs related to the third paradigm. As discussed in the chapter 3, there are various methods which could suit as well or even better for the demands of the dynamic paradigm, but the test has been limited to these four in this research.

The role of Chapter 4 is to present the contribution of the five published articles which dealt with the anticipation of societal change from different angles. Each article had practically two roles. Firstly, they introduced a specific field, a piece of hindsight, or an approach of anticipation which is highly relevant inside the second paradigm of futures research. Secondly, they introduced the idea and the practical use of at least one relevant anticipation research method. In this article, I call this second role of the articles, alongside the work in Chapters 4 and 5, as the theoretical test of a method. The theoretical test questions of each method's suitability for the needs of the third paradigm, the test objectives, and the criteria for the evaluation of the methods' overall contribution are concluded in the end of each articles' summary in Chapter 4.

Chapter 5 has three main roles. Firstly, it summarises and discusses the selected four currently strong and already existing anticipation methods' suitability to the demands of the third paradigm, and the methods' general usability. Secondly, it discusses the opportunities and challenges that are discovered in two foresight methodology development projects; "FRISCO" and "Liberal education and competence in labour markets 2030". Thirdly, it focuses on the fourth research question of the thesis *iv) What types of challenges and themes FFRC futurists are attaching to the third paradigm, and what types of practical challenges to grasp the theme appear in the attempts of two selected projects?"*. These different types of attempts to grasp the focal points and challenge of developing new methodology for the third paradigm of futures research shed light to the plurality around the issue. The key conclusion is that a methodology of the third paradigm should accept a certain type of postmodern fragmentation, and it should contain multiple methods, multiple steps, and it should have a sense of the dynamical, non-linear and occasionally chaotic world in its nature.

Finally, the sixth chapter grasps the last question v) How can all the discoveries and new insight be attached to the meta-framework of Six pillars: futures thinking for transforming, and what kind of new recommendations can be made in order to grasp the complex future? Here, the cumulated new insight is merged with the prevailing Six pillars, in order to pave way for better multi-pillar, multi-method, multi-question, and multi-steps projects to grasp the dynamical and complex futures. The biggest changes that I recommend to the six pillars are the following. Firstly, there should be a new pillar "Analysis of environment type" which has three parts: i) evaluation of the

type of an environment - is the type of the functional environment merely: Chaotic - Edge of chaos – Order/stable, ii) Which type is the system you are in or co-operate with? System: Mechanical – Organic – Dynamical, iii) What is the dominating type of self-renewal in the system you are in or co-operate with? Self-renewal: Chaotically dynamic – Dissipatively self-organising – Autopoietic? Secondly, I recommend two new analysis frameworks (FSSF and MRA) to be utilized in the Six pillars. FSSF is recommended as an extension for the mapping, and MRA is suggested as an extension for anticipation. Thirdly, I suggest new allowance of imagination, virtualisation, and experiencing of futures as views which should be embedded more strongly to the fifth pillar of the meta-framework. In my opinion, these extensions help the framework to grasp the challenge of the third paradigm better.

The work has followed the principles of hermeneutical, explorative, interdisciplinary and cumulative approach. The process has containded external knowledge discussions, self-reflections and formulations of concluding outcomes, as can be seen from Figure 1 in Chapter 2. As the research part is already finished, the final step of the methodological process of this thesis is final self-reflection. It can be started by saying that this research has contained many levels which have been quite demanding to be handled alone. Especially the macrolevel of the thesis, the discussions and arguments around futures research paradigms shifts, other related taxonomies, the role of historical, current and future aspects in the issue, the role of anticipated societal change within the issue, has been a big field to be sense-made. Another parallel, perhaps even a bigger field of research has been the discussion and theories around systems theories, complexity and chaos theory, non-linearity and their relationship to dynamical paradigm. Third large issue has been the discussion around the meta-framework of Six pillars. How the framework could be developed further to grasp the high demands of the possibly forthcoming new paradigm of futures research better. Fourth large issue was related to the questions "What kind of research process should be developed, in order to say anything relevant to this large and complex issue of paradigm shifts?" and "What kind of research process should be developed, in order to say anything relevant to the Six pillars meta-framework?" This issue contained the discussion around this research's philosophy, especially the role of hermeneutical, explorative, interdisciplinary and cumulative approach. Fifth large issue was the test of the four currently strong anticipation methods. As there were many issues which were demanding to be handled alone, handling the entire sense-making process in order to develop the meta-framework to suit the third paradigm better, was an even larger meta-level task. Thus, there have been many difficulties in the process, and sometimes the theme has seemed too fragmented to be studied, and sometimes the methodology and

philosophy has seemed to be too "open" to grasp the complexity into solid enough conclusions, but eventually, I think this way has taught me a lot. Even large, complex and evolving themes can be studied, and such study can be bound to methodological development work which benefits the entire research field.

Among others, Pirjo Ståhle and Mika Mannermaa have made one preliminary step in this jouney by defining the basic characteristics of the dynamical/evolutionary system and paradigm. Sohail Inayatullah has made another large step by defining the principles of multi-pillar, multi-method, multi-question, and multi-steps projects of grasping the complex future. I have made the third step by binding these aspects together and defining some recommendations. In the future, someone will hopefully make the fourth step by operationalizing the theories into tangible practice in futures research.

APPENDIXES A, B, C, AND D

The key terminology of this thesis is defined in appendixes A, B and C. Appendix A provides an overview to the terminology and research areas of complexity, Appendix B defines the concepts that are more related to chaos theory and dynamic organisation, and Appendix C introduces some more interdisciplinary concepts of transformation that arise especially from futures research and social studies. Appendix D discusses the experiences of the FFSF test use in the project *Liberal education and competence in labour markets 2030*.

Appendix A: Complexity terminology

Complexity theory seeks to understand how organisation and stability arise from the interactions of many agents according a few simple rules. In other words; how order emerges out of chaos (Kauffman 1993). It can be said that the main themes of complexity research have been studied by physicists, chemists and mathematicians for over a hundred years, and these scientists have evolved a toolkit of concepts and techniques to which complexity theory has added only a handful of new items (Ball 2004, 3-5). During 1980s, more and more attempts to gather and merge the contribution of various disciplines into one unified theory of complexity started to emerge. These endeavours established both the new science of complexity and the chaos theory as its neighbouring science. In 1990s, the union between complexity science and evolution biology, biochemistry, computer simulations, and social sciences started to establish new sciences of life and bioinformatics, and new theories of organisational complexity (c.f. Kauffman 2007, 2003, 2000, 1995; Mitleton-Kelly 2003; Cilliers 1998).

Complex and complicated: If a system, despite the fact that it may consist of a huge number of components, can be given a complete description in terms of its individual constituents, it can be described a complicated system. Things like jumbo jets or computers are complicated. In a complex system, on the other hand, the interaction between the different constituents of the system and the interaction between the system and its environment are of such a nature that the system as a whole cannot be fully understood simply by analysing its components. Moreover, these relationships are not fixed, but shift and change, often as a result of self-organisation. (Cilliers 1998, viii-ix.)

Complex systems and post-modern society "operate under conditions *far from equilibrium*. They need a constant flow of energy to change, evolve and survive as complex entities. *Equilibrium*, symmetry and complete stability mean death. Just as the flow of energy is necessary to fight *entropy* and maintain the complex structure of the system, society can only survive as a process. It is defined not by its origins or its goals, but by what it is doing. In *post-modern society* this constant activity, this lack of equilibrium is pushed to ever higher levels, particularly through the role of the mass media. This has an unsettling effect on many, and undeniably one has to develop certain skills to cope with these conditions, but to yearn for a state of complete equilibrium is to yearn for a sarcophagus". (Cilliers 1998, 122.)

What causes order is a multidisciplinary concern, which applies to matter, life, brains, artificial intelligence and social systems. Order refers to the emergence of different entities or "kinds" (organisms or social entities) and new connections between them. Furthermore, connections reach order only in the context of environmental constraints. (Mitleton-Kelly 2003, 8.)

> *According to Eve Mitleton-Kelly (2003, 23-50), the ten generic principles of complexity are 1. Self-organisation, 2. Emergence, 3. Connectivity, 4. Interdependence, 5. Feedback, 6. Far from equilibrium, 7. Space of possibilities, 8. Co-evolution, 9. Historicity & time, 10. Path-dependence. These key concepts of complexity can be briefly summarized as follows:*

Self-organisation: Spontaneous emergence of order – e.g. molecules may spontaneously organise themselves into right-handed and left-handed cells. Both natural selection and self-organisation are necessary for evolution (Kauffman 1993). Modern thermodynamics distinguishes between two types of phase transitions: conservative and dissipative. Conservative self-organisation means the phase transition of reversible structures in thermal equilibrium, such as the growth of snow crystals, which can revert to water or steam if the temperature is changed. (Nicolis & Prigogine 1989, 14, 50-52.)

Emergence: Self-organisation + creation of new order (Kauffman 1995). In modern thermodynamics, dissipative self-organisation is the phase transition of irreversible structures far-from-thermal-equilibrium. Macroscopic patterns emerge from the complex non-linear cooperation of microscopic elements when the energetic interaction of the dissipative (open) system with its environment reaches some critical value. (Nicolis & Prigogine 1989, 51; Mitleton-Kelly 2003, 41; Mainzer 1996, 4.)

Connectivity and Interdependence: All complex behaviour arises from the inter-relationship, interaction, and inter-connectivity of elements within a system and between the system and its environment. Another aspect that paves way for complexity in systems is *multidimensionality* where dimensions interact and influence each other. (Mitleton-Kelly 2003, 26-28; Aaltonen 2003.)

Feedback: Positive feedback drives change (reinforcing, amplifying), and negative feedback maintains stability in a system (balancing, moderating, or dampening) – e.g. central heating system switches the heating on or off

depending on the desired temperature. According to Arthur (1990, 2002), stabilising forces do not always operate or dominate Instead, *positive feedback loops* sometimes magnify the effects of a small economic shifts, and increasing returns from positive feedbacks create many possible equilibrium points depending, of course, on the *negative feedback loops* that may also operate in the same system simultaneously. For instance, early small gain in market share would improve the competitive position of one system and help it further increase its lead, which happened in the even match between Beta and VHS formats. (Mitleton-Kelly 2003, 38-40.)

Far from equilibrium: Thermal equilibrium is a state in which the velocities and the accelerations of all the material points of a system are equal to zero. In equilibrium the system is in a state of rest. (Nicolis & Prigogine 1989, 54-6.) In far from equilibrium conditions, non-linear relationships prevail, and a system becomes inordinately sensitive to external influence. In far-from-equilibrium conditions we find that very small perturbations or fluctuations can become amplified into gigantic, structure-breaking waves (Mitleton-Kelly 2003, 32-7).

Space of possibilities, adjacent possible and internal gating mechanisms: Pursuit towards the space of possibilities helps systems to discover and create new patterns of relationships and different structures. According to Kauffman (2000, 207-9; 2003), "once the catalysis in the markets is started by beneficial invention, the system will be pushed *further from equilibrium,* and therefore, there will be a more diverse space of possibilities created (stronger aim into adjacent possible). Next, due to adjacent possible and *increasing returns* in the process, there will be a necessary *bifurcation* period ahead. (…) It just may be the case that biospheres on average keep expanding into the adjacent possible. By doing so they increase the diversity of what can happen next. It may be that biospheres, as a secular trend, maximize the rate of exploration of the *adjacent possible*. If they did it too fast, they would destroy their own internal organization, so there may be *internal gating mechanisms* in ordered systems. Kauffman (ibid.) calls this an average secular trend, since the systems explore the adjacent possible as fast as they can get away with".

Co-evolution takes place when related entities change at the same time, and the change is long-term. In the short term it is more a matter of adaptation than co-evolution. In a social co-evolving ecosystem, each organisation is a fully participating agent which both influences and is influenced by the social ecosystem made up of all related business, consumers, and suppliers, as well as economic, cultural, and legal institutions. (Mitleton-Kelly 2003, 29-32.)

Historicity & time: An observer could predict which state will emerge, only chance will decide through the dynamic of fluctuations. The system will in effect scan the territory and will make a few attempts, perhaps unsuccessful at first, to stabilize. The particular fluctuation will take over. By stabilizing it the system becomes a historical object in the sense that its subsequent evolution depends on this critical choice. (Nicolis & Prigogine 1989, 72; Mitleton-Kelly 2003, 34.)

Path-dependence, *Increasing returns*, and *Self-reinforcing growth*: Increasing returns refer to the increasing pull of new technology in the markets – if there starts to be more products, more peers using them, more retailers and support services etc. around a format, a self-reinforcing growth process has been started. This entity is a process, which Arthur (1990) calls path-dependence.

> *Alongside with the ten generic characteristics of complexity, Mitleton-Kelly (2003) has pointed out five main areas of complexity research, which are either under natural sciences or social sciences. The research areas under natural sciences are: 1. Dissipative structures, chemistry-physics (e.g. Prigogine 1967; 1989); 2. Complex Adaptive Systems, evolutionary biology (Kauffman 1993; 1995); 3. Autopoiesis and Self-generation, biology/cognition (e.g. Varela and Maturana 1992); and 4. Chaos theory (e.g. Strogatz 1994; Waldrop 1992). Under social sciences she has located autopoiesis' applications to social systems (Luhmann 1990a; 1990b), the theory of path-dependence and increasing returns in economics (Arthur 1990, 1995, 2002), and strategy within complex social systems (Lane & Maxfield 1997).*

Autocatalysis: Self-production, a fundamental property of biological life, is the result of an autocatalytic cycle in which genetic material is replicated by the intervention of specific proteins, themselves synthesized through the instructions contained in the genetic material. (Nicolis & Prigogine 1989, 18.) A nuclear explosion is probably one of the most commonly known autocatalytic processes.

An *autonomous agent* is a thing that can act on its own behalf in an environment. In more detail, an autonomous agent is a thing that can reproduce itself and do at least one thermodynamic work cycle. In principle, bacterium is just a physical system - a bunch of molecules that hang together and do things to one another. However, when we think about a bacterium swimming upstream in a glucose gradient we normally say that the bacterium is going to get food. That is to say, we talk about the bacterium teleologically,

as if it were acting on its own behalf in an environment. Therefore, both bacterium and the cells in your body are busy doing work cycles all the time. Hence, all free-living organisms (except some special cases) are autonomous agents as all do work cycles and reproduce. (Kauffman 2003.)

A*utopoiesis* means self-production, self-maintenance, self-renewal, and self-definition of the existence of a system via the exclusion of areas that do not belong to the system (*autos* = self, *poiein* = to do, to produce, to maintain existence, to do again, to conceptualize). Autopoietic organisation separates itself from its environment and functions as an autonomous entity. It is a system, which self-produces all of its elements in a network interaction of the same kind of elements in its own system. Here, it reproduces its life systems, understanding and communication. Such autopoiesis is a functionally isolated self-referring process, which means that all operations in the system are explained by referring first to something outside its own sub-system, and then referring back to its own operations. Economy is an example of autopoietic organisation in a society (Luhmann 1990.) Autopoietic organisation is an organisation of a "pack of certain relations" which defines autonomous entities as separate and living unities. (Maturana & Varela 1992, 43-52.)

Bifurcation: the term stems from physics and chemistry, where it refers to a point in which the matter can no longer evolve in its path and is therefore determined to change its state into another form (see symmetry breaking and dissipative structure). Once a critical point is reached, a bifurcation offers two equivalent choices of steady state. In a critical phase transition which leads to novel non-equilibrium steady states, there may be many branching points, and at each point the options are well-defined, but the choice is determined by random fluctuations. (Nicolis & Prigogine 1989, 72.) As Ball (2004, 133) puts it, two systems that are wholly identical at the outset might end up on quite different branches while experiencing the same driving force, simply because they happened to take different paths at each junction. Thus, the new non-equilibrium steady state that is reached through critical phase transition is an arbitrary outcome of an arbitrary process. In practical terms, the bifurcation introduces history into physics and chemistry because the bifurcations are irreversible. As a loan word for futures studies it means any phase where one path can not continue and a transition period in the evolution of the issue is necessary.

Complex adaptive systems (CASs): is a dynamic network of many agents. Social systems, stock markets, ant colonies, species, individuals, firms and nations are examples of CAS. Complex adaptive systems are acting in parallel,

they are complex in that they are diverse and made up of multiple interconnected elements, and adaptive in that they have the capacity to change and learn from experience. (Kauffman 1995; Holland 1998.)

Complex evolving systems (CESs): The ten generic principles of complexity research incorporate more than the complex adaptive systems (CAS). Therefore, Mitleton-Kelly (2003, 24) has established a more appropriate term complex evolving systems (CES) to describe both the creation of new order and co-evolutions within this whole social "ecosystem".

Entropy is the measure of the disorder or randomness of energy and matter in a system (also measure of the transformation of useful energy and matter into waste).

Dissipative systems are systems that give rise to irreversible processes. Systems which have open ways to exchange energy, matter, or information with their environment are dissipative structures and which – when pushed far-from-equilibrium (driven to crisis point) – create new structures and order. Dissipative systems usually transforms their state through a cascade of bifurcations or through phase transition. (Nicolis & Prigogine 1989, 50-2.). The third possible form of transformation for a dissipative system is autopoiesis (Maturana & Varela 1992). In contrast, closed systems more likely undergo mechanically and exogenously oriented phase transition, shape transition, or complex branching of growing colony types of transformations. (Ball 2004, 90-160.)

Non-linear: A system is non-linear if its outcomes cannot be written as a linear sum of its independent components.

Symmetry breaking: When homogeneity of a current order is broken and a new pattern emerges (see bifurcation).

Laws of thermodynamics are general laws of all transformation (mechanical, organic, dynamical, social etc.). However, they can only provide a prescription for the start and end points, and remain silent of the processes that take place between. The First Law of Thermodynamics is often called the *Law of Conservation of Energy*. This law suggests that energy can be transferred from one system to another in many forms. However, it can not be *created* nor *destroyed*. Thus, the total amount of energy available in the Universe is constant. The *Second Law of Thermodynamics* states that heat can never pass spontaneously from a colder to a hotter body. As a result of this fact, natural

processes that involve energy transfer must have one direction, and all natural processes are irreversible. This law also predicts that the *entropy* of an isolated system always increases with time. Entropy is the measure of the disorder or randomness of energy and matter in a system. Because of the Second Law of Thermodynamics, both energy and matter in the Universe are becoming less useful as time goes on. Perfect order existed in the universe only the instance after the Big Bang when energy and matter and all of the forces of the universe were unified. (further definition in Kuosa (2007a)

Appendix B: Chaos and Dynamical organisation terminology

Chaos theory describes non-linear dynamics based on the iteration of either a mathematical algorithm or a set of simple rules of interaction, both of which can give rise to extraordinarily intricate behaviour such as the intricate beauty of fractals or the turbulence of a river (Mitleton-Kelly 2003, 43).Whereas complexity theory attempts to explain how order emerges out of chaos, chaos theory focuses on the opposite logic of the same phenomena, how ever-shifting deterministic systems rapidly cease to be precisely predictable even if their initial conditions are known in great detail. In other words, how chaos emerges out of deterministic linearity, or how total randomness suddenly emerges out of total predictability (e.g. Strogatz 1994; Waldrop 1992). One of the earliest pioneers of the chaos theory was Edward Lorenz whose interest in chaos came about accidentally through his work on computer based weather prediction in 1961. Lorenz wanted to see a sequence of weather prediction data again and to save time he started the simulation in the middle of its course. To his surprise the weather that the machine began to predict was completely different from the weather calculated before. As a conclusion of the work, Lorenz (1963) had discovered both, that small changes in the initial conditions produced large changes in the long-term outcome of the weather, and that such chaos is not just a system malfunction but its normal state. Thus, weather and many other systems, such as market economy or stock markets, are constantly chaotic dynamical systems. Another important pioneer of chaos theory was Benoit Mandelbrot (1977) who discovered the fractal nature of many structures and systems. The theory of fractals means that inside a system the same geometric shape can be found within the system at different levels, i.e. that the patterns of a system repeat themselves at the micro level, at the macro level, and in all levels between. The most well known examples of fractals from the nature are snowflakes, river networks and coastlines. Thus, chaotic systems can also be bounded which means that they can have clearly defined structures as the fractals show (ibid.). As the outcomes of chaotic systems are totally indeterministic, the branch of mathematics which deals with the long-term qualitative behaviour of such (hyperbolic) dynamical systems does not attempt to answer precisely which points converge the orbit towards stable manifold or which points diverge from it. It merely attempts to answer questions like: "Will the dynamic system settle down to a steady state in the long term, and if so, what are the possible attractors?"

Attractor: The discovery and explanation of the attractors of a dynamical system has been one of the key achievements of chaos theory. An attractor itself is a centre mass or a point which starts to generate certain types of trajectories or orbits to a dynamical system. After a long enough time, the trajectories around the attractors remain close even if slightly disturbed. Two simple attractors are the fixed point and the limit cycle[32]. A *fixed point* is a point that a system evolves towards, such as the final states of a falling pebble, a damped pendulum, or the water in a glass. It corresponds to a fixed point of the evolution function that is attracting. A *limit cycle* is a periodic orbit of the system that is isolated. In phase space of the ideal pendulum, each point of a periodic orbit is close to another point that belongs to a different periodic orbit. There can be many other geometrical sets such as limit tori, a curve, a manifold, or even a complicated set with a fractal structure. Attractors that are hard to describe and that consist of great detail and complexity arise from chaotic motion and are known as *strange attractor*s. The *Lorenz attractor* which explains the unpredictability of the weather is "perhaps one of the best-known chaotic system diagrams, probably because not only was it one of the first, but it is one of the most complex and as such gives rise to a very interesting pattern which looks like the wings of a butterfly (…) An easy way to visualize (such) a chaotic attractor is to start with a point in the basin of attraction of the attractor, and then simply plot its subsequent orbit. Because of the topological transitivity condition, this is likely to produce a picture of the entire final attractor". (ibid.) As an example, the attractors which may generate a hurricane or a storm in the nature's dissipative dynamical process are e.g. topographical points in the ground, and changes or differences in local moisture and heat.

Trajectory is the path that a moving object follows through space. It thus includes the meaning of orbit - the path of a planet, an asteroid or a comet as it travels around a central mass or an attractor. A trajectory can be described mathematically either by the geometry of the path, or as the position of the object over time. In a dynamical system, the trajectory may be periodic or chaotic or of any other type, and it does not have to satisfy any special constraints of the system except for remaining on the attractor. In control theory trajectory is a time-ordered set of states of a dynamical system.

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[32] See the figures and descriptions of an attractor and a strange attractor in http://en.wikipedia.org/wiki/Attractor, in http://en.wikipedia.org/wiki/Chaos_theory, and in http://en.wikipedia.org/wiki/Image:Lorenz_attractor_yb.svg

Dynamical organisation: Dynamical systems vary from linear dynamical systems such as a pendulum which generates periodic orbits, to dynamic systems which are fully chaotic everywhere. According to Hasselblatt and Anatole (2003), a dynamical system must have the following properties in order to be defined fully chaotic: It must constantly be sensitive to initial conditions, it must be topologically mixing, and its periodic orbits must be dense. However, in most cases the chaotic behaviour is found only in a subset of the phase space of a dynamical system. In other words, usually only local chaotic processes exist inside a dynamical system. Yet, all non-linear dynamical systems are unpredictable due to their at least occasionally occurring endogenous sensitivity to initial conditions, and due to their attractors which lead to trajectories or orbits that converge to chaotic region. All living systems and all complex systems are not necessarily dynamical (Ståhle 1998). However, most living systems living far from equilibrium are sometimes dynamical or they have parts that undergo dynamical or chaotic processes, or they are sometimes interconnected to such processes (c.f. Kauffman 1995). The difference between dynamical, organic, and mechanical systems in organizational context is discussed in Chapter 2.1 – see also the concept transformation.

Self-organized criticality (SOC): Many composite systems naturally evolve to a critical state in which a minor event starts a chain reaction that can affect any number of elements in the system. Self-organised criticality is a holistic theory: the global features, such as the relativistic number of large and small events, do not depend on the microscopic mechanisms. Consequently, global features of the system cannot be understood by analysing the parts separately. SOC has led to a holistic theory for dynamic systems. (Bak & Chen 1991, 26.) Usually, when we have to explain e.g. the crash of the stock market, we try to find a number of factors that combined to cause it, often with the hope of showing that the changes of the same combination of factors occurring again are slim. This kind of analysis, however, is the result of trying to explain the behaviour of large complex systems by extrapolating from the behaviour of small, simple systems. Unfortunately this extrapolation fails. Thus, any analysis that ignores the possibility of self-organising behaviour by a complex system will be seriously lacking in explanation power. (Cilliers 1998, 96)

Appendix C: Transformation, social studies and futures research
terminology

*The list of complexity and chaos research concepts can be continued with
the following more general interdisciplinary concepts which have been
emphasized and discussed especially in an article by Kuosa (2005a)[33].*

Transformation: In the context of this thesis, transformation is understood as
something that is contrary to full equilibrium. It is a macro concept consisting
of everything that is related to change. Therefore, concepts like development,
emergence, immergence, dissipation, collapse, growth, demolition,
destruction, symmetry breaking, self-organization, phase transition, non-
equilibrium bifurcations, shape transition, complex branching of growing
colony etc. are all subordinate to it. Complex, chaotic and dynamic structures
are in a constant endogenous transformation, and they undergo non-
equilibrium bifurcations as they are far-from-equilibrium systems. Structures
and organisations that are in equilibrium are less likely to go through critical
endogenous transformation. Such structures more likely undergo mechanically
and exogenously oriented phase transition, shape transition, complex
branching of growing colony types of transformations. (Ball 2004, 90-160.)
"However, the equilibrium and non-equilibrium transformations have some
features in common. They are both collective models of behaviour arising
from the mutual, local interaction of many individual components. There are
conditions both in equilibrium and away from it for which these interactions
can make one part of a system almost miraculously sensitive to what is
happening far away. Every particle is suddenly in touch with all the others via
intricate networks of mutual nudges – and all at once, a new steady state
emerges" (ibid, 135).

Utopian thinking is a viable addition to analogous diachronic thinking,
because it disregards risks, wars, crime and the misuse of power. This is due to
the fact that utopia thinking argues that there have always been undesirable
and negative phenomena in the world, but that these entities have never
determined the development of the society as people have always found ways
to keep those phenomena under control. Thus, they argue why should we
expect undesirable events to be significant in the future? However, in utopian
thinking it is held vital that a good quality of life and its desired contents can

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[33] Concepts that can be considered as common knowledge, or that are presented elsewhere, are not
defined here.

be made real by human action. This is based on a utopia that has been envisioned but not yet made into reality. (Malaska 1983, 10.)

Linear railway thinking has been one of the most commonly used approaches for describing and justifying future scenarios. The main idea here is that a desirable course of events in one country will be repeated in other countries in due course. Development is likened to a railway track, along which nations move one behind the other at differing time intervals. It also means that the past development of one country is expected to resemble another's future. (Malaska 1991a, 154)

The Trend approach applies all statistical and mathematical methods regardless of their degree of complexity. The trend mode of thinking is based on a known and invariable pattern. A trend refers not only to something that can be revealed by statistical calculation; it also encompasses qualitative phenomena, which may be regarded as unchanged, or as changing in the same way as in the past. (ibid.) Trend-analysis is described by Glenn and Gordon (2003).

Scenario thinking was first used in futures studies in the 1950's but it was not until the 1970's, through the scenario-based works of Kahn and Wiener (1967), and Kahn, Brown and Martel (1976), that it became the most important tool for creating images or maps of the future. It is basically an intuitive approach for hypothesis setting but its advantage lies in possessing all the quantitative tools that are used for generating alternative scenarios / multi-step-paths of the future. A practical case of scenario approach is presented in Chapter 4.2.

Delphi-method originates from the ancient Greek city of Delphi, located by the mountain of Parnassos. In Delphi, the Pythias, known as oracles of Delphi, gave predictions basing on their interpretations of Apollo's messages. The method was reinvented in RAND-corporation in 1950's, where it was used for secret technology foresight for the purposes of the US military. Nowadays, the method attempts to locate expert opinions according to a procedure which is anonym, iterative, cumulative and provides feedback. (Kuusi 1999). Disaggregative Policy Delphi is a modern application of the method (Tapio 2002).

Weak signal refers to any (identifiable) observation of the current surrounding world which someone has subjectively reasoned to have some special foresight value. It bases on subjective interpretations and tacit knowledge of

something. Weak signal is a thing that helps us to manage the patterns of change. Any pattern of change which emerges will certainly signal in many ways and one usually should not rely on one signal in attempts to reason something. The weak signals function in many layers. Weak signals identified very early give information on something that might possibly start affecting something which could eventually have a significant effect. Signals identified very late are direct observations of something that gives us a good reason to believe that there will be a direct causal effect following that observation. (e.g. we know that an aeroplane is high jacked by a terrorist and the aeroplane is heading towards New York).

Wild card is an invented idea of some kind of an (sudden) and unexpected event which would definitely have strong impacts to large parts of a society. Wild card is a wild guess which goes beyond the current change / transition period. When the (dynamical) system is very sensitive to initial conditions it is almost expectable that one small event will sooner or later start a chain reaction / turbulence in the system. Wild card is a statement of such candidate initial conditions.

Six pillars meta-framework integrates and builds on a variety of futures studies' concepts, ways of thinking and techniques and integrates them into a new approach, which aims to promote people to recover their agency, and help them to create the world in which they wish to live.

Causal Layered Analysis (CLA) attempts to deepen the future by exploring the different levels of an issue or problem bringing the many discourses that create the real.

Four-quadrant mapping method attempts to deepen the future by developing inner dimensions for the CLA.

Backcasting method bases on the imagination of the desired state of the future. Once the future is imagined, one attempt to set the milestones that must have been passed in order to reach the preferred future. Once the milestones are set, the process moves towards strategies and timelines.

Futures wheel attempts to reveal the interrelations, path-dependences and co-effects related to a certain phenomena.

Environmental scanning describes a process where the operational environment of an organisation is systematically scanned for relevant

information. The purpose is to identify the early signals of positive environmental change and to detect environmental change already underway. Environmental scanning can be divided into two approaches. The outside-in approach attempts to scan the entire operational landscape in order to avoid blind spots. However, this approach is easily hindered by the problem of information overflow. The other approach of environmental scanning is inside-out, which limits the number of fields of interest and the amount of information gathered, but carries the danger of enhancing blind spots by limiting the focus of the organisation. (Schwarz 2006, 17).

Issue management attempts to identify and monitor social, technological, political and economic forces and trends, to interpret and define implications and opinions and finally to set strategic action in order to deal with the situation (Masini 1993, 105).

Strategic early warning system is a process that is divided into three main phases. The first main phase consists of the gathering of information, where all relevant weak signals, trends and issues are collected. It is followed by the second main phase, diagnosis, which is characterized by three steps. The first step contains an in-depth analysis of the core of the trends and their potential change and an analysis of the various contexts of the phenomena. The second step includes the selection and clustering of the most relevant trends and issues. The third step of the diagnosis phase consists of the identification and selection of trends and issues that are particularly relevant. Finally, the third main phase formulates an appropriate strategy to react to the relevant trends and issues. (Schwarz 2006, 18-19). One possible example of a large international strategic early warning system is the Risk Assessment and Horizon Scanning system (RAHS) coordinated by the government of Singapore.

Pattern management (PM) is a fairly new concept. One of the first developments was created by Kamran Parsaye (1999). He drew a line between Data management and Pattern management. According to Parsaye, when recent data is put into the operational system and merged with historical data gathered over time, we have Data management. When all this data analysed over time is merged with historical *patterns,* we have Pattern management. Thus, PM is not knowledge management, data mining or the construction of knowledge-based systems. PM deals with patterns after they have been discovered by data mining. Parsaye provides a simple analogy: "consider data as grapes and patterns of knowledge as wine. Data mining is then the wine-

making process, (…) and the data mining tools are like wine-making equipment".

Synthesis and development dynamics: In Malaska's methodology, the development dynamics are influenced by Hegelian thinking, in which societal development is seen as a process in which a current societal path is questioned by the obstacles and problems that arise and are seen in its trends (an anti-thesis). Then alternative courses of development that are unfolding in a transition period are outlined by diachronic, utopian, or dystopian thinking (a synthesis). In this approach current development dynamics are seen as the creators of the current situation, where thesis and anti-thesis appear, and simultaneously as the creators of the tools to construct the synthesis that will dictate future societal development. This theory puts forward the argument that there is always a crisis, called a transition period (e.g. bifurcation) between two distinct linked phases of development. Malaska 1991a, 154.) In addition, the development dynamic of a society is assumed to grow and evolve until it has used all of its available development potential and starts to degenerate due to the action of the problems and contradictions that arose in its formation (Malaska emphasises the law of entropy here). To be able to regenerate itself, the societal form in question has to realise the limits of its continued existence. (Malaska 2003b, ibid.)

Modernity: Among modernity theorists (see Giddens 1990, 1991, Habermas 1987; Wilenius 1997; Berger et al. 1974 etc.) there is no such thing as modern society; only societies more or less advanced in the continuum of modernisation. Thus, modernisation is a process which has a beginning and criteria for its advancement but no predictable end. Advancement is seen as being driven by formative forces – as a process of rationalisation where technology drives economic growth and development. (Berger et al. 1974, 9.) See the modelling of theories of societal transformation in Figure 5 in Chapter 4.1.

Post-modernity: Its common denominator is the idea of discontinuity between the eras of modernity and post-modernity. There is no linear development and no general expansion of modern goods and ideas, but increased relativism, ambivalence, contingency and qualitative diversity in all areas of society. (Scott 1997, 3-6; Latour 1993; Bauman 1998; Bell 1974; Ritzer 1995 and 1998.) Ultimately, there is the fragmentation of ideas into smaller units (for instance female emancipation and specified environmental issues), that have little in common. Compare to information society platform in Chapter 3.1.3

(see the definition of post-modern society by Cilliers (1998) from the previous paragraphs as well).

Reflexive Modernisation: Its main idea is that modernisation continues a forward path but that the transition from one era to another is also continuous. This transition does not happen in the traditional way (crisis - transition period – revolution), but follows a smooth modern path: wished for and known. It should not be understood as the same thing as post-modernisation, because postmodernists insist that all the structures of modern society will collapse as the modern era ends. Contrary to this, reflexive modernists raise the questions: What is about to begin? What kinds of new institutions and social categories will take the place of the old? (Beck, Giddens, Lash 1994.)

Appendix D: FFSF in Liberal education and competence in labour markets 2030 project

The current version of FSSF has recently been piloted in a project called *Liberal education and competence in labour markets 2030 – The roadmap to the future's success* (Aalto, Ahokas & Kuosa 2007 and 2008). The project was funded by Finland's Ministry of Education from ESF's third objective programme, and it was executed during the period of 1 August 2006 - 31 January 2008. The empirical core of the research was a Futures barometer of national education and learning. The objective of the barometer was to evaluate the short and long-term effects of selected trends, and to map the respondent opinions of probable and wished-for futures of education. The barometer was carried out through a Delphi study. In February 2007, an e-questionnaire was sent to 268 experts or stakeholders of national competence needs or national education system. A total of 113 experts or stakeholders provided answers, raising the response percentage to 42%.

The outcome of the Delphi study was analysed through three different methods. The first method was the traditional Excel-based analysis. Secondly, the answers were analysed with Causal Layered Analysis (CLA) and thirdly with FSSF.

The FSSF analysis contained three phases. In the first phase, the material was read and the most interesting pieces were selected. Then the pieces of information were tested and "sense-made" in accordance with the principles of the six categories of FSSF. The outcome of this second phase was reported separately. Once the most interesting aspects related to the futures education, learning and competence needs were identified and categorised according to the six categories, a clustering process was started. The first objective of this clustering process was to identify the main themes from the answers, which was continued with an emerging patterns managing process.

The themes that were constantly repeated in various different forms in the answers were:

- If the nationally guaranteed equality in education is terminated, if the qualification studies are no longer free of charge, and if the national value change turns towards hard values, this represents a threat to Finland's schooling system as a whole.
- The foundations of education, personal development, equality and basic funding of education must be guaranteed.
- The competence needs of labour markets must be guaranteed.

- Free education leads to stagnation, whereas paid education promotes development in education.
- There is a threat of losing national competitiveness and national competence due to national stagnation (caused by forced equality).
- Individuals' better learning and teaching endeavours should be encouraged also economically. Real know-how should be emphasized over the old titles.
- There should be real solutions for life-long learning – flexibility, motivation and assessing as well as accepting earlier learned skills and knowledge are needed.
- The structures of the schooling system should be renewed.
- The threats that are related to structural change.
- The underlying educational and personal strengths should be found and utilised nationally.
- There are both problems and benefits related to Finland's dual model (where universities and polytechnics/universities of applied sciences are strictly separated), and to Finland's national policy, which attempts to spread all levels of education to all areas of the country.

The final phase of the process was the management of emerging patterns from the six categories of FSSF. As an outcome of this process, two emerging patterns were identified:

1. A paradigm shift in education in Finland is already underway. The "one-time-event degree" paradigm will be replaced with a life-long learning paradigm. All answers and arguments provide information that supports this conclusion. Experts seem to be unanimous in thinking that the current path will be changed or replaced by something new quite soon, but there are no unanimous visions of what is to come. Flexibility, personalisation, modularity, assessing and accepting earlier learned skills and knowledge, acceptance of constant change and social media, etc., are all elements that are emerging and driving the overall paradigm shift.

2. There are two obvious value-driven general groups in the educational discussion. A) emphasisers of equality and liberal education, B) emphasisers of competitiveness and competence. Usually all arguments and practical suggestions that are presented can be derived from either of these two basic values. However, on the individual level, some people may suggest or express opinions which have both elements at the same time. In this sense, the discussion around the future of

education seems to be full of contradictions, dichotomies and paradoxes yet to be solved.

To conclude, the use of FSSF as the fist analysis tool to gather futures research material can be seen to have three benefits. Firstly, it helps to identify novelty and to separate relevant futures knowledge of a certain theme from what is irrelevant. Secondly, one obtains an easy-to-use list of futures knowledge which is balanced between different levels of knowledge. In the list, tacit knowledge, interpretations, beliefs, pre-understanding, pulling drivers, pushing drivers, formal knowledge and underlying factors, etc., are all represented, considered and "sense-made" through the theme under research. Thirdly, the use of FSSF forces one to consider the very basic ontological and epistemological dimensions as well as causalities of the theme under research. At least one obtains some kind of idea of the possible causalities, and is able to clarify his own understanding of the latter.

As already mentioned, the FSSF analysis and sense-making framework is meant to be the first research tool for any (qualitative) futures oriented research material. It can be used as a knowledge management tool as such, but it can also be used as a first step in the third paradigm's pattern management process, or it can be attached to the mapping part of the six pillars: futures thinking for transforming.

REFERENCES

Aalto, Hanna-Kaisa, Ahokas, Ira & Kuosa, Tuomo (2007) Liberal education and competence in labour markets 2030 – The roadmap to the future's success, Interim report (in Finnish). *TUTU-eJulkaisuja* 3/2007, Finland Futures Research Centre, Turku School of Economics.

Aalto, Hanna-Kaisa, Ahokas, Ira & Kuosa, Tuomo (2008) Liberal education and competence in labour markets 2030 – The roadmap to the future's success, Final report (in Finnish). *TUTU-Julkaisuja* 1/2008, Finland Futures Research Centre, Turku School of Economics.

Aaltonen, Mika (ed.) (2007) *The Third Lens. Multi-ontology, Sense-making and Strategic Decision-making*. London, Ashgate Publishing Ltd.

Aaltonen, Mika (2007) The Return to Multi-Causality. *Journal of Futures Studies* 12(1), 81-86.

Aaltonen, Mika & Sanders, T. Irene (2006): Identifying Systems: New Initial Conditions as Influence Points for the Future. *Foresight.* Vol. 8, No. 3. ISSN 1463-6689, pp. 28−35.

Aaltonen, Mika (2003) Allowing Complexity Into the Puzzle of Strategic Sensemaking. In Auli Keskinen, Mika Aaltonen & Eve Mitleton-Kelly: *Organizational Complexity*. Turku School of Economics, FUTU-publications.

Albrow, Martin (1997) *The Global Age: State and society beyond modernity*. Stanford, CA: Stanford University Press.

Amara, Roy (1984) New directions for futures research: Setting the stage. *Futures*, Vol. 36, No:s 1-2. ISSN 0016-3287, pp. 43-47.

Amara, Roy (1981) The Futures Field: Searching for Definitions and Boundaries. *The Futurist,* Vol. 15, Feb. pp. 25-9.

Ansoff, Igor H. (1975) Managing strategic surprise by response to weak signals. *California Management Review* XVIII (2).

Armstrong, J. Scott (ed.) (2001) *Principles of Forecasting: A Handbook for Researchers and Practitioners*. New York, Springer

Artuhur, Brian W. (1990) Positive feedbacks in economy. *Scientific American*, February.

Artuhur, Brian W. (2002) Is the information revolution over? If history is a guide, it is not. *Business 2.0*, March.

Autio, Minna & Wilska, Terhi-Anna (2005) Young People in Knowledge Society: Possibilities to Fulfil Ecological Goals. *Progress in Industrial Ecology – An International Journal,* Vol. 2, Nos. 3/4, 403-426.

Axford, Barry (1996) *The Global System: Economics, politics and culture*. Cornwall, Polity Press.

Bainbridge, W. S. (2002) The future in the social sciences. *Futures*, Vol. 35. 633-650.

Bak, Per & Chen, Kan (1991) Self-organised Criticality. *Scientific American*, January, pp. 26-33.

Ball, Phillip (2004) *Critical Mass: How One Thing Leads to Another*. New York, Farrar, Straus and Giroux. 528 pages.

Barabasi, Albert-Laszlo (2003) *Linked: How everything is connected to everything else and what it means for business, science, and everything*. New York, Plume.

Barber, Benjamin R. (1995) *Jihad VS. Mcworld: How Globalisim, Tribalism Are Re-Shaping the World*. New York: Random House.

Barber, Benjamin R. (1984) *Strong democracy*. Los Angeles, CA, Berkley.

Bauman, Zygmunt (1998) *Postmodernity and its Discontents*. Cambridge: Polity Press.

Beck, Ulrich (1986) *Risikogesellschaft. Auf dem Weg in Eine andere Moderne*. Frankfurt am Maine, Suhrkamp.

Beck, Ulrich (1999) Cosmopolitic perspective: About second modern's sociology [in Finnish]. *Tiede ja Edistys* 3/1999.

Beck, Ulrich; Giddens, Anthony & Scott, L. (1994): *Reflexive Modernization: Politics, Tradition and Aesthetics in the Modern Social Order*. Cambridge, Polity Press.

Becker, Ted (1981) Televote. Measuring public opinion on complex policy issues. *Political Science 33* (1, July).

Becker, Ted (1995) Etä-äänestämisestä teledemokratiaan —kokemuksia USA: sta ja Kanadasta. In A. Keskinen (Ed.) & Interaction Group: *Teledemokratia – tietoverkot ja yhteiskunta*, SILTA-sarja, Painatuskeskus Oy, Helsinki.

Becker, Ted, & Slaton, Christa D. (1981) Hawaii Televote: Measuring public opinion on complex policy issues. *Political Science* (NZ).

Becker, Ted & Slaton, Christa D. (1997) *Transforming modern representative democracy via advanced telecommunications. Voting from the home. Deliberative polling.Electronic town meetings. The Internet*. FUTU Publications, 7/97, Finland Futures Research Centre, Turku School of Economics and Business Administration.

Available at *h t t p : / / w w w . t u k k k . f i / t u t u / J u l k a i s u t / f u t u /FUTU_7_97.pdf*

Becker, Ted & Slaton, Christa D. (2000) *The future of teledemocracy*. Westport, CT: Praeger.

Bell, Wendell (2005) *Foundations of Futures Studies: Human science for a new era.* Vol. 2: Values, objectivity, and good society. New Brunswichk, NJ, Transaction Publishers.

Bell, Daniel (1974) *The Coming of the Post-Industrial Society*. London, Heinemann.

Berg, Bruce L. (2001) *Qualitative Research Methods for the Social Sciences*. 4th Edition, Boston, Allyn and Bacon.

Berger, P. & Kellner B. H. (1974) *The Homeless Mind: Modernization and Consciousness*. New York, Random House.

Blum Harold F. (1968) *Time's Arrow and Evolution*. Princeton, Princeton University Press, ISBN-13 978-0691023540.

Borg, Olavi (2003) The Relationship between Futures Research and Other Disciplines and Fields of Knowledge. In: M. Vapaavuori and S. von Bruun, *How We Research the Futures* [in Finnish]? Acta Futura Fennica No 5. Helsinki, Vapk-kustannus, ISBN 951-98852-1-8, pp. 303-313.

Boulding, Elise & Boulding, K. (1995) *The Future: Images and Processes*. London, Sage.

Bryman, Alan (2004) *Social Research Methods*. 2nd Edition, New York, Oxford University Press.

Carson, Rafael (1962) *Silent Spring*. Boston, Houghton Mifflin Company.

Castells, Manuel (1996) *The Information Age: Economy, Society and Culture*, *The Rise of the Network Society*. Malden, Massachusetts, Blackwell Publishers, Vol. 1.

Castells, Manuel (1997) *The Information Age: Economy, Society and Culture*, *The Power of Identity*. Malden, Massachusetts, Blackwell Publishers, Vol. 2.

Castells, Manuel (1998) *The Information Age: Economy, Society and Culture*, *End of Millenium*. Malden, Massachusetts, Blackwell Publishers, Vol. 3.

Casti, L. John (2000) *Five more Golden Rules: Knots, Codes, Chaos, and Other Great Theories of 20th-Century Mathematics*. New York, John Wiley and Sons, Inc.

Castronova, Edward (2008) A Test of the Law of Demand in a Virtual World: Exploring the Petri Dish Approach to Social Science. *CESifo Working Paper Series No. 2355*, July 2008

Chackland, Peter (1985) *Systems Thinking, Systems Practice*. Bath, Avon, John Wiley & Sons, Pitman Press.

Cilliers, Paul (1998) *Complexity and Postmodernism: Understanding Complex Systems.* New York, Routledge.

Coates, J., Mahaffie, J. and Hines, A. (1997) *2025 Scenarios of US and Global Society Reshaped by Science and Technology*. Greensboro, Oakhill Press.

Collins, Jim (2001): *Good to Great: Why Some Companies Make the Leap… and Others Don't.* New York, Collins, ISBN 978-0066620992, 300 pages.

Concise Oxford English Dictionary (2002) 10th Edition, Judy Pearsall (ed.), New York, Oxford University Press.

Cresswell, John W. (2003) *Research design: Qualitative, Quantitative, and Mixed Methods Approaches*. 2nd Edition, CA, SAGE, Thousand Oaks.

Cvetkovich, Ann & Kellner, Douglas (1997) "Introduction" Thinking Global and Local. In Ann Cvetkovich and Douglas Kellner (eds.): *Articulating the Global and the Local: Globalization and Cultural Studies*. Boulder, Colorado, Westview Press.

Danzin, André (1985) Complexities: Introduction to the scientific seminar on complexities. Helsinki Conference of the Club of Rome. In Vuokko Jarva (ed.) *Managing Global Issues: Reasons for Encouragement*. Lahti, pp. 154-155.

Dator, Jim & Yongseok, Seo (2004): Korea as the Way of a Future: The Emerging Dream Society of Icons and Aesthetic Experience. *Journal of Futures Studies* 9(1). ISSN 1027-6084, pp. 31-44.

Dator, Jim (1986) The Future of Futures Studies: The View from Hawaii. *Futures*, Vol. 18, No. 3, 440-445.

Dawkins, Richard (2006) *The God Delusion*. London, Bantam Press.

Denzin, Norman K. (1978) *The Research Act*. New York, McGraw-Hill.

Diamond, Jared (2005) Collapse: *How Societies Choose to Fail or Succeed?* New York, Brockman Inc.

Diamond, Jared (2003) *Guns, Germs, and Steel: The Fates of Human Societies* (Finnish edition). Helsinki, Terra Cognita oy.

Durkheim, Emil (1912) *Les formes élementaires de la vie religieuse: Le systéme tetémique en Australie*. Presses Universitaires de France.

Fairclough, Norman (1992) *Discourse and Social Change*. Cambridge, Polity Press.

Flechtheim, Ossip K. (1972) *Futurologie*. In Historisches Wörterbuch der Philosophie. Basel, Schwabe & Co Verlag, 1150–1152.

Florida, Richard (2002) *The Rise of the Creative Class – and How It's Transforming Work, Leisure, Community and Everyday Life*. New York, Basic Books.

Foreman-Wernet, Lois (2003) Rethinking Communication. In Brenda Dervin, Lois Foreman-Wernet and Eric Lauterbach (eds): *Sense-Making Methodology Reader*. New Jersey, Hampton Press Inc.

Galtung, Johan & Inayatullah, Sohail (1997) *Macrohistory and Macrohistorians*. Westport, Ct., Praeger.

Giddens, Anthony (1990) *The Consequences of Modernity*. Cambridge, Polity Press.

Giddens, Anthony (1991) *Modernity and Self-Identity*. Cambridge, Polity Press.

Gladwell, Malcolm (2000) *The Tipping Point: How little Things Can Make a Big Difference*. New York, Little Brown.

Glenn, Jeremy C. & Gordon, Theodor J. (2003) *Futures Research Methodologies* – V2.0. AC/UNU.

Glenn, Jeremy C. & Gordon, Theodor J. (2004) '2004 state of the future: the millennium project', *CD-rom*, *Normative Scenario for the Year 2050*, Washington, USA: American Council of the United Nations University (UNU), 23 pages.

Godet, Michel (1993) *From Anticipation to Action: A Handbook of Strategic Prospective*. Unesco Publishing.

Godet, Michel ; Monti, Régine, Meunier, Franci & Robelat, Fabrice (2000) *Scenarios and Strategies : A Toolbox for Scenario Planning*. Paris, Cahiers du LIPS, LIPS Working Papers.

Gordon, Theodor J. (1989) *Futures Research: Did it Meet its Promise? Can it Meet its promise?* Technological Forecasting and Social Change, Vol. 36, No. 1-2, 21-26.

Habermas, Jürgen (1987): *The Philosophical Discourse of Modernity*. Cambridge, The MIT Press.

Habermas, Jürgen (1986) [1972] *Knowledge and Human Interests*. London, Polity Press.

Habermas, Jürgen (1984) The Theory of Communicative Action. Volume 1: *Reason and the Rationalization of Society*, Boston, Beacon Press.

Hammersley, Martin (1996) The Relationship Between Qualitative and Quantitative Research: Paradigms Loyalty Versus Methodological Eclecticism. In J.T.E Richardson (ed.): *Handbook of research methods for psychology and the social sciences*. Leicester, BPS Books.

Hasselblatt, Boris & Anatole Katok (2003) *A First Course in Dynamics: With a Panorama of Recent Developments*. Cambridge University Press.

Heinonen, Sirkka & Kuosa, Tuomo (2005) Ecological Realities of Telework in Four Different Futures - Living, Working and Travelling in New Knowledge-Intensive Communities. Inderscience Publishers Double Special issue. *Progress in Industrial Ecology – An International Journal (PIE),* Vol. 2, Nos. 3/4, 2005, 329-357.

Heinonen, Sirkka (2004) Mobile telework at the crossroads of social, environmental and cultural challenges, *The 9th International Telework Workshop*, International Telework Academy ITA, Crete, Greece, 6–9 September, 9 pages.

Heinonen, Sirkka, Huhdanmäki, Aimo, Kuosa, Tuomo & Niskanen, Saila (2004) *Eco-managed Telework. A New Deal between Housing, Work and Mobility in Urban Form*, [in Finnish with abstracts in Swedish and English], Helsinki: Ministry of the Environment, The Finnish Environment 701, 232 pages.

Heinonen, Sirkka & Lahti, Pekka (2002) Sustainable, competitive or good cities – bake a cake or make a fake? *Futura*, Vol. 2, No. 2, 09–121.

Heinonen, Sirkka (1999) *Prometheus Revisited: Human Interaction with Nature Through Technology in Seneca*. Helsinki, Yliopistopaino.

Heinonen, Sirkka (1990) Time and Future in the Production of Seneca (*Aika ja tulevaisuus Sencan tuotannossa* in Finnish). Helsinki, Acta Futura Fennica No. 1. Vapk-kustannus.

Held, David (1987) *Models of democracy*. Cambridge, Polity Press.

Hideg, Eva (2002) Implications of two new paradigms for futures studies. *Futures*, Vol. 36, 283-294.

Hiltunen, Elina (2006) Was It a Wild Card or just our Blindness to Gradual Change? *Journal of Future Studies*, 11(2), 61–74.

Hiltunen, Elina (2007) A Future Sign and its Three Dimensions. *Futures,* Vol. 40, 247-260.

Hodgson, Geoffrey M. (2001) Is Social Evolution Lamarckian or Darwinian? In: John Laurent & John Nightingale (Eds.) *Darwinism and Evolutionary Economics*. Cheltenham, Edward Elgar.

Holland, John H. (1998) *Emergence: From Chaos to Order*. New York, Oxford University Press.

Ilmola, Leena & Kuusi, Osmo (2006) Filters of weak signals hinder foresight: Monitoring weak signals efficiently in corporate decision-making. *Futures*, Vol. 38, 2006.

Inayatullah, Sohail (2008) Six pillars: Futures thinking for transforming. *Foresight*, Vol. 10 No. 1, 4-12.

Inayatullah, Sohail (2004) "Introduction" Macrohistory and the Future. *Journal of Futures Studies* 9(1). ISSN 1027-6084, 1-2.

Inayatullah, Sohail (2002) Reductionism or layered complexity? The futures of futures studies. *Futures*, Vol. 34, ISSN 0016-3287, 295-302.

Inayatullah, Sohail (1998a) Macrohistory and the futures studies. *Futures*, Vol. 30, ISSN 0016-3287, 381-394.

Inayatullah, Sohail (1998b) Causal Layered Analysis: Poststructuralism as method. *Futures*, Vol. 30, No. 8, ISSN 0016-3287, 815–829.

Inayatullah, Sohail (1990) Deconstructing and Reconstructing the Future: Predictive, Cultural and Critical Epistemologies. *Futures*, Vol. 22, No. 2, ISSN 0016-3287, pp. 115-141.

Jensen, Rolf (1999) *The Dream Society. How the Coming Shift from Information to Imagination will Transform your Business*, New York, 242 pages.

Jensen, Rolf (2003) *Heartstorm, The Dream Society 2*. Kopenhagen: Jyllands-Postens Erhvervsbogklub.

Jick, Todd D. (1979) Mixing Qualitative and Quantitative Methods: Triangulation in Action. *Administrative Science Quarterly*, Vol. 24, No. 4, 602-611.

Johnson, Burke & Christensen, Larry (2004) *Educational Research: Quantitative, and Mixed Methods Approaches*. 2nd Edition, New York, Pearson Education inc.

Johnson, Steven (2001) *Emergence: The Connected Lives of Ants, Brains, Cities, and Software*. New York, Scribner.

Johansson, Frans (2004) *The Medici Effect: Breakthrough Insights at the Intersections of Ideas, Concepts and Cultures*. Harward Business School Press.

Jouvenel, Bertrand de (1967) *The Art of Conjecture*. New York, Basic Books.

Judge, Anthony (2004) Engaging Macrohistory through the Present Moment. *Journal of Futures Studies* 9(1), 3-12.

Kahn, Herman; Brown, William & Martel, Leon (1976) *The Next 200 Years. A Scenario for America and the World*. New York, Morrow.

Kahn, Herman & Wiener, Anthony J. (1967) *The Year 2000: The Framework for Speculation on the Next Thirty-three Years*. New York, Macmillan.

Kauffman, Stuart (1995) *At Home in the Universe: The Search for the Laws of Self- Organization and Complexity*. New York, Oxford University Press, ISBN-13 978-0195111309.

Kauffman, Stuart (2000) *Investigations*. New York, Oxford University Press, ISBN 0-19-512104-x

Kauffman, Stuart (2003) *The Adjacent Possible*. www.edge.org, edited by John Brockman, 11.3.03, http://www.edge.org/3rd_culture/kauffman03/kauffman_index.html

Keskinen, Auli & Kuosa, Tuomo (2006) Foundation of Citizen-Oriented E-Governance Model. *Encyclopedia of Digital Government*. Volume II. E-H. Section: E-Democracy / Category: Forms of Participatory E-Democracy. Eds. Ari-Veikko Anttiroiko and Matti Mälkiä. http://www.uta.fi/laitokset/ISI/EnDigG/ UTA/ISI, Idea-group Reference www.idea-group-ref.com, USA, 2006, 833-840.

Keskinen, Auli & Kuosa, Tuomo (2005) Citizes-oriented Decision Making. *Encyclopedia of Developing Regional Communities with Information and Communication Technology*. Section C. Edited by Stewart Marshall, Wal Taylor and Xinghuo Yu. http://itira.cqu.edu.au/encyclopedia/index.htm UTA/ISI, Idea Group Reference www.idea-group-ref.com, Aug. 2005, USA, 96-102.

Keskinen, Auli. (2004) MIDEM. Models for Interactive Decision Making, *EJEG—Electronic Journal of e-Government*, May.

Keskinen, Auli, Aaltonen, Mika, & Mitleton-Kelly, Eve (2003) *Organisational complexity. Foreword by Stuart Kauffman.* FFRC Publications, 6/2003, Finland Futures Research Centre, Turku School of Economics and Business Administration, Helsinki, November. Available at *http://www.tukkk.fi/tutu/ Julkaisut/pdf/Tutu_6_03.pdf*

Keskinen, Auli (2001) Decision making and information networks. In A. Keskinen, T. Becker, C. Slaton, T. Ohlin, & M. Schmidt (Eds.): *Future democracy in the information society, Futures, 33* (3–4), Elsevier Science, 339–370.

Keskinen, Auli, Becker, Ted, Slaton, Christa, Ohlin, Thomas, & Schmidt, Martin (2001) Future democracy in the information society. Symposium in *Futures, 33*(3–4), 339–347.

Keskinen, Auli (1999) *Towards user empowerment. On development of utilisation of information and communications technology in decision making of administrations*. Studia Politica Tamperensis, No. 6, Tampere University. Available at *FUTU/KeskinenAuli.pdf*

Keskinen, Auli (1997) Teledemocracy. Contribution for G7GOL. In S. Clift & O. Östberg (Eds.): *White paper on electronic democracy, Report for G7 + EU Information Society Pilot: Government On-line*

(GOL). Available 1997, 1998, at *http://www.statskontoret.se/gol-democracy*

Kirwin, Christopher (1995) Reasoning. In Ted Honderich (ed.): *The Oxford Companion to Philosophy*. Oxford, Oxford University Press.

Kuhn, Thomas (1962) *Structure of Scientific Revolution*. University of Chicago Press, 172 pages.

Kuosa, Tuomo (2009) Different approaches of Pattern management and Strategic intelligence. *Technological Forecasting and Social Change*. (accepted by referees, in editorial process)

Kuosa, Tuomo (2007a) A Few Extensions to Path-dependence and Emergence in Complex Social Systems. *Emergence: Complexity & Organisations* (E:CO). Issue Vol. 9 No. 4 2007, 3-16.

Kuosa, Tuomo (2007b) Forms of reasoning in Pattern management and in Strategic intelligence. Reviewed conference publication in COST A22 Conference, *From Oracles to Dialogues; Exploring New Ways to Explore the Future*, Athens July 9-11 2007. 12 Pages

Kuosa, Tuomo (2005a) Study on Logics on Society's Macro-level Transformation: A Macrohistorical Comparison of Pentti Malaska's Theory of Societal Change Compared to Other Theories of Transformation. *Journal of Futures Studies* (JFS). Vol. 10 Nro. 1, 2005, 15-30.

Kuosa, Tuomo (2005b) Weak signal or insignificant roaring: Pattern management as ontologically new approach to weak signals observations and reasoning [in Finnish]. *Futura 4/2005*, 115-120.

Kuosa, Tuomo (2004) Painspots of Societal Transformation (in Finnish). *Futura* 2/2004.

Kuosa, Tuomo (2001) *The Extension of Globalization in Finland* (in Finnish). *Politiikka* 3/2001, 257–269.

Kurzweil, Ray (1999): *The Age of Spiritual Machines: When Computers Exceed Human Intelligence*. New York, Penguin Books.

Kuusi, Osmo (1999) *Expertise in the Future Use of Generic Technologies: Epistemic and Methodological Considerations Concerning Delphi Studies*. Acta Universitatis Oeconomicae Helsingiensis A-159, Helsinki School of Economics and Business Administration, HeSe Print, 268 pages.

Kuusisto, Rauno (2004) *Aspects on Availability: A Teleological Adventure of Information in the Lifeworld*. Department of Tactics and Operations Art, Series 1 No. 1, Helsinki, Edita Prima Oy.

Lane, D. A. & Maxfield, R. (1997) Foresight, Complexity and Strategy. In Brian W. Arthur, S. Durlauf & D. A. Lane (Eds): *The Economy as*

an Evolving Complex system II: Proceedings, Vol 27, Sante Fe Institute Studies in Sciences of Complexity.

Laszlo, Ervin (ed.) (2003) "Introduction" *World Futures - The Journal of General Evolution*. Volume 59, Issue 3 & 4 April 2003, 125 -126.

Latour, Bruno (1993) *We Have Never Been Modern*. Cambridge, Harvard University Press.

Lee-Kelley, L. & Crossman, A. (2004) *Knowledge as a Shared Commodity in the 21st Century Networked Organisations: Trust and Power as Prefects*. The 9th International Telework Workshop, International Telework Academy ITA, Crete, Greece, 6–9 September.

Lindeman-Viitasalo, Marjaana (ed.) (1995) True-like delusions (*Toden näköiset harhat* in Finnish). Helsinki, Duodecim.

Linstone, Harold A. (2007) Science and Technology: Questions of control. Volume 74, Issue 2, February 2007, Technological Forecasting and Social Change, 230-237.

Lorenz, Edward N. (1963) Deterministic non-periodic flow. *Journal of the Atmospheric Sciences*, Vol. 20, 130–141

Luhmann, Niklas (1990a) *Ecological Communication* [Ökologische Kommukation in german]. Westdeutscher Verlag, Oplanden/Wiesbaden.

Luhmann, Niklas (1990b) *Essays of Self Reference*. New York, Columbia University Press.

Luoma, Mikko (2006) A Play in Four Arenas: How Complexity can serve Management Development. *Management Learning* Vol. 37 (1), Sage publications, 101-123.

Maddison, Angus (1982) *Phases of Capitalist Development*. New York, Oxford University Press.

Mainzer, Klaus (1997) Thinking in Complexity: The Complex Dynamics of Matter, Mind and Mankind. 4nd Edition, New York, Springer, 361 pages.

Malaska, Pentti (2003a) Futures Knowledge and Penetration to the Futures. In: M. Vapaavuori and S. von Bruun, *How We Research the Futures* [in Finnish]? Acta Futura Fennica No 5. Helsinki, Vapk-kustannus, 9-23.

Malaska, Pentti (2003b) Synchronic – Diachronic System Analysis. In Rune Höglund – Markus Jäntti – Gunnar Rosenqvist (eds.): *Statistics, Econometrics and Society: Essays in honour of Leif Nordberg*. Statistics Finland Research Report 238. Helsinki.

Malaska, Pentti (2003c) "*About Funnel Model: A Letter to Author from Pentti Malaska about his View and Methodology on Society's Transformation Logic*" (unpublished).

Malaska, Pentti (1998) *Sociocultural Transients of Work in the Late-Industrial Period: Usa and Finland as the Empirical Cases*. Turku School of Economics and Business Administration Finland Futures Research Centre.

Malaska, Pentti (1991a) Economic and Social Evolution: The Transformational Dynamics Approach. In Publication Ervin Laszlo (ed.): *The New Evolutionary Paradigm: The World Futures General Evolution Studies*. Volume 2. The Vienna Academy for Global and Evolutionary Studies, Austria, ISBN 2-88124-375-4.

Malaska, Pentti (1991b) A Conceptual Framework for the Self-reliant Transformation of Africa. In Akilu Lemma & Pentti Malaska (eds.): Africa Beyond Famine: A report to the Club of Rome. *African Studies Review,* Vol. 34, No. 2, ISSN 00020206, pp. 158-159.

Malaska, Pentti (1991c) *Sociocybernetic Transient of Work in the Late-industrial Period*. Turku School of Economics and Business Administration, Finland Futures Research Centre, FUTU-publication.

Malaska, Pentti (1983) Futurepolitical draft (in Finnish). Vol. 4. Helsinki, Pellervon taloudellinen tutkimuslaitos.

Mandelbrot, Benoit (1977) *The Fractal Geometry of Nature*. New York, Freeman.

Mannermaa, Mika (2004) Strong future from weak signals (in Finnish). Helsinki, WSOY.

Mannermaa, Mika (1999) TOOLBOX and weak signals (in Finnish). *Futura* 2/1999.

Mannermaa, Mika (1991) In Search of an Evolutionary Paradigm for Futures Research. *Futures*, Vol. 23, No. 4, ISSN 0016-3287, pp. 349-372.

Mannermaa, Mika (1992) *Evolutionary Futures Research: Searching Qualifications of Futures Research's Paradigms and Methodologies* [in Finnish]. Acta Futura Fennica No. 2. Helsinki, Vapk-Kustannus.

Maturana, Humberto R. & Varela, Francisco J. (1992) *The Tree of Knowledge: The Biological Roots of Human Understanding*. London, Shambhala.

Masini, Eleonora B. (1993) Why Futures Studies? London, Grey Seal.

Masini, Eleonora B. (1989) The Future of Future Studies. *Futures*, Vol. 21, No. 2, 152-160.

Masse, Pierre (1965) *Le plan ou I'anti-hasard*, Idées Gallimard.

Massey, Alexander (1999) Methodological triangulation, or how to get lost without being found out. In G. Walford, and A. Massey (eds.): Explorations in methodology, *Studies in Educational Ethnography*, Vol. 2, Stamford, JAI Press, 183-197.

McNeill, John R. & McNeill, William H. (2005) *The Human Web: A Bird-Eye View of World History* (Finnish edition). Jyväskylä, Gummerus.

Meadows, Donella H.; Meadows, Dennis l.; Randers, Jorgen & Behrens William W. (1972) *The Limits to Growth*. A Report to The Club of Rome

Mitleton-Kelly, Eve (2003) In Eve Mitleton-Kelly (ed): *Complex Systems and Evolutionary Perspectives on Organisations: The Application of Complexity Theory to Organisations*. Oxford, Pergamon.

Molitor T.T Graham (2003a) Molitor Forecasting Model: Key Dimensions for Plotting the Patterns of Change". *Journal of Futures Studies* 8(1), 61-72.

Molitor T.T Graham (2003b) The Power to Change the World: The Art of Forecasting. *Public Policy Forecasting*, Potomac MD.

Naisbitt, John (2004) *Preview of the future – where is the world headed*? Naisbitt's seminar in Kalastajatorppa at 15.12.2004, Helsinki, Kontakti.net. (unpublished report written by Tuomo Kuosa)

Naisbitt, John (1997) Megatrends Asia: *The Eight Asian Megatrends that are Changing the World*. London, Nichlolas Brealey Publishing.

Naisbitt, John and Aburdene, Patricia (1991) *Megatrends 2000. Ten New Directions forth 1990s*. New York, Morrow.

Naisbitt, John (1985) *Ten New Directions Transforming Our Lives*. New York, Warner Books.

Nicolis, Grégoire & Prigogine, Ilya (1989) *Exploring Complexity: An introduction*. New York, Freeman and Company, ISBN 978-0716718598.

O'Hara-Devereaux, Mary & Johansen, Robert. (1994) *Global Work. Bridging Distance, Culture and Time*. San Francisco, CA, Jossey-Bass Publishers, 439 pages, ISBN 1-55542-602-6

Oliver, W.R. (2000) *The Coming Biotech Age: The Business of Bio-Materials*, New York, McGraw-Hill.

Olsen, Wendy (2004) Triangulation in Social Research: Qualitative and Quantitative Methods Can Really Be Mixed. In M. Holborn (ed.): *Developments in Sociology*, Ormskirk, Causeway Press, ISBN 1902796829.

Organisation for Economic Cooperation and Development (OECD) (2002) *Understanding the Brain: Towards a New Learning Science*,

Paris: OECD Centre for Educational Research and Innovation, 115 pages.

Parsaye, Kamran (1999) From Data Management to Pattern Management. *DM Review Magazine*, January issue 1999.

Pearson, Ian & Lyons, Michael (2003) *Business 2010: Mapping the new commercial landscape*. Rollinsford NH, Spiro Press.

Physical Geography Net (2007) *Laws of Thermodynamics*. 1.9.2007. http://www.physicalgeography.net/fundamentals/6e.html

Potter, Jonathan (1996) *Representing Reality: Discourse, Rhetoric and Social Construction*. London, Sage.

Prigogine, Ilya & Stengers, Isabelle (1984) *Order out of Chaos: Man's New Dialogue with the Nature.* New York, Bantam Books.

Prigogine, Ilya (1967) *Dissipative process, quantum states and field theory*. XIVe Conseil de Physique Solvay. Oct. 1967. Bruxelles.

Rifkin, Jeremy (2002) *The Hydrogen Economy: The Creation of the Worldwide Energy Web and the Redistribution of Power on Earth*. New York, Penguin Group.

Rifkin, Jeremy (2001) *The Age of Access: How the Shift from Ownership to Access is Transforming Modern Life*, New York: Penguin Books.

Rifkin, Jeremy (1998) *The Biotech Century: Harnessing the Gene and Remaking the World*, New York, Penguin Putnam Inc.

Riner, Reed (1987) Doing futures research. *Futures*, Vol. 19. 311-328.

Rizer, George (1995) *McDonaldisation of Society: An Investigation into the Changing Character of Contemporary Social Life*. Thousand Oaks, Pine Forge Press.

Rizer, George (1998) *The McDonaldisation Thesis: Explorations and Extensions*. London, Sage.

Robertson, Roland (1992) *Globalization: Social Theory and Global Culture*. London, Sage.

Rouvinen, Petri; Vartia, Pentti & Ylä-Anttila, Pekka (2007) *Next 100 years: Timeadventure to the world and Finland 1907-2107* (in Finnish). Helsinki, Taloustieto.

Rubin, Anita (2003) "Soft System Methodology and other Methods of Future Studies." http://www.metodix.com/showres.dll/en/enindex

Sardar, Ziauddin (1993) Colonizing the future: the "other" dimension of futures studies. *Futures* 25(2), 179-187.

Saukko, Paula (2003) *Doing Research in Cultural Studies: An Introduction to Classical and New Methodological Approaches*, London, Sage.

Scholte, Jan A. (1996) Beyond the Buzzword: Towards a Critical Theory of Globalization. In E. Koffman & G. Youngs (eds.): *Globalization: Theory and Practice.* London, Pinter.

Scott, Alan (1997) "Introduction" Globalization: Social Process or Political Rhetoric? In publication A. Scott (ed.). *The Limits of Globalization: Cases and Arguments*. New York, Routledge.

Schwarz, Jan O. (2006) The future of futures studies: A Delphi study with a German perspective. Aachen, Shaker Verlag.

Silverman, David (2000) *Doing Qualitative Research: A Practical Handbook*. London, Sage.

Slaughter, Richard A. (2008) "Introduction" Integral Futures Methodologies. *Futures*, Vol. 40, 103-108.

Slaughter, Richard A. (2005) *Futures beyond Dystopia*. London, Routledge Falmer.

Slaughter, Richard A. (1999) A New Framework for Environmental Scanning. *Foresight*, 1(5), October, 442-45.

Slaughter, Richard A. (1995) *The foresight principle*. London, Adamantine Press.

Snowden, David (2002) Complex acts of knowing: Paradox and descriptive self-awareness. *Journal of Knowledge Management*. Vol. 6, (2), 100-111.

Strogatz, Steven H. (1994) *Nonlinear Dynamics and Chaos: With Application to Physics, Biology, Chemisty and Engineering*. Cambridge, Westview Press.

Ståhle, Pirjo & Kuosa, Tuomo (2009) Self-renewal of Systems: Basis of success and objective [in Finnish, Systeemien itseuudistuminen: Menestymisen perusta ja päämäärä]. *Aikuiskasvatus.* (forthcoming)

Ståhle, Pirjo (2008*)* The dynamics of self-renewal: A systems-thinking to understanding organizational challenges in dynamic environments. Chapter 7 in Ahhmed Bounfour (Ed.) *Organisational Capital: Modelling, measuring and contextualizing. London, Routledge*.

Ståhle, Pirjo (1998) *Supporting a System's Capacity for Self-renewal.* Research Report 190, Department of Teacher Education, University of Helsinki. Pages 393.

Tapio, Petri (2002) *The Limits to Traffic Volume Growth: The Content and Procedure of Administrative Futures Studies of Finnish Transport CO2 Policy*. Acta Futura Fennica No 8. Turku, Painosalama Ltd.

Todd, Emmanuel (2003) *After the Empire: The Breakdown of the American Order*. Columbia University Press. ISBN 952-5421-12-0.

Toffler, Alvin (1981) *The Third Wave*. London, Collins.

Toffler, Alvin (1991) *The Big Turn* [Finnish edition, tr. Heikki Eskelinen.] Helsinki, Otava.

Wallerstein, Immanuel (1983) *Historical Capitalism*. Verso Editions.

Wallerstein, Immanuel (1974) *The Modern World-System 1: Capitalist Agriculture and the Origins of the European World-Economy in the Sixteenth Century*. New York, Academic Press.

Waldrop, M. Mitchell (1992) *Complexity: The Emerging Science at the Edge of Order and Chaos*. New York, Simon & Schuster.

Waters, Malcom (1995) *Globalization*. London, Routledge.

Watts, Duncan J. (2003) *Six Degrees: The Science of a Connected Age*. New York, W.W. Norton & Company.

Webster's New Tweintieth Century Dictionary of the English Language (1971) Second Edition, Unabridged, Cleveland and New York, The World Publishing Company. (page 1134)

*Webster's New International Dictionary of the English Language (*1950) *Second Edition, Unabridged*, W.A. Neilson, T.A. Knott, P.W. Carhart (eds.), Springfield, MA, G. & C. Merriam Company.

Weick, E. Karl (2001) *Making Sense of the Organization*. Oxford, Blackwell Publishers Inc.

Wilber, Ken (2000) *Integral Psychology*. Boston, Shambala.

Wildman, Paul & lnayatullah, Sohail (1996) Ways of Knowing, Culture, Communication and the Pedagogies of the Future. *Futures,* Vol. 28, No. 8. 723-740.

Wilenius, Markku (1997) *Faust of Wheels: Conceptualizing Modernization and Global Climate Change*. Commentationes Scientiarum Socialium 52/1997, Helsinki, Gummerus kirjapaino.

Willmott, Hugh (2003) Organization Theory as a Critical Science? Forms of Analysis and "New Organixational Forms". In Haridimos Tsoukas and Christian Knudsen (eds.): *The Oxford Handobook of Organization Theory*. New York, Oxford University Press, 88-112.

ARTICLE 1

Kuosa, Tuomo

A Study on Theories of Society's Macro-Level Transformation: A Macrohistorical Comparison of Pentti Malaska's Theory of Societal Change to Other Theories of Societal Transformation.

A Study on Theories of Society's Macro-Level Transformation

A Macrohistorical Comparison of Pentti Malaska's Theory of Societal Change to Other Theories of Societal Transformation

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Abstract

In this article I will critically examine Pentti Malaska's theory of societal change. This will be made with respect to his "funnel model" of society and the perspectives of the most commonly known theories on the macro-level transformation of societies. The theories presented here are modernity-, postmodernity-, reflexive modernity-, global age-, historical capitalism-, the information age theory- and the cycle theory. After the brief introduction of the "rival" theories, a macrohistorical evaluation of the similarities and differences between the theories of transformation will be made. The analytical views used here are: continuity, time, evolutionary, coherence and development categories. After the analysis of the theories, Malaska's theory's position in the puzzle of the categories will be evaluated. Finally, there will be a conclusion presented of Malaska's theory's relationships with the other theories. The primary questions are: which theoretical perspectives is the funnel model consistent with and with which theoretical perspectives is there significant contradictions and discrepancies? Additionally, what kind of philosophical deviations can be identified between Malaska's theory and other theories of societal transformation, and how profound are those differences?

During his long career in future studies Pentti Malaska developed a theory about the transformational dynamics of societal change, and the societal shifts that occurred with the different types of growth. (Malaska 1989: 131-155, 1991: 304-313, 1998, 1983) Malaska based his theory's methodology primarily on the application of analogous, dialectical diachronic thinking. (The wave metaphor in Toffler 1981 and Soft System Methodology in Rubin 2003) Also, utopian thinking, railway thinking, trend thinking and scenario thinking are strongly embedded within it, and Hegelian-types of change dynamics are used to apply it. (Malaska 1991a: 136, 151-154) Furthermore, he mathematically formalized an economic-technical, socio-political and culture-spiritual synchronic structure of societies. (Malaska 2003a: 155-164)

In order to analyse the future with an analogous diachronic approach, it is necessary to use a longer time span for which there is already a "description" or "theory". Malaska takes the shift from agrarian society to industrial society and the transition period between the two. By placing the emergent industrial society in the agricultural society at the beginning of the transition period, it becomes possible to see, identify and use the special features of the transition to explain the emergence of new societal demands, and the evolution of a new dominant social force. This method can then be applied to our current era and help create scenarios for the future development of our society. The classic examples of exponents of diachronic thinking with regard to describing different futures are Herman Kahn's in *The Next 200 Years* (1976) and Daniel Bell's *The Coming of the Post-Industrial Society* (1974) as well as Toffler's *The Third Wave* (1981).

Utopian thinking is a viable addition to analogous diachronic thinking, because it disregards risks, wars, crime and the misuse of power. This is due to the fact that utopia thinking argues that there have always been undesirable and negative phenomena in the world, but that these entities have never determined society's development as people have always found ways to keep those phenomena under control. Thus, they argue why should we expect undesirable events to be significant in the future? However, in utopian thinking it is held vital that a good quality of life and its desired contents can be made real by human action. This is based on a utopia that has been envisioned but not yet made into reality. (Malaska 1983: 10)

Linear railway thinking has been one of the most commonly used approaches for describing and justifying future scenarios. The main idea here is that a desirable course of events in one country will be repeated in other countries in due course. Development is likened to a railway track, along which nations move, one behind the other, at differing time intervals. It also means that one country's past development is expected to resemble another's future. (Malaska 1991a: 154)

The Trend approach applies all statistical and mathematical methods regardless of their degree of complexity. The trend mode of thinking is based on a known and invariable pattern. A trend refers not only to something that can be revealed by statistical calculation, it also encompasses qualitative phenomena, which may be regarded as unchanged, or as changing in the same way as in the past. (ibid., Malaska 1965)

Scenario thinking was first used in futures studies in the 1950's but it was not until the 1970's that it became the most important tool for creating images or maps of the future. It is basically an intuitive approach for hypothesis setting but its advantage lies in possessing all the quantitative tools that are used for generating alternative scenarios of the future. (ibid.)

Development dynamics forms another supporting column for Malaska's methodology. They are influenced by Hegelian thinking, in which societal development is seen as a process, in which a current societal path is questioned by the obstacles and problems that arise and are seen in its trends (an anti-thesis). Then alternative courses of development that are unfolding in a transition period are outlined by diachronic, utopian, or dystopian thinking (a synthesis). In this approach current development dynamics are seen as the creator of the current situation, where thesis and anti-thesis appear, and at the same time as the creators of the tools for constructing the synthesis that will dictate future societal development. This theory puts forward the argument that there is always a crisis, called a transition period (e.g. as bifurcation[1]) between two distinct linked phases of development. (ibid.) In addition the development dynamic of a society is assumed to grow and evolve until it has used all of its available development potential and starts to degenerate due to the action of the problems and contradictions that arose in its formation (Malaska emphasises the law of entropy here). To be able to regenerate itself, the societal form in question has to realise the limits of its continued existence. (Malaska 2003b, ibid.)

In an ontological sense Malaska understands the object of study (human beings, enterprise, society, global community) as not only a

changing, but a developing unit, that constantly moves from one phase of evolution to a more complex phase pushed by the dynamics of development. As this occurs there are always shorter or longer periods of crisis, i.e. a period of transition, which could also be described as uncorrelated changes between the phases. During this crisis the previous patterns of life disappear and new ones emerge. However, the new phase also contains many essential elements of the old phase but these elements and their interconnections are irreducibly changed. For example, industrial society contains agricultural production, however, this is obviously industrialised. Consequently, industrial society might be regarded as the most efficient agricultural society in all the history. Overall Malaska's ontology understands development as a process where one moves from one phase of development to more complex one, and on the other hand the same process can be characterised as moving from one crisis to another crisis. (ibid.)

Malaska also demonstrates his model with the aid of Agnus Maddison's (1982) *Phases of Capitalist Development*, as well as, the statistical studies of labour and industry by Dennis A. Swyt; *The Workforce of U.S. Manufacturing in the Post-Industrial Era* (1988) and Swyt's unpublished paper (1993) (which I haven't found) *Matrix Mapping Correlations between My Four Occupational Groupings and Those Defined by U.S. Census Bureau*, plus Malaska's own studies of OECD countries. (1991b) In Swyt's analysis, which Malaska follows in his own study, the occupational structure is taken as the starting point for the analysis. He divides occupations into four categories, that he calls Physical Production, Physical Service, Managerial-Administrative and Technical-Professional. From these categories Swyt constructs a three-dimensional model, which statistically shows, among other things, that in the USA since the 1940's the occupational structure has begun to diverge from the "hegemony" of physical production (PP $\geq$ 50%) and become more and more service-driven. In his index Swyt shows that, not only has the service sector itself grown, but that service-oriented work has become more common in all areas of the economy.

Pentti Malaska's The Funnel Model of Societal Transition

The basic elements of Pentti Malaska's Funnel Model are bifurcation, a source (a germinating weak signal/idea), nucleation, extensive exponential growth, intensive growth, cultural evolution, and the emergence of (eras) or "societies" with different kind of needs, occupations and modes of production. Bifurcation refers to a branching point of development, where the critical mass of one kind of development reaches a peak and starts to lose its dominance and thus leaves room for something new to emerge. The bifurcation of the agricultural world leads to the industrial one. However, some nations have never reached this bifurcation point and perhaps never will. The term "post-industrial" society refers to a major bifurcation from industrial society to a new kind of society, that differs from industrial society as much as ours differed from the previous agricultural one. (Malaska 1991a: 137-8)

According to Malaska (ibid), any major bifurcation requires a source (the germination of a weak signal/idea) to begin the bifurcation process. The germination serves two purposes for development. Firstly, it has to benefit the dominant production mode, in particular it has to increase its productivity and efficiency. This has applications beyond its initial use and produces a new form of activity. This activity is very different to and, in a way, external to the dominant production mode itself. By producing new means (software, hardware etc.) for the dominant mode, a cross-catalytic effect then transforms the dominant sector from a stage of extensive growth to one of intensive growth. During the period of intensive growth wealth and welfare are accumulated and thus new societal needs are created and can also be satisfied. These new needs stimulate a chain reaction in the developmental process. The other function of the activity based on the germination of the idea is auto-catalytical growth that leads to it taking the role of the dominant production mode in society for satisfying new and old needs. This process, which Malaska calls the Chain of Development, and the transition peri-

17

ods between the different types of growth, is illustrated in figure 1. In the figure, the succeeding societies are classified according to their core needs, as; societies of basic needs (SBN), societies of tangible needs (STN) and societies of intangible needs (SIN).
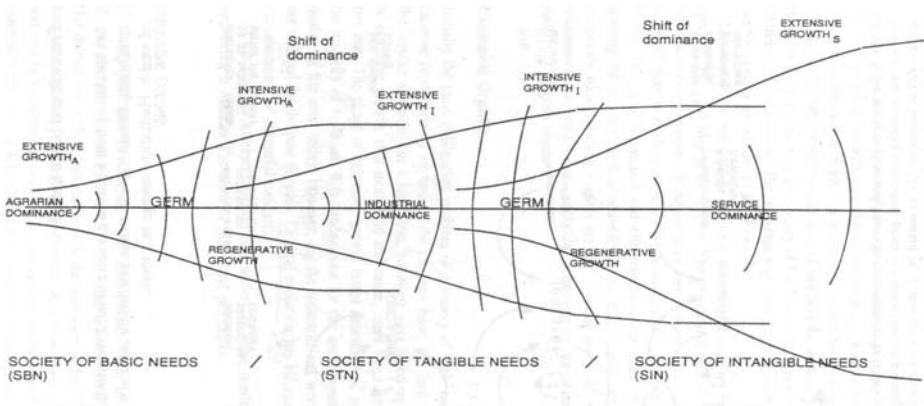

Figure 1. The transformational dynamics of societal change. Source: Malaska 1989, 308

The differences between the various stages of complex growth - extensive-, intensive- and regenerative growth are described below.

Table 1: Complex Growth

(0) Autocatalytic germ emerges and regenerating growth may start	
(1) Extensive growth	
Objective:	As much, as fast, as many as possible the means of needs to satisfaction
Policy:	Extensive exploitation of resources
Effectiveness:	Gross production
Measure of standard of living:	Resources used per capita
(2) Intensive growth	
Objective:	More from less, better than before, entropy efficiency
Policy:	Increase in resource efficiency and in quality of products and services
Effectiveness:	Productivity in use of resources
Measure of standards of living:	Gross production per capita
(3) Transmutation of the previously dominant sector	

(Malaska 1991a, 140)

The Society of Basic Needs

Pentti Malaska (ibid.) argues that the early developmental phases of society are not determined by the dominant method of production, which characterises the phases, but by the types of needs of a society the satisfaction of which is considered to be the primary goal of society. In traditional agricultural societies (SBN) the core development occurred around the basic needs for food, clothes and shelter. The satisfaction of these basic needs was regarded as the objective of the SBN-society. Consequently, traditional farming, cattle herding, and forestry were implemented in the most efficient way possible to accomplish the objective. In this process appropriate production methods, infrastructures, concepts of work and livelihood, family composition, welfare, ways of distributing and exercising power, and even particular social values evolved.

In a society of basic needs extensive growth meant an expanding resource base, increased land area and cattle. For millennia, solutions were based on a policy of extensive growth: increasing agricultural land use, more cattle, and more forest turned over to productive use. (Malaska 1983: 4)

Gradually intensive growth took place in the SBN-society. At the time when agriculture was still in the dominant position in society an external contribution from tool manufacture, chemical production etc. increased the efficiency of agricultural production and made it more productive in the use of its resources and the utilisation of its products. Thus at this time the new industrialised production of tangible products began to occur - improving agricultural productivity tremendously. (Malaska 1989: 309-310) In other words, the intensive growth in agriculture began to accelerate, a factor which could not have evolved without new contributions from industry, mechanisation, chemical use, or the selective breeding of plants and animals, and the division of labour. (Malaska 1991: 144) Furthermore the services of the public sector in the form of education, road networks and other elements of the industrial infrastructure supported the growth. (Malaska 1998: 13)

At first intensive growth in an agricultural society makes the accumulation of new wealth possible for the producers in the dominant sector, but does not satisfy the other possible needs of their society. Later on as wealth increases and generates surpluses the landowners and farmers find it more beneficial to invest in production that fulfils new needs being created by the new industrial methods.

When agriculture reaches its regenerative stage, excess material and social wealth accumulate in correspondence with savings in inputs and costs. Eventually, new emergent needs are no longer fulfilled by farming and animal husbandry. The term "regenerative growth" is used for these new needs as they emerge and begin to be satisfied by the products of the ideas germinating from the new industrial mode of production. The new needs satisfied by manufacturing, are called tangible needs. (Malaska 1989: 312)

The Society of Tangible Needs

The intensive growth in agriculture leads to more and more economic growth and income from sources sectors other than agriculture. The contributing sector embraces a seed or a source, from which the new regenerative growth begins, these seeds then develop over time into the new dominant form. (Malaska 1991: 145-8)

In a Society of Tangible needs, i.e. in an industrial society as we know it, goods are produced most efficiently by organised, large-scale industry where Fordism and Taylorism are embedded. Production is not based on craftwork as it was in the agricultural society. Industry and industrial progress facilitate the more immediate satisfaction of tangible needs for more people. Thus, the beginning of the industrial revolution began a time of strong extensive growth in the Western world's industry, when resources were not spared. Later on industrialists and politicians effectively redesigned its reality-concept and the values it created and finally industrial society began its intensive growth period.(ibid.)

19

Intensive growth in industrial production means a stage, where the aim is to produce more from less: to save capital, labour, raw materials, energy, the environment and at the same time improve quality and service. (ibid.) This happened in the 1970's (Malaska refers to Jean Voge 1983 – which I haven't found). Now the world's societies are in, or are approaching a period of regenerative growth before a radical new development of society. New needs are emerging simultaneously with rapid improvements in productivity, in the dominant manufacturing industries as is the appearance of new production methods and new services. (Malaska 1989: 312)

The Society of Intangible Needs

In the intensive growth period of the STN-society the catalyst for the economy and industry is information, scientific knowledge, and the development of human relations. Information technology's characteristics are so general that they can be utilised in all sectors of production in society and are the driving force behind this economic shift. Information and information technology are just as important for the satisfaction of intangible needs as power engines were for the satisfaction of tangible needs. Information technology is a vital part of the intensive growth and regenerative growth, but
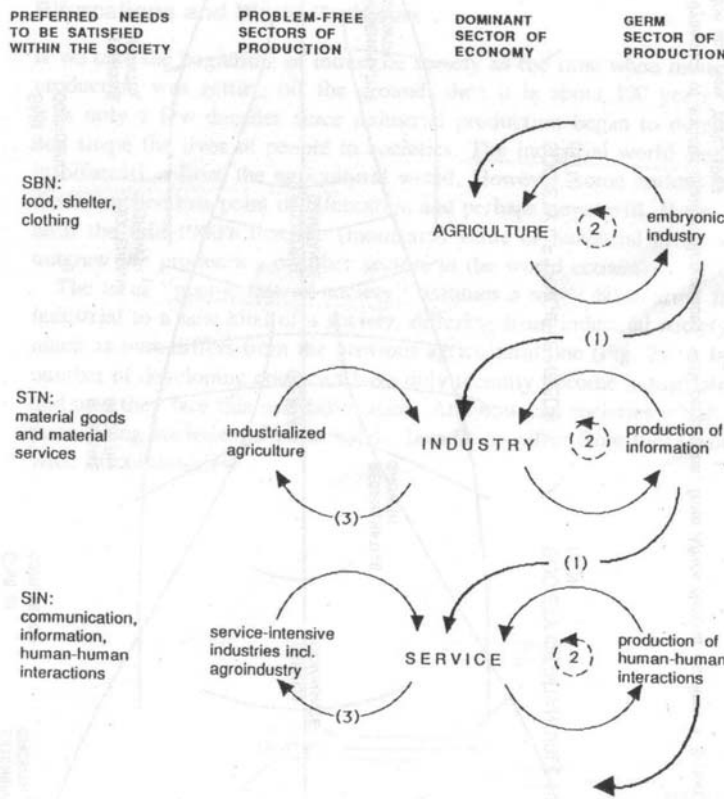
Figure 2. The process of societal transition: Arrows marked by (1) indicate the formation of a new dominating auto-catalysing production sector resulting from the germination of new ideas: a shift of dominance. The arrows marked by (2) describe the cross-catalysing interaction between the dominant production sector and the new ideas. Arrows marked by (3) indicate the change in the position of dominance between the prevailing and emerging production sectors. Source: Malaska 1991, 141

it is not the only vital element of society. Therefore, in Malaska's (1991: 148-50) opinion there is not enough justification for calling the next development phase of society the information society; just as it would not be correct to call the present phase of societal development the automobile or jet engine society. The term "the information society" is apt for the intensive growth period of industrial society. According to Malaska (ibid., 2003) the society of intangible needs should rather be called "service society" (if we focus on its dominant production mode) or "the interaction society" (if we focus on needs) instead. On the other hand, the "information society" could be seen as an interim period (a 20-30 year transition period) until the new phase of development stabilises.

Emerging Societies

In Fig. 2 Malaska illustrates his idea of emerging societies. The arrow marked (1) indicates the formation of the renewed growth in the dominant production sector that resulted from the first germination of new ideas. The idea is created in the first place to benefit the present production mode and its increased productivity. Arrow (2) marks the forming of cycles, which describe the auto-catalysing interaction between the dominant production mode and the functions of the new idea(s)- in short the dominant sector moves away from a state of equilibrium. Arrow (3) describes the crisis situation in which industry follows agriculture and becomes an unproblematic branch of production in the post-industrial society of intangible needs and indicates the changing of the dominant form of societal production.

Macrohistorical Approach in This Article

The macrohistory as an analytical perspective used partly in this article can be said to be the study of the grand patterns of change. Macrohistorical analysis asks: what are the shapes of historical processes – in more objectively speaking? Is the change in time linear,

progressive, cyclical, contraction patterns or spiral-like, and how does the stages emerge from previous stages etc. (Inayatullah 2004: 1; Galtung and Inayatullah 1997) Macrohistory can be understood as a construct in (or of) social reality – as a memetic complex, or topologically knotted, cycles. Like a complex atom, holding in an implicate order the variations of historical possibility in which the variations of higher "atomic weight" may remain to be detected. (Judge 2004: 9) Hence, macrohistory by focusing on different theories of change, from different epistemes, approaches and perspectives, forces us out of our own tunnel visions of the future. (Inayatullah 2004: 1)

Objectives, Perspective and Structure of This Article

There are seven different theories of societal transformation presented in this chapter. These theories itself are of course not really unified entities, but merely as summarizations of different viewpoints, paradigms, opinions, trends and even ideologies, as theories usually are. There are rival issues and approaches concerning each of the theories, such as Baumans idea of postmodernity vs. Focaultian, Bourdioun etc. but I'm not attempting to go further in these ideological or ontological debates. I'm not dividing theories into two different groups depending, are those academic as Giddens theory of modernity, or merely high quality popular summarizations such as Toffler's work. My pursue in this article is to locate the general common nominators from each theoretical approach, or to put it in other words, to find mutual features from the most widely known and fundamentally different rival (academic) summarized discourses.

When the common features are located, there will be given a macrohistorical evaluation of the similarities and differences between the theories of transformation. The analytical view used here are: continuity, time, evolutionary, coherence and development categories. After the analysis of the theories, Malaska's theory's position in the puzzle of the categories will be

evaluated. Finally, there will be a conclusion of Malaska's theory's relationships with the other theories. In the concluding remarks, it will be presented for instance, how Malaska?s theory is consistent with modernism in time category, and how it is in contradictory with postmodernism in coherence category. etc.

A Brief Description of The Seven Theories

Modern:

In Modern development theory (M) (and the theories based on this approach) there is typically a belief in linear development and the continuous convergence of societies, stability, order. (Bauman 1998) The most common terms associated with this theory are control, efficiency and developing countries, which implies that some countries have not yet developed into industrial ones.

Among modernity theorists (Giddens 1990, 1991; Habermas 1987; Berger et al. 1974 etc.) there is no such thing as modern society only societies more or less advanced in the continuum of Modernisation. Thus, modernization is a process, which has a beginning and criteria for its advancement but no predictable end. Advancement is seen as being driven by formative forces, as a process of rationalisation, where technology drives economic growth and development. (Berger et al. 1974: 9) Markku Wilenius (1997: 20-21) lists the formative forces of modernisation as: 1. The development of modern science and technology. 2. The expansion of capitalism, 3. The formation of nation states. 4. The reflexivity of modern identity. The fourth formative force represents the change from traditional community-oriented identity to individual-oriented identity resulting from individualisation and the fragmentation of the traditional time-place embedded community.

In a methodological sense linear thinking and the trend approaches are strongly embedded in theories of modernity. It is also possible to place diachronic and utopian thinking, approaches that were used in Malaska's (1991: 151-4) methodology, into modernity, because

both approaches emphasise universal continuity or universal qualitative development.

The idea of globalisation has been a popular (mega)trend, which has often been included in different development theories (Kuosa 2001; Keskinen and Kuosa 2005a and 2005b), I will use it as an example here as well. For example globalisation is usually expressed by words such as McDonaldisation or Cocacolonialisation, that refer to the US's domination of popular culture (Barber 1995; Cvetkovich and Kellner 1997: 2-3, 11-5) or the expansion of brands (Klein 2001: 27-63) over national cultures threatening the world's cultural hegemony. (Scott 1997: 3-7; Robertson 1992: 138-45; Giddens 1990: 55-9, 170-3; Waters 1995: 4, 13) Examples of research where the general focus is on cultural globalisation and the theoretical approach is similar to modernity's are George Ritzer's publications (1995 and 1998).

Postmodern:
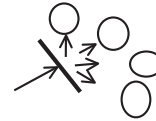
The common denominator of postmodernity (PM) is the idea of discontinuity between the eras of modernity and postmodernity. There is no linear development nor general expansion of modern goods and ideas, but increased relativism, ambivalence, contingency and qualitative diversity in all areas of society. (Scott 1997: 3-6; Bauman 1998) Ultimately there is the fragmentation of ideas into smaller units (for instance female emancipation and specified environmental issues), that have little in common.

In the social sciences postmodernity has often been recognised as an intellectual attitude of "anything goes" or abandoning everything characterising the modern project and leaving one with a feeling of vertigo. (Malaska 2001: 225-226) On the other hand, Paul Cilliers (1998: 112-141) argues that postmodernism is a complex phenomena, with its robust nature which necessarily includes the idea of self-organisation, fixed but ever changing and emergent properties. Due to these properties, postmod-

ernism and complexity certainly do not lead to the conclusion that anything goes. (ibid. viii) Furthermore, "in postmodern society this constant activity, this lack of equilibrium, is pushed to ever higher levels, particularly through the role of the mass media. This has an unsettling effect on many, and undeniably one has to develop certain skills to cope with these conditions, but to yearn for a state of complete equilibrium is to yearn for a sarcophagus." (ibid. 122)

When globalisation is taken into account in publications of postmodern approach (Robertson 1992: 138-45; Scott 1997: 3-7; Kuosa 2001), it can be said that many authors come up with Robertson's (1992) concept of glocalization. The word glocalization is based on the Japanese word dochakuka (taking local conditions into account in marketing).

Reflexive Modernisation:

The basis of reflexive modernisation (RM) refers primarily to Ulrich Beck's, Anthony Giddens' and Scott Lash's book The Reflexive Modernisation (1994). The three authors see this theory from slightly different angles. Giddens describes the transition from simple to Reflexive Modernity through his theory of post-traditional society (1990; 1991, 1994), Lash focuses on the information society, its history and future and its relationship to reflexivity, structure, aesthetics and community. (1994), Beck emphasises his idea of risk society and transition to "eine andre Moderne" (Second Modern). The common idea, shared by all three, is the idea that modernization continues a forward path but that transition from one era to another is also continuous. This transition does not happen in the traditional way, crisis - transition period - revolution, but follows a smooth modern path: wished for and known.

According to Beck (1999: 178-9, 184-6), RM does not only refer to the increased value of reflection and knowledge, but to real paradigmatic change in modern nation states that subsequently influences the world community. Eventually, this new modernisation creates a whole new kind of capitalism, -politics, -laws and -lives.

Reflexive Modernisation should not be understood as same thing as postmodernisation, because postmodernists insist that all the structures of modern society will collapse as the modern era ends. Contrary to this, reflexive modernists raise the questions: What is about to begin? What kinds of new institutions and social categories will take the place of the old? (ibid, 178-9)

The Global Age theory:

The fourth theory on society's macro level transition is Martin Albrows (1997) The Global Age (GA). According to Albrow, there will be a whole new era, which has nothing in common with the old modern era. The start of this era can be seen in the growing and deepening mental gap between generations, and also in the unique expansion of globalisation in people's everyday life. Nowadays, satellites share the same news, which makes it possible for a single protest to be seen instantly around the world. This process isn't explained with reference to modernism or the continuing claims for societal convergence, nor by post-modernist fragmentation theories. Moreover reflexive modernists are not able to explain this process any better, because reflexive modernisation is too deterministic, and thus can not be included in the process of globalisation. This is because, globalisation lives in its own non-deterministic history, where there is no beginning to the process, no direction to the development, nor an end to the process. In the other words, Albrow emphasises globalisation as an independent process, which can not be stopped, though it might halt or regress temporarily. (Albrow 1997: 9, 77-80, 95)

Historical capitalism:

Alongside Karl Marx's theory of historical materialism, there are many other theorists who present examples of Historical Capitalism (HC). However, Immanuel Wallerstein's theory is the example chosen here. (for similarities and

23

differences between Wallerstein's and Marx's theories see Wallerstein 1983, chapters I and V)

According Wallerstein, the capitalistic world order was constructed in 16th century Europe (compare to Marx's modern capitalism in the 15th century) eventually becoming global in the 19th century. Wallerstein refers to a form of capital, which is separate from and has a clear difference between the current economic system and the previous one. In its early form capital was something, which was saved in order to be consumed in the future, or something, possessing some value in its relationship to other goods. As society developed capital became a tool for expanding and collecting more capital, which facilitated the new world order.

The new world order is constructed on the basis of the following three theories: 1. The use of capital to generate new capital (maximize profits), 2. The restriction of competition in order to gain an advantage for an elite, and 3. The establishment of single world markets. When all nations are interconnected the markets develop as a single unit, which leads to the division of tasks in the system. In this way the core, semi-periphery and the periphery are created. In this system the existence of the highest technology at the core (production with profitable refinement which requires high skills) is partly possible, because it is surrounded by a semi-periphery (production which requires some less demanding skills) and a periphery (mostly the collection and/or production of raw materials). In this theory exploitation is seen as becoming a permanent feature due to the fact that the semi-periphery and the periphery are strongly dependent on the core. (Wallerstein 1983; 1974: 66-132)

While modernists believe in a process of global linear development evolving into a better world and the continuous convergence of world markets, Wallerstein presents a different view. He emphasises the disadvantages of the modern development and argues that there will be increasing polarization, which leads to an abject proletariat and modernisation facing a dead end. Then, after the end of the modernisation process, a new society will form based on some form of socialism. However, it will not have anything in common with former socialist systems, because those creations of historical capitalism were parts of the same world market as capitalist countries were. As Wallerstein presents the idea, the new socialism will have both (mentally and physically) new foundations and, most likely, new driving forces behind its development. (ibid.)

Information Age:

Manuel Castells approach to the question of society's macro level transformation emphasised a break between the modern era and the forthcoming new era. (1996,1997, 1998) He argues that the Information Age (IA) has been constructed by informative development theories (the information technology revolution) and an ever expanding network economy. He goes on to argue that modern production modes, structures and social classes will fade, because in the Information Age people will not be divided into social classes according to their relationships to modes of production life, but according to their relationship to the Net. This relationship is created by new global technology and the global economy. Thus, the new social groupings of will be; Networkers, Flexi-timers and the Jobless (this is also called the fourth world). (Castells 1996: 216-96, 1998: 68-82)

Castells does not want to predict the future very far. He describes the forthcoming revolution, the reasons behind it, as well as its consequences. What comes after the Information Age, when the Net dominates our lives, he does not anticipate. He only assumes and hopes that the new social movements (emancipative, environmental etc.), which are based on identity, will have enough strength to fight back against a potentially hostile Net. (Castells 1998: 335-60)
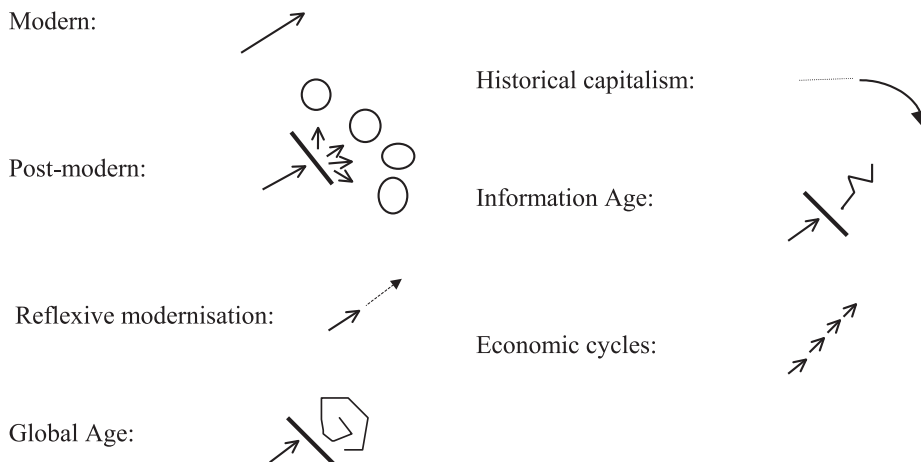
Economic Cycles:

The pioneering work on Economic Cycle (EC) analysis was made by Russian Nikolai D. Kondratiev (1892-1931) in his dissertation (1922) on long term economic cycles *The World*

Economy and its Condition During and After the War. The general approach in cycle analysis is a belief in linear economic development, in which future economic trends can be predicted from the available knowledge of past economic periods. Kondratiev's most widely known argument is the theory of long-period-cycles, where national economies are predicted to have alternate 50-year long periods. Economic growth is seen as being followed by economic recession and so on. The theory of long-period-cycles also takes in mid to long periods of 7-10-years as well as short periods of 3-4 years inside each 50-year period. Furthermore, in each era, there will always be some major "catalyst or motors" of growth, such as inventions like the steam engine or the internal-combustion engine, which enables the change of a cycle. (Maddison 1982: 64-85)

Today this theory has many adherents and modified applications, for instance Toffler's (1981, 1990) wave metaphor. Also Yu V.

Yakovets' cycles of civilisation (Malaska 1991; Yakovets 1993), Leach's episodes (Malaska 1991; Leach and Wagstarff 1986) and Kusnetz's epochs (Maddison 1982) would be good examples of these theories. John Naisbitt's (1982, 1990) theory of mega-trends could also be added to the list. It can be said, that Naisbitts theory previously described the ongoing changes of the industrial era, but recently it has turned more to the direction of whole systems Pattern management, where framework created by the history steers the plastic of the future. The theory states that, when the time is ready / "puzzle" is filled the emergence of new era is enabled. (Naisbitt 2004) Despite Kondratiev's originally rather positivistic approach, these modified theories have been given, in many cases, a broader base that enables diachronic thinking and utopia thinking to be embedded in these theories of society's transformation from one era to another.

Figure 3. The theories of society's macro level transformation:

Modern:

Post-modern:

Reflexive modernisation:

Global Age:

Historical capitalism:

Information Age:

Economic cycles:

Furthermore, the theories of non-linearity (Strogaz 1994; Aaltonen 2003), self-organized emergency, chaos (Kauffman 1995), intangible needs and creativity (Florida 2002; Jensen 1999 and 2003; Dator and Yongseok 2004), and linked complexity (Barabasi 2002; Watts 2003; Cilliers 1998) can be seen to provide a different kind of additional perspective on internally or externally emerging development. However, these fields of studies don't establish any independent and fully adaptable theory, or unifying discourse, of social macro-level transformation, as the described seven theories do. Thus, the theories of complexity etc. are merely used for sparring the thinking of society's macro-level development in this article.

The Differences and Similarities between the Theories[2]

First of all, the seven theories can be divided into two *Continuity* meta classes: Those that perceive a tangible break between eras, and those that expect that the change will be unbroken and gradual. Postmodernists, Global Age and Information Age theorists emphasise a profoundly new era, which has very little in common with the previous modern era. In contrast, modernists, reflexive modernists, historical capitalism and economic cycle theorists expect that the modernisation process is an unbroken continuous process, albeit in very different ways. To be more specific, when reflexive modernists believe in a smooth transformation into another kind of society, the cycle analysers expect that inside the modernisation process there will always be new kind of eras, with new kind of "motors" of economical growth. In addition, adherents of historical capitalism expect that modernisation in its capitalistic form will eventually start slowing down. In this view, modernisation is not seen as an ever evolving process, but merely a path into an even worse or disastrously into a dead end.

Another way to categorise the theories is divide them into *Time* classes: does the theory focus on a shorter time period, a longer time period, or continue indefinitely? Reflexive mod-

ernists and information age theorists focus on the near future, whilst postmodernists and historical capitalist theorists use a longer time continuum. Modernists, economic cycle analysts and global age theorists usually describe a theory that continues indefinitely. However, in those theories the description is usually implicitly expressed.

A third possibility is to divide them into *evolutionary* classes and ask if a profound change in the direction of the global transformation's "path" is possible? In the global age theory the future of the transformation process is seen as completely open, but historical capitalist theorists expect a change in the described theory, and postmodernists leave the future only partly open. The others (M, RM, IA, EC) do not really allow for deviation from their theory.

The concept of *coherence* finds a major divide between those theories that see the possibility of many simultaneous directions for transformation (postmodernists), and those who want to include all "rival" trends in one all encompassing theory (the other theories M, RM, GA, HC, IA, EC).

Finally, the theories can be divided into *Development* classes: are those that regard the future as a process that progressively develops into something more positive for all. This is the main belief in M, RM, EC and IE theories. Postmodernists and global age adherents differ slightly here, as they leave societal development more open. The only theory that clearly contradicts the others is historical capitalism, in which modern development is regarded negatively.

Similarities and Differences With Malaska's Theory

As Malaska bases his Funnel model on analogical diachronic thinking, railway thinking and trend thinking, it can be said to resemble modernist thinking. However, the Funnel model's approach also contains elements of utopian thinking, scenario thinking and development dynamics (the emergence of new ideas from states of chaos). This allows for a much more open and even evolutionary view. In addition,

Malaska's style of expression, using funnel figures (see Fig. 2) to describe change and the emergence of new ideas is not genuinely linear. It contains linear extensive growth, non-linear intensive growth and branching or renewal through crisis/bifurcation (or breaks), the sources of new eras/new extensive growth, nucleation and the idea of qualitative change in needs in each new era. On the other hand the idea of a chain of eras, with new "motors" of economic, societal and cultural growth (three-fold growth), shares some common ground with economic cycle analysis but only on a general level.

Perhaps the clearest differences exist between Malaska's theory, and post-modern, historical capitalism and global age theories, which can not be presented via Malaska's expressive model. See Fig. 4.
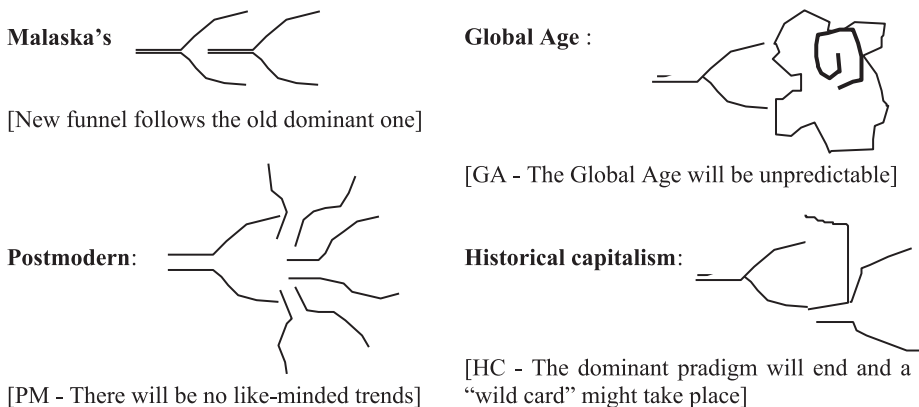
Malaska's theory's relationship to the five meta classes described above can be expressed as follows. Malaska's concept of *continuity* belongs to same "gradual and continuous change" group as: M, RM, HC and EC (see Fig. 3). This does not mean that "smooth change" theories cannot have crises or breaks in their development. Quite the contrary, for instance Malaska's theory clearly emphasises crisis and bifurcation points between the dominant mode and the emerging mode. Thus, the essential difference between tangible and gradual continuous change can be found in the theory's rela-tionship to diachronic thinking. For instance, Malaska emphasises the source of a new societal mode, which grows from inside the old mode and develops into the new dominant mode.

In the *Time* category, Malaska's theory is linked to the M, GA and EC, or theories that present an infinite overview of societal development. In an *Evolutionary* sense the Funnel model does not accept the idea of "a sudden directional change" in transformation as M, RM, IA and EC do. A transition period with an accompanying crisis might emerge suddenly, but a complete break with the previous era is discounted. Thus, evolution in the Funnel model refers more to a gradual or voluntary transformation and less to a type of self-organising evolution.

For coherence Malaska belongs in the same group as M, RM, GA, HC, IA and EC who want to include all "rival" trends in one overall theory. That is in clear contradiction with PM (see Fig. 4). However, such theories are not necessarily meant to collect absolutely all trends of the society, e.g. not all social trends can be encompassed. A theory that tries to encompass all others refers here more to the division between those that see society as a coherently developing single unit and those that see society as a fragmented collection of "rival" small units.

Figure 4. Different theories and their applicability to Malaska's funnel model

Malaska's

[New funnel follows the old dominant one]

Global Age :

[GA - The Global Age will be unpredictable]

Postmodern:

[PM - There will be no like-minded trends]

Historical capitalism:

[HC - The dominant pradigm will end and a "wild card" might take place]

Malaska's notions of *development* sits in the same group as M, RM, IA and EC because they understand societal change as process that moves from less complex and inferior states to better and more complex states.

In conclusion, Malaska's theory most closely resembles the modern-, the economic cycles- and the reflexive modern theories. It has a few similarities with the information age theory, but obviously less similarities to the global age- and historical capitalism theories, and has practically no similarities with postmodernism.

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Notes

1. Malaska uses the word bifurcation. Its history is in physics and chemistry, where it refers to a point in which the matter can no longer evolve in its path and is therefore determined to change its state into an other form. As a loan word for futures studies it means as well any phase where one path can not continue and there is a necessary transition period in the evolution of the issue.

2. The comparison presented here can be seen as somewhat problematic, as the deeper ontological discourse behind the analysis is not presented, due to the afforded space here.

References

Aaltonen, Mika. 2003. "Allowing Complexity Into the Puzzle of Strategic Sensemaking." In Auli Keskinen, Mika Aaltonen and Eve Mitleton-Kelly *Organizational Complexity*. Turku School of Economics and Business Administration.

Albrow, Martin. 1997. *The Global Age: State and Society Beyond Modernity*. Standford, California: Standford University Press.

Auli, Keskinen and Kuosa Tuomo. 2005a. "Foundation of Citizen-oriented e-governance Model." In Ari-Veikko Anttiroiko and Matti Malkia.(eds) *Encyclopedia of Digital Government*. http://www.uta.fi/latiokset/ISI/EnDigG/9 pages.

_____. 2005b. "Introduction to Citizes-oriented Decision Making: New eDemocracy Tools for the 21st Century." *Encyclopedia of Developing Regional Communities with Information and Communication technologygy*. Stewart Marshall, Wal Taylor and Xinghuo Yu. Eds. http://itira.cqu.edu.au/encyclopedia/index.htm 10 pages.

Bauman, Zygmunt. 1998. *Postmodernity and its Discontents*. Cambridge: Polity Press.

Barabsi, Albert-Laszlo. 2002. *Linked: The new Science of Networks*. Cambridege: Perseus Publishing.

Barber, Benjamin R. 1995. *Jihad VS. Mcworld: How Globalisim, Tribalism AreRe-Shaping the World*. New York: Random House.

Beck, Ulrich. 1986. *Risikogesellschaft. Auf dem Weg in Eine andere Moderne*. Frankfurt am Maine, Suhrkamp.

_____. 1988. *Gegengifte. Die organisierte Unverantwortlichkeit. Frankfurt am Main Suchrkamp*. Translated in English (1995): *Ecological Politics in the Age of Risk*. Cambridge: Polity Press.

_____. 1999. *Kosmopoliittinen perspektiivi: Toisen modernin sosiologiasta* [Cosmopolitic perspective: About second modern's sociology in Finnish]. Tiede ja Edisty 3/1999.

Beck, U, A. Giddens, and L. Scott. 1994. *Reflexive Modernization: Politics, Tradition and Aesthetics in the Modern Social Order*. Cambridge: Polity Press.

Bell, Daniel. 1974. *The Coming of the Post-Industrial Society*. London: Heinemann.

Berger, P, Berger and B, H. Kellner. 1974. *The Homeless Mind: Modernization and Consciousness*. New York: Random House.

Castells, Manuel. 1996. *The Information Age: Economy, Society and Culture. Vol 1: The*

Rise of the Network Society. Malden, Massachusetts: Blackwell Publichers.

_____. 1997. *The Information Age: Economy, Society and Culture. Vol 2: The Power of Identity*. Malden, Massachusetts: Blackwell Publichers.

_____. 1998. *The Information Age: Economy, Society and Culture. Vol 3: End of Millennium*. Malden, Massachusetts: Blackwell Publichers.

Cvetkovich, Ann and Douglas Kellner (eds.) 1997. "'Introduction': Thinking Global and Local." In Ann Cvetkovich and Douglas Kellner (eds.) *Articulating the Global and the Local: Globalization and Cultural Studies*. Boulder, Colorado: Westview Press.

Cillers, Paul. 1998. *Complexity and Postmodernism: Understanding Complex Systems*. New York: Routledge.

Dator, Jim and Seo Yongseok. 2004. "Korea as the Way of a Future: The Emerging Dream Society of Icons and Aesthetic Experience." *Journal of Futures Studies* 9(1): 31-44.

Florida, Richard. 2002. *The Rise of the Creative Class – And How It's Transforming Work, Leisure, Community and Everyday Life*. New York: Basic Books.

Galtung, Johan and Sohail Inayatullah. 1997. *Macrohistory and Macrohistorians*. Westport, Ct.: Praeger.

Giddens, Anthony. 1990. *The Conseguences of Modernity*. Cambridge: Polity Press.

_____. 1991. *Modernity and Self-Identity*. Cambridge: Polity Press.

Habermas, Jürgen. 1987. *The Philosophical Discourse of Modernity*. Cambridge: The MIT Press.

Inayatullah, Sohail. 2004. "Introduction, Macrohistory and the Future." *Journal of Futures Studies* 9(1): 1-2.

Jensen, Rolf. 1999. *Dream Society, How the Coming Shift from Information to Imagination will Transform Your Business*. New York, McGraw-Hill.

_____. 2003. *Heartstorm, The Dream Society 2*. Kopenhagen: Jyllands-Postens Erhvervsbogklub.

Judge, Anthony. 2004. "Engaging Macrohistory through the Present Moment." *Journal of Futures Studies* 9(1): 3-12.

Kahn, Herman and Anthony J. Wiener. 1967.

The Year 2000: The Framework for Speculation on the Next Thirty-three Years. New York: Macmillan.

Kahn, Herman, William Brown and Leon Martel. 1976. *The Next 200 Years. A Scenario for America and the World*. New York: Morrow.

Kauffman, Stuart. 1995. *At Home in the Universe: The Search for the Laws of Self-Organization and Complexity*. New York: Oxford University Press.

Klein, naomi. 2001. *No Logo*. London: Flamingo.

Kuosa, Tuomo. 2001. "Globalisaation käyttäala Suomessa". [The extension of globalisation, in Finnish], *Politiikka* Pp. 257-269.

Maddison, Angus. 1982. *Phases of Capitalist Development*. New York: Oxford University Press.

Malaska, Pentti. 1965. *Aikasarjoihin perustuva tutkimus söhköenergian kulutuksen rakenteesta Suomessa vuosina 1945-63* [a doctoral dissertation in Finnish]. Suomen Teknillinen korkeakoulu, Tieteellinen tutkimus No. 18. Helsinki.

_____. 1983. *Tulevaisuuspoliittinen hahmotelma* [Futurepolitical draft in Finnish]: Pellervon taloudellinen tutkimuslaitos, Vol. 4. Helsinki.

_____. 1989. "A Conceptual Framework for the Self-reliant Transformation of Africa." In Publication Akilu Lemma and Pentti Malaska (eds.). *Africa Beyond Famine: A report to the Club of Rome*. Midsomer Norton: Tycooly Publising.

_____. 1991a. "Economic and Social Evolution: The Transformational Dynamics Approach." In Publication Ervin Laszlo (ed.). *The New Evolutionary Paradigm: The World Futures General Evolution Studies* Volume 2. New York: Gordon and Breach Science Publishers.

_____. 1991b. *Sociocybernetic Transient of Work in the Late-industrial Period*. Turku School of Economics and Business Administration Finland Futures Research Centre, FUTU-publication.

_____. 1998. *Sociocultural Transients of Work in the Late-Industrial Period: Usa and Finland as the Empirical Cases*. Turku School of Economics and Business Administration Finland Futures Research Centre.

_____. 2001. A Futures Research Outline of a

29

Post-Modern idea of Progress Pp. 225-243.

_____. 2003a. "Synchronic – Diachronic System Analysis." In Rune Höglund – Markus Jäntti – Gunnar Rosenqvist (eds.). *Statistics, Econometrics and Society: Essays in honour of Leif Nordberg*. Statistics Finland Research Report 238. Helsinki.

_____. 2003b. "About Funnel Model: A Letter to Author from Pentti Malaska about his View and Methodology on Society's Transformation Logic" (unpublished).

Naisbitt, John. 1982. *Ten New Directions Transforming Our Lives*. New York: Warner Books.

_____. 2004. *Preview of the Future – Where Is the World Headed?* Seminar in Kalastajatorppa at 15.12.2004, Helsinki, Kontakti. net. (unpublished)

Naisbitt, John and Patricia Aburdend. 1990. *Megatrends 2000. Ten New Directions for the 1990s*. New York: Morrow.

Rizer, George. 1995. *McDonaldisation of Society: An Investigation into the Changing Character of Contemporary Social Life*. Thousand Oaks: Pine Forge Press.

_____. 1998. *The McDonaldisation Thesis: Explorations ans Extensions*. London: Sage.

Robertson, Roland. 1992. *Globalization. Social Theory and Global Culture*. London: Sage.

Rubin, Anita. 2003. "Soft System Methodology and other Methods of Future Studies." http://www.metodix.com/showres.dll/en/enindex

Scott, Alan. 1997. "Introduction: Globalization: Social Process or Political Rhetoric?" In publication Alan Scott (ed.). *The Limits of Globalization: Cases and Arguments*. New York: Routledge.

Strogatz, Steven H. 1994. *Nonlinear Dynamics and Chaos: With Application to Physics, Biology, Chemisty and Engineering*. Cambridge: Westview Press.

Swyt, Dennis A. 1988. "The Workforce of U.S. Manufacturing in the Post-Industrial Era." *Technological Forecasting and Social Change* 34: 231-251.

Toffler, Alvin. 1981. *The Third Wave*. London: Collins.

_____. 1991. *Suuri käänne* [The Big Turn - Finnish edition, translated by Heikki Eskelinen.] Helsinki: Otava.

Wallerstein, Immanuel. 1974. *The Modern World-System 1: Capitalist Agriculture and the Origins of the European World-Economy in the Sixteenth Century*. New York: Academic Press.

_____. 1983. *Historical Capitalism*. Verso Editions.

Waters, Malcom. 1995. *Globalization*. London: Routledge.

Watts, Duncan J. 2003. *Six Degrees: The Science of a Connected Age*. New York, W.W. Norton & Company.

Wilenius, Markku. 1997. *Faust of Wheels: Conceptualizing Modernization and Global Climate Change*. Commentationes Scientiarum Socialium 52/1997, Helsinki: Gummerus kirjapaino.

ARTICLE 2

Heinonen, Sirkka & Kuosa, Tuomo

Ecological Realities of Telework in Four Different Futures - Living, Working and Travelling in New Knowledge-Intensive Communities. Double Special issue. Edited by Auli Keskinen.

Ecological realities of telework in four different futures: living, working and travelling in new knowledge-intensive communities

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Abstract: Telework is an alternative way of organising work in an information society. However, its impacts on the environment and on transport may not automatically be beneficial. In a sustainable information society, telework should be implemented in specific environmentally managed ways for which this article gives recommendations.

Telework is closely linked to the larger concepts of working, housing and travelling in communities. Accordingly, the changes in these areas determine the developments that will take place around the thematique of telework. Four different futures are presented here based on a possible bifurcation that is anticipated to occur after the information society.

What kind of a working culture and teleworking pattern will prevail in each of the depicted futures in 2030? The recommendations for eco-managed telework are reconsidered in each of these four futures. To conclude, an analysis will be given on the appropriateness of the recommendations in order to proactively create ecologically sustainable realities of telework in different future working vistas.

Keywords: eco-managed telework; futures images; sustainable information society; Bio-Age; Fusion Age; Talent Age.

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Furthermore, he is participating in many other education, consultation and R&D projects and he writes regularly for Finnish and international publications.

1   Introduction to eco-managed telework

This article introduces the concept of eco-managed telework and hypothetically experiments it in four different futures and respective working cultures. We apply here a theoretical framework, which combines the telework into two traditions: first, to the theory of sustainable development, and second, to the context of futures studies. Measuring the level of eco-management of telework in the present time through statistical data, including the evident rebound effects of telework, is what concerns the domain of sustainable development. In the framework of future studies, there is a layer of prospective evaluation processes added to this basis of assessing the environmental management of telework. The possible actions and policies of individuals and organisations are evaluated, not only in the present time but also from the perspectives of possible futures via scenario processes or through the use of other long-term foresight approaches.

The experimental structure of this article and the four different futures to be depicted in the following are presented in Figure 1.

The next section presents various cultures of work in the four different possible futures, based on the bifurcation we anticipate of the societal development after the information society. Sustainable Information Society is forecast to transform into a Bio-Age (Rifkin, 1998) where knowledge, technology, and nature are merged in innumerable ways (2010-2020). This new era could then alternatively realise itself as 'Fusion Age' which means society as dominated by technology, or as 'Talent Age', which refers to society as dominated by the human capital. Both of these alternative realities may subsequently be foreseen to produce two futures, leading to altogether four futures where working, living, and travelling have different ways, functions,

and purposes (see Figure 1). The more specified descriptions of the four futures (Security-driven, Consumer-driven, Intelligence engineering-driven, and Social networker-driven futures) are presented in Appendix 1.[1]

Figure 1 The cognitive structure of the four different futures and eco-management of telework as reflected on them
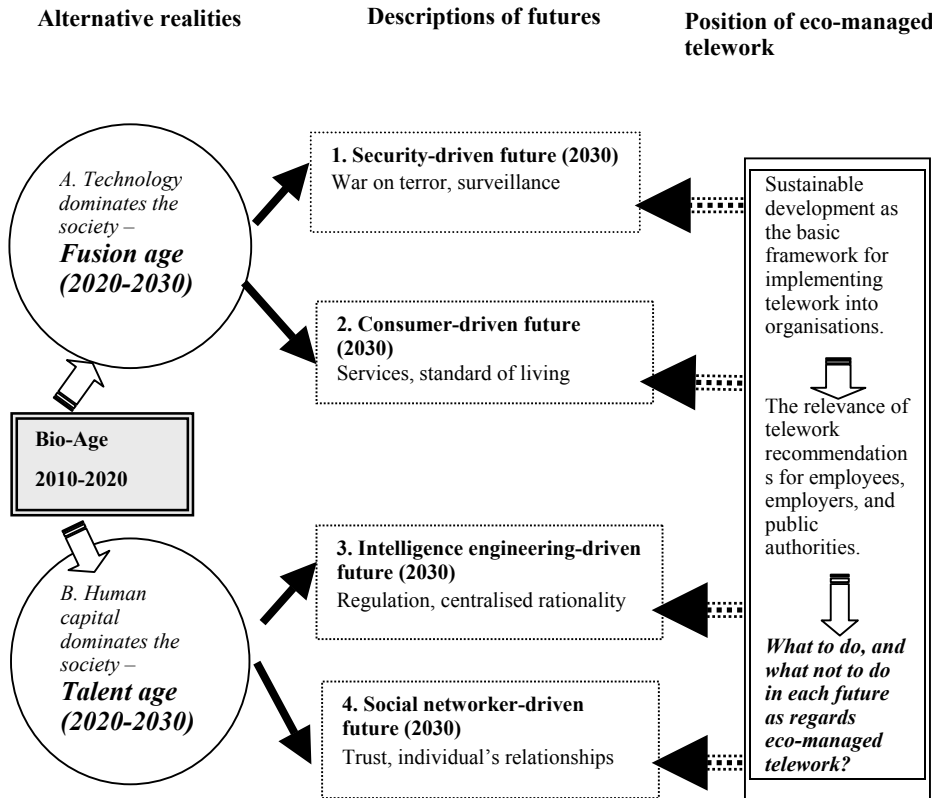
The third section looks deeper into the theory and practice of telework. What factors are evidently reinforcing the hypothesis of environment-friendly telework, and what factors are nullifying it? The critical discussion of the strengths and possible rebounds of telework are presented in this section. What is there to be recommended and what should be avoided in the light of such argumentation? Furthermore, the actual lists of 'ten commandments' of eco-managed telework for employees, employers, and public authorities, as well as ten perilous pitfalls of eco-managed telework, are listed in Appendix 2. The ten commandments are results of a recently completed project on Eco-managed telework (Heinonen *et al.*, 2004) wherein several workshops were organised to encompass the views and comments of various stakeholders.[2]

Eventually, Section 4 will give an analysis made on the eco-managed teleworking precepts and pitfalls presented in Section 3. The ultimate question is, which of today's recommendations for eco-managed telework will require special actions, based on the foreseen knowledge of a given future, and which of the commandments will more easily be followed in the natural course of events (in a given future). The prospective

knowledge each of these futures images contains is therefore recommended to be evaluated and utilised in all the telework policy-making processes. Accordingly, this is a tentative task of futures knowledge management.

2   Culture of work in the four futures images

The four different futures scenarios outlined in more detail below are based intentionally on the same logics of development. They are not meant to present only a simplified analysis on a positive/negative scale between a utopian future and a dystopian future, where the business-as-usual future would lie somewhere in between, as is commonplace in many conventional futures studies. Instead, the ground of development in each of these scenarios is solid economic growth combined with high technology growth. Although the strong economic growth is a constant parameter in each of the futures envisioned here, its division among the different segments of population varies. Correspondingly, even if the technological development is rapid and massive in each future, the nature of its penetration into society and its goals and consequent implications are rather different. Besides, it must be kept in mind that the approaches of each scenario are orientated from the viewpoint of the Western world; they are feasible in that context only.

   The deviation between the four futures is based mainly on different social developments – variations in the working cultures, in security levels, in an individual's status, in education, in technology's role in relation to humanism, *etc.* Thus, the scenarios are meant to present more realistic complex alternatives for the futures images, which are often to some extent extremely positive and to some extent extremely negative. Here we present different combinations of both; positive and negative things are different in each scenario. Furthermore, it must be noted that these futures images provide a roughly structured set of logical and possible pathways to the future. How probable and preferred they are, remains outside the scope of this article and can be estimated by others. The number of possible combinations of social, economic, technological, and environmental developments can naturally result in a vast number of different inherently logical futures.

2.1   Four different futures

Reality A: Fusion Age (2020–2030)
Technology dominates society – with its two derivative futures

It is the year 2030. Development of technology dominates every aspect of life in society. Many new and unexpected inventions and applications have been made in recent years. We call this era the Second Fusion Age. After the Information Age (1990–2010) (Castells, 1996; 1997; 1998; Rifkin, 2001) we experienced the Bio-Age (2010–2020) (see Coates *et al.*, 1997; Glenn and Gordon, 2004,Chap.3; Rifkin, 1998), which developed in a creative process, especially in the fields of biotechnology, gene technology, ICT, and medical technology. The most beneficial outcomes of that era were:

- Affordable and ecological *hydrogen fuel*.

- The new applications for *materials to imitate living organisms*, which provided a whole new family of less expensive and more versatile goods.

- Invention and broad implementation of the so-called *propagating systems*, which refers to closed biological systems where the emissions and wastes of the previous process are used as fuel for the next process. The processes are being put into the chain where photosynthesis, biological or chemical decomposing *etc.* will follow each other to produce different kind of goods with little or no emissions (Kauffman, 2000,pp.81–107, see also Brown, 2002).

- New inventions for *soft or nature-oriented ways to treat medical patients.* These inventions made it possible for an average person to live over a hundred years of healthy life and to work until the age of 80.

Finally, inherent illnesses were conquered with new treatments and new gene therapies, at least in the highly techno-dominated Western world. This, of course, also created extensive growth in the global markets (Oliver, 2000, see also Albrow, 1997 and Axford, 1996).

The second phase of the First Fusion Age (2020–) turned out at least as radically transforming an era as the first phase had been. As the global economy's GDP grew at the rate of over 5% annually (2010–2018), due to the rise of new markets, the ground for the Second Fusion Age was solid. There were overwhelming funds invested in new technical ideas or applications. Thus, some unexpected technological development took place. The new creations in the fields of chemistry, physics, and nanotechnology were finally merged effectively to the previous inventions of the Bio-Age (see *e.g.*, ISTAG, 2001). Robot technology came to be fully utilised in all fields of society. Work, such as hard physical labour in construction, vanished gradually during the 2020s, thanks to construction robots. The first large-scale fusion reactor was built in the year 2020. Consequently, in five years' time, the price of electricity declined over 95% from the level of the year 2000. The price of fuel dropped 85% within the same time frame.

Now in the year 2030, over three million people are living in space settlements. The newest technological pursue is to invent energy-absorbing satellites to optimally utilise the solar energy for the settlements of tomorrow. Moreover, an average family earns more than in the year 2000, but spends less than 5% of their income to housing and less than 1% to travelling, although the housing and travelling have become luxurious compared to the standards of the year 2000. This became possible, owing to diminished prices of energy, materials, robots and construction, as well as a result from implementing propagating-system-based recycling on almost everything.

Future 1: Society driven by security: the first alternative future of techno-dominant society

This description of the future builds upon the previously presented Techno-dominant reality. What if technology would have dominated the whole society's development until the year 2030 as presented, and furthermore, if that would have happened under strong security-driven priorities? The more detailed description of the futures can be found in Appendix 1.

2.2   The culture of work in the security-driven future: work is compulsory activity

The working culture has changed dramatically. There are various indexes and sensors to measure all workers' efficiency in any profession. People are being paid, promoted, and facilitated according to their efficiency and daily performance (see *e.g.*, the Japanese model of 'digital monitoring' by Shimozaki *et al.*, 2004). The same sensors are used for measurements in the office, in public areas, at home, and elsewhere. In the Security-driven future, people need a high-security clearance to be able to travel abroad or within the country. People with lower clearance need special permissions even to pay a visit to relatives in a neighbouring city or to take a stroll in a wealthier area of the same town. This makes having a job a necessity for all citizens, not just for the income but for the individual's social status and therefore freedom. This of course also brings the question of telework into new light.

In an eco-managed model, workers remain mainly in their own neighbourhood and telework as often as possible, due to the security policies more than to ecological awareness. Among all social classes, long-distance travelling takes place only when necessary. The general surveillance is based mainly on high-tech applications, not on military surveillance and supervision. Average people order the goods they need mainly from internet companies or do their shopping in local stores. Minor terrorist conflicts neither cause remarkable loss of resources nor pollute the environment. The use of propagating systems diminishes the amount of waste and emissions. In an eco-disastrous model, the Nomads and other higher social classes are travelling constantly both on the Earth and in space in a way that disregards the environmental issues and the general opinion of the lower classes. People of the lower classes are extremely dissatisfied with the obvious inequality, which is the cause for terrorism and small-scale city wars. Furthermore, average people try to travel to their working places as often as possible, which of course requires large security arrangements. Material equipment, such as fences or bullet-proof vehicles, are used very widely to increase the security level. Mobile surveillance troops are nearly everywhere. Terrorist attacks and small-scale city wars cause constant environmental catastrophes and are a severe waste of resources. The air, soil, and water are becoming more and more polluted. Erosion and desertification are at work at the nonpopulated areas and all population is located in the megacities or around them.

Future 2: Society driven by consumerism: the second alternative future of techno-dominant society

The consumer-driven future bases on the same Techno-dominant reality as the Security-driven, but the priorities are different. What if the technical development would have been driven by the consumers' needs and by the demand for services, *i.e.*, seeking primarily to improve the standard of living?

2.3   The culture of work in consumer-driven future: work is meaningful activity

The working culture has changed in many ways from the year 2000. The time controlling devices are no longer used in most professions. Working is merely a way of entertaining and doing something meaningful, instead of earning the daily bread. There are very few

obligations for the employees on reaching the monthly goals as long as the results are sufficiently satisfactory. There is a broad variety of different technical tools to support employees' work at home. It is widely acknowledged how important it is that especially a worker with family spends the majority of his or her weekly working time at home with the family – not with colleagues. Virtual technology applications, ubiquitous (surrounding) intelligence, *etc.* are utilised very often to maintain connections and networks, and to absorb tacit knowledge.

In an eco-friendly model, people prefer buying services and renting mobility and memberships from all encompassing service companies, instead of buying material goods such as cars. The service companies are implementing the Propagating systems on all recycling, and the use of resources is socially responsible. Telework is common and well facilitated. In an eco-catastrophic model, people use most of their work and leisure time on travelling around the world – always in a fast and luxurious mode. As techno-equipment are affordable, they are also mass-consumed without a real need. There are massive piles of obsolete equipment and wide disregarding of the idea to reduce the use of resources. Especially the ever wealthier people of former developing countries are attracted to all material equipment and goods, which has increased global pollution. The developed countries add to the environmental problem by recycling their old ICT equipment to the developing countries.

Reality B: Talent age (2020–2030)
Human capital dominates society – with its two deriving futures

It is the year 2030. The project of developing the human capital has dominated the society. Numerous new unexpected social innovations and applications have taken place in recent years. We call this era Talent Age (2020–2030) (see *e.g.*, Florida, 2002). Within the framework of sustainable development, the social dimension of sustainability has emerged as a crucial factor, for instance, in urban planning (Heinonen and Lahti, 2002). After the Information Age (1990–2008) there was a short period of the so-called Bio-Age (2008–2020), but that was not technically as radical as it was mentally. The new innovations of the Bio-Age enabled efficient gene therapy, improved forms of education, better understanding of psychology, brain and nerve systems, better understanding of humanity and social networking, *etc.* (Glenn and Gordon, 2004; Oliver, 2000). The final and the most vital input of the Bio-Age was the invention made in the year 2020. That was a Brain Programming Device (BPD), a little DNA-computer chip, which enabled the human brain to learn especially mathematics and languages at sleep through automated conditioning. The BPD, united with new innovations of gene therapy as well as discoveries of psychology and medical science, raised human intelligence and the human capital into new levels. The more intelligent individuals and organisations are the key to an ever increasing economic growth, and better standard of living through improved capacity to manage information and knowledge (see Coates *et al.*, 1997,pp.401–431; Kaye, 1994; OECD, 2002). At the same time, many social and mental problems, such as mental illnesses, child abuse, alcoholism, *etc.* have almost vanished during the Talent Society owing to bio-technically supported social responsibility.

The development of technology has been fairly rapid during the Talent Society, but not an end *per se*. Technology has been merely a supporting and enabling tool for social development.

Future 3: Society driven by intelligence engineering: the first alternative future of human-capital dominating society

The future driven by Intelligence Engineering bases itself on the previously presented reality dominated by the human capital. What if the development of the human capital would have dominated the development of the whole society as mentioned above, and furthermore, if that would have happened with strongly centralised planning? What if the common goal of society would have been the human breeding into *homo humanus* (see Huxley, 1932; Flechtheim, 1972)?

2.4 The culture of work in intelligence engineering-driven future: work is learning

During the past 20 years, the culture of work has changed dramatically. Nowadays, workers are expected to have many new obligations in their timetables, but at the same time many previous obligations are taken away. The amount of the leisure time has diminished somewhat compared to the year 2000. On the other hand, the experts do not any longer have to use much time on physical household tasks as such work is either automated or transferred to professionals. Furthermore, the annual income, abilities to travel, and standard of living have grown rapidly at the same time. Instead of household work *etc.*, people are obligated to study and practice under government and employer supervision for some five hours a day, at home or at various special education centres. At home, employees have virtual home eLearning rooms. There are also some additional obligations such as going once a week to a medical BPD-chip-charging centre for an electronic IQ enhancement. During the treatment the worker sleeps overnight, when the brain absorbs electronically new learning capacities and socially correct mindsetting.

In an eco-friendly model people do not spend their increased wealth on travelling or material equipment, but on eLiterature, eSoftware, eExperiments, ubiquitous technology, eLearning rooms, *etc.* Teleworking is common, and there are much less physical offices far away from homes of employees. In an eco-catastrophic model, the learning centres, domestic eLearning rooms, physical offices are vast, materially well facilitated, and therefore huge energy consumers. People spend their increased wealth to luxurious travelling abroad, as well as to fancy vehicles. Telework is subjugated only to eLearning, not to working itself.

Future 4: Society driven by social networking: the second alternative future of human-capital dominating society

The future driven by social networkers bases itself on the same previously presented Human-capital dominating reality as the one driven by intelligence engineering. The basic assumption of Social networker-driven society is that the creative economy, storytelling, trust, different networks and feminine values have dominated the whole societal development since 2010 (see *e.g.*, Jensen, 1999). This future capitalises on globalisation and on overcoming physical distances and cultural barriers (*e.g.*, O'Hara-Devereaux and Johansen, 1994). The question is, what would this kind of society be like after 20 years of development?

2.5   The culture of work in social networker–driven future: work is networking

Work at home, work in office, mobile working, working in semipublic space, *etc.* were fully merged into one collective working mode in 2020. Nowadays, workers are as nodes of horizontal and vertical networks, and the physical locations make no difference to the working. Physical offices have become very rare, while virtual, semiphysical and symbiotic forms of interaction have become dominant. The working life and the networks base strongly on trust among its members (see Lee-Kelley and Crossman, 2004; Heinonen, 2004). The employee cannot create much individually without the support of the network; efficiency of each employee is estimated according to various approaches, such as the level of the following characteristics: creativity (the number of new ideas per month), connectedness, level of artistic skills and expression, friendliness and support, ability to promote cultural inheritance in the net, learning and teaching in the net.

In an eco-friendly model, employees work through multiple networks, with a nearly total detachment of the physical locations. The eco-friendly telework has here consciously become the dominant mode of teleworking. In an eco-catastrophic model, there are a lot of needs for workers of face-to-face meetings around the world. When there is no need for daily travelling to workplace, people replace the lacking trip to work with multiple journeys in leisure time, such as shopping, visiting friends in neighbouring towns, or just driving for fun.

3   Telework in the framework of sustainable development

Telework means working outside the employee's regular office, either at home, in a telework centre or some other facility, typically utilising information and communication technologies (see *e.g.*, Nilles, 1998; Heinonen *et al.*, 2004). The environmental 'slice' of the 'telework cake' has aroused much appetite ever since telework became known. However, the environmental 'slice' has not been much enjoyed in practice. Instead, the environmental aspect of telework has been largely presented theoretically as part of the liturgy of sustainable development. Appeals to the environmental aspect of telework have been made when motivating the promotion of telework in local agendas or in organisation policies.

Associating telework with environmental issues is thus a very early phenomenon (*e.g.*, Nilles, 1991). Efforts to bring forth the environmental impacts date back to the 1960s in California, USA. However, there are experiences from many countries that advocating telework merely from the environmental point of view does not necessarily bring about the best results (*e.g.*, Mokhtarian, 1998). Instead, telework should be promoted in a holistic framework where environmental motivation is closely connected to implementing telework in its sociopsychological and economic dimensions (Heinonen *et al.*, 2004). This means improving the balance between work and family life (Cullen *et al.*, 2003), uninterrupted working, efficiency of work, and reduced need for office space, *etc.* In this jungle of expectations, shadowed by suspicions concerning telework, we have to try to gain more knowledge on what the specific impacts of telework in each field of life are. Can telework provide solid solutions to the problems of the hectic worklife, as it is argued:

- by *e.g.*, affording flexibility and undisturbed working periods

- by making it possible to combine family life and working life in an optimal way adjusted to the employee's situation

- improving one's quality of life when the stress from commuting is relieved?

Can telework, in fact, improve the quality of the environment at community and society level, while it is claimed to improve the quality of life at individual level? Can telework achieve this by, say:

- reducing the number of trips from home to work

- reducing the energy use and pollution from commuting

- making the dormitory residential areas safer and more lively?

To make the matter more complicated while pondering these questions, one must bear in mind that the interrelations between the impacts and the combined output of such impacts of telework on various key activities in communities are of crucial importance, not just the implications separately. It must be taken into account that there are also quite opposite views and arguments concerning the impacts of telework on transport. The most frequently presented arguments can be presented as follows.

Table 1 Two clusters of arguments representing different viewpoints to the relations between telework and the traffic behaviour

Main hypothesis: Information and telecommunication technologies will replace passenger transportation
Factors reinforcing the hypothesis
The ICTs will replace some of the vehicle traffic because the teleworkers do not have to travel to their offices on 'teledays'.
Several studies have shown that a transfer to telework has reduced passenger traffic.
One of the most important motives in the telework transfer experiments has been avoiding the job commuting.
Factors nullifying the hypothesis
The teleworkers move further away from their jobs and cause just as much commuting traffic as before (fewer trips but a longer commuting distance).
The teleworkers might decrease their commuting but at the same time increase other kind of trips (for example, personal business trips to shops, to friends/relatives, to hobbies).
On some days the teleworker will work both at home and at the traditional workplace.
Other people might fill the space on roads freed by the teleworker, for example if the teleworker's spouse or other family member (who usually uses public transport, two-wheel traffic *etc.*) uses the now available car.

Source: Andersen *et al.* (1997,p.231)

The actual outcome has been monitored in numerous empirical studies, showing a range of transport savings results (*e.g.*, Nilles, 1991; 1998; Balepur *et al.*, 1998). On average, the savings are relatively limited. However, what becomes apparent is that the transport implications are much dependant on the design and management of the telework situation. Most telework initiatives have not been launched primarily for transport

saving reasons, and, consequently, the way the work is arranged seldom supports this effect. As telework is used by a growing share of the labour force, it is relevant to identify in what ways this type of work can lead to an overall transport reduction, and how this may be promoted.

3.1 Potential savings

The savings gained from telework can be calculated if the commuting mode, distance, and frequency are known (Heinonen, 2000; Heinonen *et al.*, 2004).[3] In a hypothetic case where 200,000 Finnish employees who normally drive to work, telework on one day per week, the savings are as follows. The emissions caused by car traffic would decrease (in tons) as indicated in the following table (Harmaajärvi *et al.*, 2004).[4]

Table 2 The potential reduction of emissions (measured by tons/a) through telework per year (200,000 teleworkers on one day/week)

Emission	Reductions (tons/a)
Carbon monoxide (CO)	1300
Hydrocarbons (HC)	190
Oxides of nitrogen (NO_x)	360
Particles	12
Carbon dioxide (CO_2)	29,500

Even if this telework potential does not cause a very large deduction in the total output, the decreased emissions help to diminish the environmental constraints. Every kilometre not driven directly affects the net emissions. Decreasing the total traffic is the most effective way to decrease the emissions from transport.

Table 3 The potential yearly savings gained from telework (200,000 teleworkers on one day/week)

Type of savings	Amount of savings
The number of commuting roundtrips	8.8 million
The time used for commuting	6 million hours
Commuting mileage	170 million kilometres
Driving expenses/socio-economy	24 million €
Driving expenses /private households	50 million €
Accident expenses	3.4 million €
Emission costs	1.7 million €
Infrastructure expenses	Postponement of investment decisions

3.2   Recommendations needed

The general recommendation concerning telework from environmental point of view is that telework should be introduced and implemented in an eco-sensitive or eco-managed way whenever feasible (see specific recommendations in Appendix 2).[5] The possibilities for applying eco-managed forms of telework should be considered at the outset of each telework programme.

3.3   Eco-managed telework instead of eco-disastrous telework

Beneficial environmental impacts from telework are by no means automatic nor self-evident. Unless we use the eco-managed framework for implementing telework in organisations, cities, and regions, detrimental effects are quite plausible. Near at hand – without eco-management – is a worst-case scenario of 'eco-disaster' teleworkers who telework only half the day at home and speed up in their car for the office in the afternoon (Heinonen, 2001; Heinonen *et al.*, 2004). This of course reduces congestion, but does not yield any savings in energy use and pollution. Later in the evening, they drive to the auto-market at the outskirts of the city, generating many vehicle kilometres. In lack of social contacts after working so hard at home in their home office or 'hoffice', they may drive to see friends or go sporting. Sports and socialising in itself is of course quite recommendable for each of us, but from the environmental point of view what matters is when, how, and where people do that. Teleworkers in this environmentally-worst-case scenario need a room both at office and at home, they are not very willing to share the costly office space. They want to have all necessary ICT equipment both at work and home, increasing eventually the amount of computer waste. They cannot organise the material on what they are working, so they need all the reports copied as well, exploiting thus huge numbers of paper resources. Now that teleworking is possible, an employee might also decide to move farther away from the office. The number of commuting days is decreased, whereas the vehicle kilometres with subsequent pollutants and energy use are increased. Even if they drive less frequently to office, when they do drive, it means actually more environmental burden to communities.

   The eco-managed teleworker, on the other hand, is well aware of the environmental impacts of different forms in telecommuting (Heinonen *et al.*, 2004). Together with his or her employer they have agreed on the best practice patterns of work and mobility. They are conscious of the value of eco-managed telework as part of the environmental strategy of the organisation. Telework in this scenario is also integrated as part of the employee's possible propensity towards ecological way of life or environmental-friendly behaviour in general. The key idea in eco-managed telework is that ecologically enlightened organisations should pave the way and provide many incentives for eco-managed teleworking among its employees. The same can be adopted in cities and larger regions as an agreed policy. Those cities, towns, and regions which respond to this challenge of implementing eco-managed telework see telework as an instrument for reducing commuting and congestion and accordingly its environmental burden. However, they try to approach the issue on a holistic scope. Therefore, they are watchful for avoiding possible pitfalls in telework scheme from the point of view of the environment. Such a proactive environmental procedure is *e.g.*, to build ICT infrastructure or its reservations in new development areas when the street or road is already dug open for installing other municipal engineering.

In a recent survey by the Helsinki Metropolitan Area Council (HMAC-YTV), the preliminary results show that a typical teleworker in the Helsinki Metropolitan area is a highly educated and well-off male employee, younger than average (HMAC-YTV, 2001). He lives in a detached house, drives a car to the office; distance from home to the job is longer than average. Does this imply that a teleworker is prone to more mobility when trips to work are reduced? Or, is the diminished commuting a quality-of-life target for a person who is already accustomed or obliged to much travelling? In this survey, 3.6% of all the respondents claimed to have teleworked on the day the questionnaire was concerned with. Of the respondents active in working life, more than 5% teleworked at least one day per week and 13% replied to have teleworked occasionally during the last six months.

3.4 Eco-managed telework in theory and in practice

Eco-management of telework means that regardless the main approach of telework implementation, all applications will be made as environmental-friendly as possible, now and in the predicted future, and as much according to the principles of sustainable development as possible (Heinonen, 2001; Heinonen *et al.*, 2004). This means systematic and conscious efforts towards eco-management of telework.

In theory, eco-managed telework can thus be defined as encompassing the whole field of various technical and functional solutions in adapting telework in a way that is as environmental-friendly as possible. The eco-friendliness of telework can be evaluated by paying attention to four basic settings concerning where, at what frequency, with what techniques and with what motivation telework is being done (Figure 2). These aspects are then connected to other relevant issues such as what is the usual mode of commuting or what are the other patterns of mobility in the household of the teleworker.

Figure 2   Four basic settings of the teleworking mode
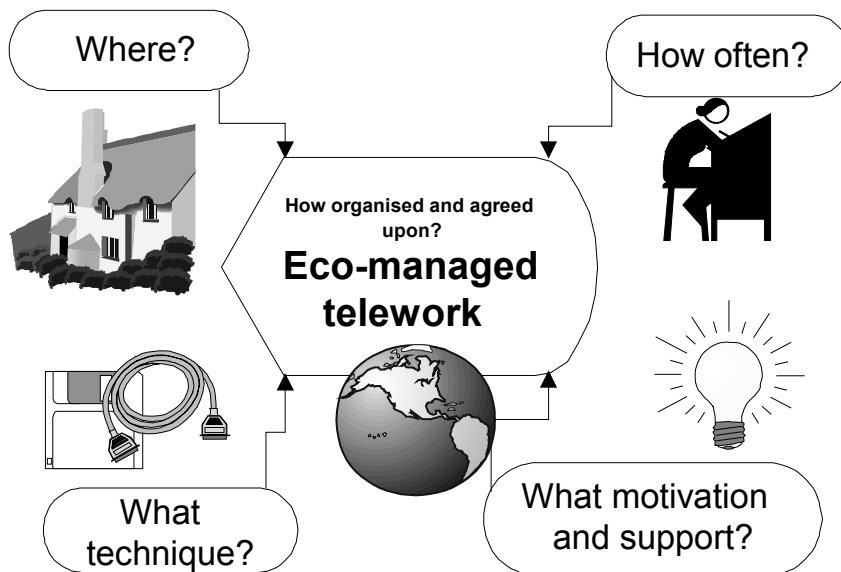
Source: Heinonen *et al.* (2004) and Heinonen (2004)

When the aim is for eco-managed implementation of telework, we could bring forward the areas of concern from an environmental point of view:

- transport

- office area

- space in the home[6]

- equipment.

The relative size of these impacts depends on the setup of the telework, but in general, not only transport but also office area reduction can offer very significant savings when implemented. The extra energy used in the home is marginal, if not a separate building is used. The electronic equipment 'costs' a lot in environmental terms to manufacture, but running costs are low. Often, it is easier to define eco-managed telework in a negation, *i.e.*, as encompassing the whole field of various technical and functional solutions in adapting telework in a way that has as few detrimental environmental as possible.

In practice, we must look in more detail how this eco-management of telework can be achieved. In other words, the concept of eco-managed telework has to be operationalised. Practical tools for promoting telework in an eco-managed form can be given to various stakeholders as recommendations – presented as 'ten commandments' of eco-managed telework:

1   for employees, *i.e.*, teleworkers themselves

2   for employers

3   for policymakers and public authorities.

The 'commandments'[7] or recommendations are presented in Appendix 2 as Tables 4, 5, and 6. They are not presented necessarily in the order of importance. However, they have to be applicable simultaneously in an ideal case. This means that following any of the rules must not hinder following any other rules. In all cases of telework it is not possible or appropriate to follow all the rules. However, the more rules you are able to follow, the closer you are to the eco-management of telework. When communicating with any stakeholders, and with policymakers in particular, you need to be quite clear in your communication. Only the key points and recommendations should be brought forward. In the recommendations there is still abundance of rules, among which the most critical points and rules should be picked out.

When comparing experiences from the Nordic countries it can be pointed out that Denmark was among the first European countries to start giving regulations on telework arrangements. In Denmark, the share of teleworkers grew from 1% to 5–15% of labour force in a few years (Bloch, 2000). One important factor to promote the development was the decision that a computer which employer gives to employee to use at home is not a taxable advantage. In Norway, impacts of telework have been assessed in Oslo and Bergen. The analysis showed that telework has potential to reduce transport and emissions in both regions. The government has included several telework projects into its development programmes concerning labour markets and regional policy. The Norwegian Research Council has financed a comprehensive telework programme 'Project telework'. In Sweden, the government has proposed large state support to a countrywide broadband channel for households and rural areas. The Stockholm county

alone has been estimated to embrace a potential of 300,000 people who could more or less substitute their commuting trips by telework from home (Harmaajärvi *et al.*, 2004). According to Arnfalk (1999) a quarter of a million Swedes telework at least once a week.

4   Assessment of ecological realities of telework in the four futures

In this section, the recommendations for eco-managed telework given in the third section are reconsidered as reflected in each of the four futures presented in the second section. We will give an analysis on what recommendations seem such as they will be taken into consideration and even fulfilled within the natural development logics of a given future image. In addition, we will highlight which recommendations should require closer attention in a given future image, because their message will not or cannot be followed unless some specific measures or steps are taken. The goal is to depict what should be made in each of the futures envisioned in order to proactively create ecologically sustainable realities of telework in different future working vistas.

The symbols represented in each future concerning the recommendations are:

P – The specific commandment requires special actions and policy in order to lead to eco-managed forms of telework in a given future. The recommendations marked with *P* become thus further emphasised.

N – The goal of the specific commandment is more easily attained in the natural course of events in a given future. The recommendations marked with *N* will be more or less fulfilled in the future in question and become therefore less urgent as regards active measures.

The numbers after each letter symbol (P or N) refer to the order of commandments presented in Tables 4, 5, 6, and 7 in Appendix 2: Ten commandments of eco-managed telework for employees (Table 4); Ten commandments of eco-managed telework for employers (Table 5); and Ten commandments of eco-managed telework for public authorities (Table 6). Finally we wish to pinpoint, according to our assessment, the most imminent pitfall for each future that needs special attention. This is done on the basis of the list of ten perilous pitfalls of eco-managed telework (Table 7 in Appendix 2).

Future 1: Society driven by security

Employees: P: 7, 8 and N: 2
Employers: P: 4, 8 and N: 1, 3
Public authorities: P: 5, 8 and N: 7
Pitfalls: 5a

For employees, the recommendations to use the public transportation combined with telework option, and the commandment for employee to extend the vacation at summer cottage with the aid of teleworking periods, get emphasised in the security-driven future (P: 7 and 8). The main driver for this advice is the worsened security situation. There is much need for well-protected trains and buses if employees use public transportation instead of private vehicles, and if they spend as much time as possible somewhere farther away from the dangerous cities. The cottages, however, need more security equipment. Therefore, the commandment to avoid half or partial telework days becomes self-evident in the security-driven future (N: 2).

166

344   *S. Heinonen and T. Kuosa*

The employers are recommended to establish telework facilities for employees living far away from the main office, and to provide regular workers with mass transit tickets as part of their job benefits (P: 4 and 8). Telework will be naturally adapted as a tool to develop human capital within an organisation, as it has become used as often as possible (N: 1 and 3).

The public authorities are advised to promote the use of mass transit tickets, and to guarantee legally equal positions for teleworkers and nonteleworkers in the organisations (P: 5 and 8). The broadband networks will be very common in the rural areas as well (N: 7).

The most severe pitfall standing in the way of eco-managed telework in security-driven society is the fact that employees will need everything as multiple. Security devices are especially needed for work, commuting, home and summer cottage (Pitfall 5a).

Future 2: Society driven by consumerism

Employee: P: 4, 5 and N: 8, 10
Employer: P: 2, 5 and N: 9
Public authorities: P: 2, 5, 4 and N: 7, 1
Pitfalls: 5a

In the Consumer-driven future, the employees are especially recommended to avoid buying multiple telework *etc.* equipment and to minimise technical apparatus in general, despite the overwhelming advertising. Special policies are also needed to encourage people not to move farther away from the office merely on the basis of increased teleworking possibilities (P: 4 and 5). N: 8 and 10 are more easily attained in the Consumer-driven future as working is a meaningful activity, not a compulsory duty. Vacations at summer cottages are naturally extended, and the teleworking periods are chosen according to the employee's own case in a very natural course of events in the given future.

In the Consumer-driven future, employers are advised to adapt telework as a part of sustainable strategy, *i.e.*, not only because of efficiency and entertainment, but also due to environmental issues. More regulation is needed to make employers take proper care of recycling the disposed equipment, and try to restrain the number of unnecessary apparatuses (P: 2 and 5). Almost all other goals are more or less attained in the natural course of event. In particular, teleworkers will have a possibility to include the time used in teleworking at train in their regular working hours in the given future (N: 9).

Public authorities are recommended to set telework quotas for larger organisations, and to reward the best telework-applying organisations in the public sector. Authorities can also be advised to make employees' mass transit tickets feasible, and to provide tax reductions and special rewards for organisations, which promote the location of jobs to outmigration areas (P: 2, 5 and 4). N: 7 and 1 are taking place in the natural courses of events in the Consumer-driven future. This means that broadband networks or a WiFi (wireless open broadband) will be provided in the rural areas as well, and there will be residential areas reserved for telework-housing combinations.

The most severe pitfall is the fact that workers will need everything as multiple. Special data security equipment is needed for work, commuting, summer cottage, and the primary home. The most obvious pitfall of eco-management in the Consumer-driven

future is, however, embedded in irresponsible consuming. As markets are pushing equipment, everything for telework will not be just need on a double, but on a multiple principle (pitfall 5a).

Future 3: Society driven by intelligence engineering

Employee: P: 3, 5 and N: 8
Employer: P: 2, 5 and N: 9, 4
Public authorities: P: 5, 8 and N: 1, 6
Pitfalls: 1 and 5a

In the Intelligence Engineering-driven future the employees are advised to avoid driving on telework days, and to use portable laptops, besides telework for eLearning as well, in different locations. In the given future, there is high risk in the rapidly increased income level. As the use of eCommerce-orientated eSoftware is common and obligated, people might start spending their increased wealth to material objects, luxurious travelling abroad, and to fancy vehicles (P: 3 and 5). Along with many of the other commandments, N: 8 is anticipated to take place in the natural course of events in the future. People will most likely extend the vacations at summer cottages with pre- and post-teleworking periods, because it is affordable, well supported, and an ideal way for employees to better relate to the relaxing natural environment, as the working life is very technology-oriented. This, however, will not be a very eco-managed way of working if portable laptops are not being used as eLearning tools. The employers are advised to adapt telework as a part of business strategy, not only to enhance eLearning and efficiency, but also to pay attention to environmental issues. It is also commanded that the employers take proper care of recycling the disposed equipment, and try to restrain the number of unnecessary apparatuses (P: 2 and 5). N: 9 and 4 are considered to be most naturally attained in this future. Teleworkers are foreseen to have a possibility to include the time used in teleworking, as well as on eLearing, at train in one's regular working hours. Employers allow long-distance commuters to create satellite intelligence clusters working near the homes of these employees.

   The public authorities are strongly advised to promote the use of mass transit tickets and to guarantee legally equal positions for teleworkers and nonteleworkers in the organisations (P: 5 and 8). Along with many other commandments fulfilled, there will naturally be residential areas with space reserved for telework use. The organisations which provide mobile teleworkers the possibility to include the eLearning time at train to their regular working hours, will be favoured in this future (N: 1 and 6.).

   The most obvious pitfall of the given future will be the risk that teleworkers have to make a trip to office even on teleworking days (Pitfall 1). That might happen due to possibly poor organisational skills or due to the fact that going to the BPD chip charging centres are not seen as one working day in the week, but merely as a duty, which everybody has to do once a week before going to work. E-learning equipment for multiple places may also burden the environment (Pitfall 5a).

Future 4: Society driven by social networking

Employee: P: 3, 7 and N: 4, 5
Employer: P: 8, 2 and N: 7, 4, 5, 9
Public authorities: P: 5, 4 and N: 1, 6, 7, 8
Pitfalls: 1, 3

In the Social Networker-driven future, employees have to be strongly recommended to avoid driving and travelling on telework days. That might happen in the natural cause of event, if people prefer eNetworking. However, if they prefer face-to-face meetings on top of other forms of networking, there might arise a risk of eco-catastrophic travelling both in leisure time and in (tele)working days. The use of public transport is also highly recommended with telework option (P: 3 and 7). It can be estimated that there will not be any significant need for buying multiple telework *etc.* equipment, nor an overwhelming need to minimise technical apparatus in general. This is because ubiquitous horizontal and vertical networks supported by ambient intelligence are surrounding people at home, public and semipublic fora, while travelling and working (N: 4 and 5).

Employers are recommended to provide their employees with mass transit tickets for public transportation, and to integrate telework in their environmental strategy (P: 5 and 4). Almost all other commandments are anticipated to be obeyed in the natural course of events, but the commandment seven becomes a special natural condition owing to the inherent value of networking. In this future, teleworkers will not be forgotten nor devalued in any forms compared to any other workers, as all employees are members of the same networks despite the physical locations of individuals. They will have several mobile and stable teleworking facilities at various nodes of their network (N: 7, 4, 5, 9).

Public authorities are encouraged to make sure that mass transit tickets are feasible in the organisations for employees and that the taxation context is favourable to eco-managed teleworking (P: 5 and 4). Nearly all other commandments become fulfilled in the natural course of events in this future. In particular, it can be foreseen that teleworking facilities are taken into account in all residential area planning, as multiple networks are inevitable parts of the whole constructed environment (N: 1, 6, 7, 8).

When working at office, in face-to-face meetings, and commuting as well as spending time at home or at public fora become fully merged, there will no longer be any deviation between telework day and office-work day. This may prompt people to start moving more and more, preferring face-to-face meetings and travelling in general. The most perilous pitfalls of the Social Networker-driven future are the travelling on teleworking days, and the risk of other members of the family to use the teleworker's car, while otherwise they would have used mass transit (Pitfalls 1 and 3).

5   Conclusion

In this article, we first gave an introduction to environmental-friendly telework, *i.e.*, eco-managed telework within the framework of sustainable development and of futures studies. Next, we presented briefly four different possible futures for 2030 (full descriptions in Appendix 1) and the typical working cultures foreseen to prevail in each of the futures. These futures images were based on rather similar economic and technical streams of development. At the same time they represented a broad variation between the futures in social issues and in cultures of work: Society driven by Security,

Society driven by Consumerism, Society driven by Intelligence Engineering, and Society driven by Social Networking.

When presenting telework and its ecological realities in theory and in practice, a systematic analysis of the elements involved was given. It critically argued the hypothesis of environmental-friendly telework, both what factors reinforced such an outcome and what factors were nullifying it. We summed up the conclusions into four lists of commandments as best practices of eco-managed telework. The lists, presented in full in Appendix 2, were concerned with:

1   what the employees can do for eco-managed telework

2   what the employers can do for eco-managed telework

3   what the public authorities can do to promote it.

There was also a list of perilous pitfalls of eco-managed telework to balance out and complete the picture of the proactive recommendations with the ever prevailing threats. The awareness of such pitfalls is expected to help teleworking employees and employers to be prepared to prospectively avoid them.

As an experimental futurist exercise, the whole set of commandments for eco-managed telework, fully presented in Appendix 2, were compared and reevaluated in the light of the proactive knowledge on different cultures of work in the four different future images in knowledge-intensive communities. Thus, the relevance of the commandments for eco-managed telework in each different future was assessed and prioritised. Some of the recommendations were considered to become eventually fulfilled in each future, and some seemed to require purposive policy measures even in the future. The most obvious pitfalls were also pinpointed in anticipation of each future image.

As a result of this futurist exercise, it became obvious that our set of commandments for best practices in eco-managed telework can be used as a dynamic process where each of the recommendations may be more or less emphasised in future societal phases. At the current situation they highlight the road to environmentally managed modes of teleworking. For projecting the assessment of these recommendations onto foreseeable futures, it is possible to proactively prepare policies needed to cope in the changing socio-technical circumstances. The development of various teleworking practices, applications, and modes is not automatically beneficial to the environment. It can be directed towards sustainable forms by making the interrelations between teleworking and environmental impacts more clearly visible by means of these recommendations. Moreover, by regularly reviewing the commandments of eco-managed telework from the point of view of different stakeholders and of different futures, it is at least theoretically possible to influence the practices of telework in organisations. For this pragmatic purpose, it is worthwhile to anticipate in this way the future societal conditions where telework is done in the complex and changing context of living, working, and travelling in knowledge-intensive communities.

References

Alahuhta, P. and Heinonen, S. (2003) 'Ambient intelligence in everyday life: housing', *Report of the Project Ambient Intelligence in Everyday Life (AMI@Life) Funded by the European Science and Technology Observatory (ESTO)*, VTT Building and Transport, RTE 2223/03, Espoo, p.27, http://www.vtt.fi/rte/projects/yki4/everydaylife.pdf

Albrow, M. (1997) *The Global Age: State and Society Beyond Modernity*, California, Stanford: Stanford University Press.

Andersen, H.K., Elberling, M. and Moltke, I. (1997) 'Distance working – motives and barriers: experimenting with the impact of distance working on transportation', *Telework 96 'Working in a Wider Europe', Proceedings of the 3rd European Assembly on Telework and New Ways of Working*, Vienna, 4–6 November 1996, pp.221–233.

Arnfalk, P. (1999) 'Information technology in pollution prevention. Teleconferencing and telework used as tools in the reduction of work related travel', *IIEEE Dissertations*, Lund University, The International Institute for Industrial Environmental Economics, p.1.

Axford, B. (1996) *The Global System: Economics, Politics and Culture*, Cornwall: Polity Press.

Balepur, P.N, Varma, K.V. and Mokhtarian, P.L. (1998) 'The transportation impacts of center-based telecommuting: interim findings from the neighborhood telecenters project', *Transportation*, Vol. 25, No. 3, pp.287–306.

Bloch, L. (2000) 'The Euro-telework project', *National Reports*, Copenhage, Denmark.

Brown, L. (2002) 'The eco-economic revolution: getting the market in sync with nature', *Futurist*, March–April.

Castells, M. (1996) *The Information Age: Economy, Society and Culture*, *The Rise of the Network Society*, Malden, Massachusetts: Blackwell Publishers, Vol. 1.

Castells, M. (1997) *The Information Age: Economy, Society and Culture*, *The Power of Identity*, Malden, Massachusetts: Blackwell Publishers, Vol. 2.

Castells, M. (1998) *The Information Age: Economy, Society and Culture*, *End of Millenium*, Malden, Massachusetts: Blackwell Publishers, Vol. 3.

Coates, J., Mahaffie, J. and Hines, A. (1997) *2025 Scenarios of US and Global Society Reshaped by Science and Technology*, Greensboro: Oakhill Press.

Cullen, K., Kordey, N., Schmidt, L. and Gaboardi, E. (2003) *Work and Family in the eWork Era*, Amsterdam: IOS Press, p.218.

Dertouzos, M.L. (1999) *What Will Be: How the New World of Information Will Change Our Lives*.

Flechtheim, O.K. (1972) *Futurologie*, Historisches Wörterbuch der Philosophie, hrsg von J. Ritter, Band 2, Basel, pp.1150–1152.

Florida, R. (2002) *The Rise of the Creative Class – and How It's Transforming Work, Leisure, Community and Everyday Life*, New York: Basic Books.

Glenn, J.C. and Gordon, J.T. (2004) '2004 state of the future: the millennium project', *CD-rom*, *Normative Scenario for the Year 2050*, Washington, USA: American Council of the United Nations University (UNU), p.23.

O'Hara-Devereaux, M. and Johansen, R. (1994) *Global Work. Bridging Distance, Culture and Time*, San Francisco: Institute for the Future, p.439.

Harmaajärvi, I., Heinonen, S. and Lahti, P. (2004) *Urban Form, Transportation and Greenhouse Gas Emissions. Experiences in the Nordic Countries*, VTT Building and Transport, TemaNord Vol. 540, p.90.

Heinonen, S. (1998) *Analysis of the Finnish Teleworking Population*, Helsinki: Ministry of Labour, http://www.mol.fi/esf/ennakointi/raportit/telework.pdf

Heinonen, S. (2000) *Impacts of Telepresence on Traffic and the Environment*, (in Finnish with an English abstract), Helsinki: LYYLI Publications, No. 21, p.135.

Heinonen, S. (2001) 'Eco-managed eWork as a new urban and regional strategy', *Paper at the Conference Telework2001, Session on Community Developments*, 13 September, Finlandia Hall, p.12.

Heinonen, S. (2004) 'Mobile telework at the crossroads of social, environmental and cultural challenges', *The 9th International Telework Workshop*, International Telework Academy ITA, Crete, Greece, 6–9 September, p.9.

Heinonen, S. and Lahti, P. (2002) 'Sustainable, competitive or good cities – bake a cake or make a fake?', *Futura*, Vol. 2, No. 2, pp.109–121.

Heinonen, S., Huhdanmäki, A., Kuosa, T. and Niskanen, S. (2004) *Eco-managed Telework. A New Deal between Housing, Work and Mobility in Urban Form*, (in Finnish with abstracts in Swedish and English), Helsinki: Ministry of the Environment, The Finnish Environment 701, p.232.

Helsinki Metropolitan Area Council (HMAC-YTV) (2001) *The Present State of Mobility*, (in Finnish) Publications of the Helsinki Metropolitan Area Council, B 10.

Huxley, A. (1932) *Brave New World*, Great Britain.

IST Programme Advisory Group (ISTAG) (2001) *Scenarios for Ambient Intelligence in 2010*, European Commission, Community Research, User-Friendly Information Society. Final Report Prepared by Ducatel, K., Bogdanowiz, M., Scapolo, F., Leijten, J. and Burgelman, J-C., Seville: IPTS.

Jensen, R. (1999) *The Dream Society. How the Coming Shift from Information to Imagination will Transform your Business*, New York, p.242.

Kaye, D. (1994) 'Managing the information revolution', *Futures*, Vol. 26, No. 4, pp.416–429.

Kauffman, S. (2000) *Investigations*, New York: Oxford University Press.

Kitou, E. and Horvath, A. (2002) *E-Commutair - The Telework Impact Estimation Tool. Consortium on Green Design and Manufacturing*, University of California, Berkeley, http://cgdm.Berkeley.edu/telework/

Lee-Kelley, L. and Crossman, A. (2004) 'Knowledge as a shared commodity in the 21st century networked organisations: trust and power as prefects', *The 9th International Telework Workshop*, International Telework Academy ITA, Crete, Greece, 6–9 September.

Mäkelä, K., Laurikko, J. and Kanner, H. (2004) 'Road traffic exhaust gas emissions in Finland. LIISA 2003 calculation software', *Research Report RTE 2814/04*, (In Finnish with an English abstract), Technical Research Centre of Finland, Building and Transport, Espoo, p.50 + apps. p.41.

Mokhtarian, P. (1998) 'A synthetic approach to estimating the impacts of telecommuting on travel', *Urban Studies*, Vol. 35, No. 2, pp.215–241.

Nilles, J. (1991) 'Telecommuting and urban sprawl: mitigation or inciter', *Transportation*, Vol. 18, pp.411–432.

Nilles, J. (1998) *Managing Telework. Strategies for Managing the Virtual Workforce*, New York, p.330.

Organisation for Economic Cooperation and Development (OECD) (2002) *Understanding the Brain: Towards a New Learning Science*, Paris: OECD Centre for Educational Research and Innovation, p.115.

Oliver, W.R. (2000) *The Coming Biotech Age: The Business of Bio-Materials*, New York: McGraw-Hill.

Rifkin, J. (1998) *The Biotech Century: Harnessing the Gene and Remaking the World*, New York: Penguin Putnam Inc.

Rifkin, J. (2001) *The Age of Access: How the Shift from Ownership to Access is Transforming Modern Life*, New York: Penguin Books.

Schwartz, P. (2003) *Inevitable Surprises: Thinking Ahead in a Time of Turbulence*, New York: Gotham Books, p.247.

Shimozaki, C., Kinezaki, N., Watanabe, K. and Matsuo, J. (2004) 'Why isn't it teleworking? A case of flexible work', *The 9th International Telework Workshop*, International Telework Academy ITA, Crete, Greece, 6–9 September.

Taylor, J. and Wacker, W. (2000) *The Visionary's Handbook: Nine Paradoxes That Will Shape the Future of Your Business*, New York: Harper Business, March, p.254.

Tuomi, I. (2003) *Networks of Innovation*, Oxford.

Notes

1   For the rationale of futures studies and prospective thinking as preparation in the face of various – even paradoxical and unexpected – futures, see Schwartz (2003) and Taylor and Wacker (2000).

2   The project of Eco-Managed Telework was carried out within the Research Programme of the Finnish Environmental Cluster of the Ministry of the Environment. The commandments of environmental-friendly telework have been developed in a dynamic process, which can be updated to follow the societal development and to revise the list accordingly. They could thus be introduced to international debate and modified as well as improved to fulfil the needs of eco-managed teleworkers in a sustainable information society.

3   There is another calculation programme for telework developed by Kitou and Horvath (2002) at UC Berkeley, calculating emissions savings from telework. It can be an interesting tool when we start to use emissions trading, see http://cgdm.berkeley.edu/telework/

4   The emission amounts were calculated by the LIISA model, estimating road traffic exhaust discharges and developed at VTT (Technical Research Centre of Finland) (Mäkelä *et al.*, 2004). For the analysis of teleworking population, see Heinonen (1998), http://www.mol.fi /esf/ennakointi/raportit/telework.pdf

5   This was the main argument of the Eco-managed Telework Project, carried out at VTT Building and Transport, presenting three sets of best practices for environmental-friendly telework, http:// www.vtt.fi/rte/projects/yki4/etatyoeng.htm

6   This could include furniture.

7   The term 'commandments' implies that the rules should/must be followed at all times. However, since this cannot be expected to be done in reality, an alternative term commandment is 'recommendations'. The 'commandments' are here used as a compelling and provocative phrase to evoke the idea of social responsibility. The commandments were made on the basis of the results of several case studies within the project on 'Eco-Managed Telework' and discussed in three workshops represented by various stakeholders.

8   See the Swedish recommendations, http://www.utbildning.regeringen.se/eugemutbmal /rapporter/f01.pdf

9   This has been presented as a theoretical assumption in several telework discussions. Yet, there is no empirical evidence to support this pattern. However, other trips such as shopping, day care, taking children to hobbies and school are still there (see Jo Skådemal, Linköpings Universitet, Licentiate's thesis). Some of these other trips can be postponed to normal commuting days. Others have to be made daily.

Appendix 1: Description of four futures

Future 1: Society driven by security: the first alternative future of techno-dominant society

This description of the future builds upon the previously presented Techno-dominant reality. What if technology would have dominated the whole society's development until the year 2030 as presented, and furthermore, if that would have happened under strong security-driven priorities?

It is the year 2030. The war on terrorism has been going on since 11 September 2001. Technology has been developing rapidly, which has provided a very long-lasting and strong economic growth for the Western world's markets. The polarisation has deepened both locally and globally. In the Western world there is a global elite of a few million people of Nomads (three million of them living in space settlements, the rest in gated communities), wealthier middle class, and the majority of lower classes. Despite the strong economic growth, there is a high unemployment rate among the lower class, and their annual income is usually only 10–20% of the income of the upper middle class, not to mention the wealthy Nomads. This has of course caused locally a lot of social dissatisfaction and disorder. Globally, the polarisation has been even more severe. Terrorism, fundamentalism, and organised crime have increased both locally and globally. The global war on terrorism has only deepened year by year. This has had an effect on a variety of things around the world – especially on security and surveillance policies. Biological warfare is a threat posed by terrorists and merged with wide utilisation of mobile wireless ICT, in particular. The authorities make an effort fighting bioterrorism with similar weapons.

People are obligated to carry a microchip under their skin, containing all relevant information about them. It is an ID card encompassing personal data, CV, plus information of the carrier's biometric information. At the same time it is also a bank card, credit card, insurance card, passport (conventional passport to other countries and an access passport to restricted areas inside the country), online health register, communication device, driving licence, navigation tool, *etc.* The public environment is totally covered with observation devices, which read constantly the chips nearby. Paying in stores, trains, or barber shops is fast and easy. All you need is an instant biometric confirmation from your eye, *etc.* It is very difficult, for example, to steal anything from anywhere and not be caught. There are also special police units who are testing the chips with reading tools to reveal any misuse. The laws on the misuse of chips are strict.

The use of microchips, constant surveillance, and big income differences have led to classification of people in public space. There are different compartments, moving pavements, restaurants, *etc.* for people at different security levels. Some unknown foreigners, expected fundamental 'osamabinladens', other violently behaving groups, the most dangerous ex-convicts, *etc.* are in the lowest security class – under armed surveillance. Homeless alcoholics fall in the fourth class. Normal poor unemployed are located in the fifth class. The majority of ordinary citizens travel in the 'middle-classes'. The most respected Nomads, CEOs of large companies, and politicians enjoy the highest 12th class, under heavily armed protection. The digital divide and polarisation of people into the Categories A and B as regards access to information, knowledge, networks, and skills has become a polarisation in terms of security segregation.

Future 2: Society driven by consumerism: the second alternative future of techno-dominant society

The Consumer-driven future bases on the same Techno-dominant reality as the Security-driven, but the priorities of society have been very different. What if the technical development would have been service and consumers' needs – driven, *i.e.*, seeking primarily to improve the standard of living?

It is the year 2030. Most people belong to a wealthy middle class both in the Western world and in the developing countries. However, the figures of annual income are still higher in Western-world countries. The absolute poverty, which was globally quite common in the year 2000, has vanished. The global division of labour has provided better income to all working people in the world and a global minimal social security guarantees for the poorest to survive. The global taxation, Tobin-tax, global lottery, *etc.* collect considerable amounts of money for the International Social Fund (Glenn and Gordon, 2004,Chap.3).

The average income of all working people is +400% higher from the average of the year 2000, owing to a rapid economic growth during the Bio-Age. At the same time variation in the employees' income has somewhat diminished. Three million people live in space settlements, which have been established for experimental use and for preparing humans for longer living and travelling in the space.

Technology has developed rapidly, but at the same time technology has been hidden to the environment more and more (see *e.g.*, ISTAG, 2001; Alahuhta and Heinonen, 2003). Intelligence exists almost everywhere, but that has not been accomplished in a way that would diminish people's privacy. As people do like to live, travel, and work in close harmony with nature, this has also happened. Consumer needs have been drivers of all product and service development (see *e.g.*, Dertouzos, 1999). Instead of buying products, people prefer to buy services and to rent memberships from all encompassing service companies (Rifkin, 2001). Thus, it has been the way of socially responsible consumer-orientated development.

Future 3: Society driven by intelligence engineering: the first alternative future of human-capital dominating society

The future driven by Intelligence Engineering bases itself on the previously presented reality dominated by the human capital. What if the development of the human capital would have dominated the development of the whole society as mentioned above, and furthermore, if that would have happened with strongly centralised planning? What if the common goal of society would have been the human breeding into *homo humanus* (see Flechtheim, 1972)?

It is the year 2030. Human intelligence in new IQ standards has doubled from the level of the year 2000. The true challenge for our education system is to double the creativity level as well. Despite the rapid development of the brain capacity, the level of individual creativity has increased only by 20% (in CL index) from the level of the year 2000. As it is widely acknowledged, that lack of creativity has been one of the major reasons why productivity has not been growing in the past five years. Thus, the major investments of society have been allocated into projects in the field of education research for increasing creativity.

In the Talent Society, selected human breeding plus prebirth gene therapy are both in use, and partly obligated. The government supervises human intelligence and genetic mass breeding. The politically accepted common goal of society is to create, elaborating the futurist and classic ideological thinking of Flechtheim (1972), a better human species, *Homo humanus*, before the year 2050; thus, to create people who are socially and morally better humans and more trustworthy workers and family members, more humane, more caring, and happier. In addition, they are more intelligent, more creative, and more powerful as regards physical fitness: stronger, faster, *etc.*

Future 4: Society driven by social networking: the second alternative of human-capital dominating society

The future driven by Social networking bases itself on the same previously presented reality dominated by the human capital as the future driven by Intelligence Engineering. The basic assumption of society driven by Social networking is that the creative economy, storytelling, trust, different networks, and feminine values have dominated the whole societal development since 2010 (see *e.g.*, Jensen, 1999). This future capitalises on globalisation and on overcoming physical distances and cultural barriers (*e.g.*, O'Hara-Devereaux and Johansen, 1994). The question is, what would this kind of society be like after 20 years of development?

It is the year 2030. After the Bio-Age (2008–2020), it became widely understood what really runs the economy, creates new growth, and makes the most efficient use of the human capital. It is the creativity and teamwork, aided by supporting environments. There are multiple dimensions of human creativity, to be quickly faded or erased away by wrong kind of environments, wrong kind of spurs, and wrong kind of education and communication. Correspondingly, the right kind of stimulus of creativity and the establishment of the right kind of horizontal and vertical networks are the key elements for better use of the human capital (see *e.g.*, Castells, 1996; 1997; 1998; Tuomi, 2003). After all, the human capital is the burning fuel of the rapidly growing talent economy.

The Bio-Age (2008–2020) itself was an important era from the point of view of technology and science development. The most important inventions during the era were, however, the various social applications and innovations. In the technical sense, there were many vital inventions made during the Bio-Age, such as Local Symbiotic Network (LSN), which was invented in 2015. The LSN enables symbiotic actions for different human-machine-(ubiquitous) technology-nature-environment combinations.

After the Bio-Age, the Talent Society (2020–2030) has truly been based on the richness of cultural inheritance, layers, individuals' creativity and know-how, and different combinations of vertical or horizontal networking. Arts and Business were merged for a long time ago into new business models. The education system and the culture of work life were changed in stages into creativity-friendly forms after 2010. The Real Time Teamwork (RTT) was introduced shortly after the invention of LSN in 2015, and it really multiplied the efficiency of teamwork into new spheres. In RTT, not only workers communicate globally in real time, but they are also supported by extensive automatic databases, and by experience devices activating all senses.

Appendix 2: 'Commandments' for eco-managed telework (Heinonen et al., 2004)

Table 4   'Ten commandments' of eco-managed telework for employees

'What can the employees do?' for eco-managed telework
1   Conceive telework as part of eco-sensitive lifestyle.   Be aware of the environmental and economic impact of your commuting.
2   Avoid half or partial telework days (do not travel to office on teleworking days).
3   Avoid car driving on telework days for other purposes (shopping, hobbies *etc.*).   (Car driving should be limited in general, not just on teleworking days).
4   Do not move farther away from your office *merely* on the basis of teleworking possibilities.
5   Use a portable laptop and minimise technical apparatus (avoid double equipment).
6   Avoid copying or printing documents, reports *etc.* as double (one version at the main office, another at home). (Again, printing and copying should be avoided per se).
7   Use public transport combined with telework option.
8   Whenever feasible, extend the vacation at summer cottage by teleworking periods 'pre and post holiday'.
9   Create appropriate teleworking routines - for working times, communication with employer, colleagues, business partners and clients. Consider the risks of telework that are possible in your own case in advance. Will telework increase the risk of burn-out, the sense of alienation, the risk of decreased efficiency? Will these risks create need for travelling?
10   Minimise the risks of telework that are possible in your own case. Choose carefully the teleworking periods and daily rhythm that is the most suitable for you. Take care of your social network and contacts.

Table 5 'Ten commandments' of eco-managed telework for employers

'What can the employers do?' for eco-managed telework
1   Adapt telework policy as part of the development of the human capital in your organisation. Bear in mind, however, that some employees are better suited to telework than some others.
2   Adapt telework policy as part of the environmental policy and strategy in your organisation.
3   Find out the telework potential among your staff as regards employees commuting long distances or hard conditions. Pay special attention to telework potential among those driving by car to and from work.
4   Find out the telework potential of the employees with long commuting distances and living in the same direction. Consider the possibility of establishing a telework facility for them near their homes.
5   Equip your employees with a portable that can be used both at telework and at office. Make sure that the recycling of disposed equipment is done properly.
6   Make sure that there is no unnecessary use of energy at a teleworker's office space (lighting, heating). When the need for extension arises for office buildings, consider fulfiling this need by telework arrangements in connection with reorganising the existing office space. Experiment with *e.g.*, desk sharing, room shifting. Adjust, whenever possible, office space.
7   A teleworker must not be forgotten nor devaluated in any other ways as compared to other employees *e.g.*, as regards career development or exchange of information. Special emphasis must be paid to full-time teleworkers so that they will have access to counciling and to technical support when problems of work process or of communications should arise.
8   Provide regular teleworkers and mobile teleworkers with mass transit ticket as part of their job benefits.
9   Give mobile teleworkers a possibility to include the time used in teleworking at train in their regular working hours.
10   Try telework in your own position and tasks and think about making it as eco-managed as possible. Make the commitment: "I recognise these recommendations very well, and hope that you recognise this fact…"

Table 6 'Ten commandments' of eco-managed telework for public authorities

'What can the public authorities do?' for eco-managed telework
1   When planning residential areas, reserve spaces for common use that can be modified to telework inside the area.
2   Set telework quotas for organisations of certain size (*e.g.*, 10 % for organisations employing more than 150 persons). Reward the best telework-applying organisations in the public sector.
3   In connection with decentralisation, give special attention to possibilities to introduce telework solutions.
4   Tax deductions to organisations permitting telework, and to teleworkers themselves. Special bonus to corporations which promote the location of jobs to out-migration areas (*e.g.,* by establishing satellite offices and telework centres).
5   Make it feasible for organisations to introduce mass transit ticket for their employees.
6   Favour the organisations which give their mobile teleworkers a possibility to include the time used in teleworking at train in their regular working hours.
7   Support building a broadband network outside densely built-up areas, too. In earth construction, reserve space for telecommunication cables.
8   Make sure that the legislation gives an equal position to teleworkers as compared to their nonteleworking colleagues working in the same organisation.
9   Arrange annual telework campaigns during the annually arranged European Telework Week and the Carfree Day.
10 Apply telework in your own organisation and consider what would be the most eco-managed forms of such telework applications.[8]

Table 7   Ten perilous pitfalls of eco-managed telework

1. Due to poor organisational skills you have to go to your office on a telework day.

⇒ The teleworkers makes a trip to work even on teleworking days.

2. Other members of the family ask you to help them in driving to school, hobbies *etc.*

⇒ The teleworker drives other people to various errands.

3. Other members of the family use the teleworker's car, while otherwise they would have used mass transit.

⇒ The savings from teleworker's unmade trip to work will be consumed.

4. Due to alienation the teleworker drives by car in the evening to get social contacts or other activities.[9]

⇒ The teleworker moves more using motor transport during his or her leisure.

5a. The teleworker has double office space, double equipment, double material and generates double use of energy.

⇒ The teleworker wastes resources while needing everything as double.

5b. The managers, colleagues and contact persons tend to forget you on the 'out of sight, out of mind' principle. You will not get necessary information, you might drop off the career development.

⇒ The teleworker will socially drop out.

6. While working at home, the line between work and private life will become blurred and the risk of burn-out is increasing.

⇒ The teleworker works too much.

7. While working at home, your efficciency is decreasing little by little. You have difficulties in concentrating on work.
The TV or the refrigerator become temptations.

⇒ The teleworker works too little.

8. Some teleworkers are not capable of good results in teleworking practices. Therefore, the possibilities of teleworking are restricted in an organisation.

⇒ The lack of trust in teleworking is detrimental to work at large.

9. Your home is not well suited to telework due to lack of space and of quietness. There is no teleworking centre near your home either.

⇒ There is no proper space or place for telework.

10. The teleworker has to pay the costs of teleworking, equipment, telecommunication, furniture *etc.* Other economic 'losses' emerge, such as lunch benefits *etc.*

⇒ The teleworking costs fall on the teleworker alone.

ARTICLE 3

Keskinen, Auli & Kuosa, Tuomo

Citizen-Oriented Decision Making.

Citizen–Oriented Decision Making

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INTRODUCTION

The potential of information communication technology (ICT) opens up whole new sets of concepts and practical solutions to be developed when working with research and development (R&D) on new democratic praxis in the knowledge era (OECD, 2000; Keskinen, 2001). It is not sufficient to try to use ICT as a voting tool without first ensuring universal access to data, information, and knowledge for citizens in order for them to build their knowledge base and, second, to empower citizens to become independent decision-making collaborators. This interactive decision-making approach calls for new models that will complement, evolve, and reform the current representative democracy to better suit the modern needs of rapidly moving and changing societies (Becker, 1995; Keskinen, 1997; Becker & Slaton, 1997).

As many researchers have pointed out, the world of the 21st century is globalized (Albrow, 1997), not only in an economic sense, but also in social, political, environmental, and technical senses (Axford, 1996; Kuosa, 2001, pp. 257–269). The Internet, global media and advertising, and multinational enterprises and brands (Klein, 2001; Florida, 2002) have created a more global consciousness (Rifkin, 2001) supported by rapidly evolving ICT (Castells, 1996, 1998), and a new geographical dimension: cyberspace. Cyberspace can be seen as a complementary dimension with the more tangible social and geographical dimensions. Societies in the developed world have changed dramatically in the past 200 years, and the speed of change does not show any signs of slowing down. Should the old-fashioned representative democracy change along with this process too (Kuosa, 2004; Keskinen et al., 2003; Keskinen, 2004)?

The new decision-making model, presented in this article, attempts to close the gap between the needs of the 19th and 21st centuries by emphasizing citizens' active role in political decision making. This model is based on legally supported participatory citizenship (Barber, 1984), as is the case in the Multiphase Referendum Method, for example. The model focuses on citizens' needs and regards citizens as collaborative decision makers. Political authorities are tied with decisions taken in legally organized deliberative procedures. Thus, this model is called the "Citizen-Oriented Model."

BASIC ASSUMPTIONS OF E-DEMOCRACY RESEARCH

The basic assumptions of the traditional representative democracy are explained in detail by Held (1987). The new models of strong and participatory democracy are extensively discussed by Barber (1984). Further, the most modern deliberative and teledemocracies are discussed and explained by Becker and Slaton (1997, 2000). Hence, we have made the following basic assumptions for research and development of the citizen-oriented democracy:

1. We assume that employing ICT for decision making can contribute to better decision-making procedures.
2. We pursue the transformational politics, which means that our aim is to change existing power structures, from stiff to dynamic, through empowering citizens.
3. We assume that the representative model is still valid, and other models are complementary to this. This does not mean that the present representative model should stay unchanged, rather, it means that different models have their proper uses for different purposes during the total decision-making life cycle. This calls for a conscious process to integrate new, participatory, and deliberative models with the representative one in a new innovative way.

THE CITIZEN-ORIENTED MODEL

The concepts of this model are described in the following section. The most important approach is that different decision-making models can be used in different stages of the decision process. This means that all the models of citizenship are not mutually exclusive, but they play different roles during the life cycle of the process, and,

furthermore, in true democratic fashion, this should also be decided by the citizens.

In the Citizen-Oriented Model, citizens are considered as decision makers with equal opportunities to representative decision makers. The vital difference to all other models is that the citizens set the agenda, not the politicians, so this process should be interactive and based on win-win strategies. However, there has to be a procedure to coordinate this process and avoid contingency/continuous need of voters input. In other words, citizens should, in many cases, be in the role of strategic decision making, and conventional decision makers in the role of executives (OECD, 2001; Becker, 1995; Keskinen, 1997).

Tools of Citizen-Oriented Model

Almost all deliberative/participatory democracy ICT tools can be used in this model as tools of any chosen phase of the decision-making process. Relevant and already used tools can be listed as follows: Internet, text messages, digital TV, local TV and radio, online debates, online polls, citizens' jury, deliberative poll, drawing lot, funnel model, e-vote, multiphase referendum. It is also clear that present state-of-the-art interactive communications methods must be further developed for facilitating genuine dialogue among parties concerned (Carson et al., 2002; Keskinen, 1999; Keskinen et al., 2001).

Examples of Successful Methods in Use

A number of successful methods have already been used throughout the world. Some of these methods can be grouped under the term "deliberative designs" because of their high levels of group interactivity, coupled with thoughtful discussion.

The citizens' jury is one example of a deliberative design and was created by Ned Crosby in the United States in the 1970s. The "jury" is typically selected using stratified sampling in order to match a profile of a given population. The participants (usually a group of 12–20) spend 2 to 3 days deliberating on a "charge" under the guidance of an impartial moderator. Participants have opportunities to question experts and to discuss the complexities of the issue and are asked to work toward a consensus response. Hundreds of citizens' juries have been conducted throughout the world since the mid-1970s, for example in the United States, United Kingdom, and Australia (Carson & Martin, 1999).

Consensus conferences have many similarities with the citizens' jury and have been conducted in Denmark since the mid-1980s. Usually a consensus conference allows more control of the "witnesses" or experts to be called and is organized under the watchful eye of a steering committee. This method often involves preparatory workshops for the participants as well as the final deliberation. Like a citizens' jury, it culminates in a written report. The Danish Board of Technology delivers the recommendations from its consensus conferences to the Danish Parliament. Consensus conferences have been conducted in many other countries, for example, Australia, Japan, South Korea, and the United Kingdom (Slaton, 1992).

Planning cells have been conducted in Germany since the mid-1970s and overcome the weakness of size that is inherent in a small "jury." Peter Dienel who first convened these planning cells typically conducts a series of simultaneous "cells," for example, 20 cells (each with 25 participants), thereby offering validity and reliability with his results (Slaton, 1992).

The deliberative poll was designed by James Fishkin and is even larger in scale. The deliberative poll is an opinion poll with a deliberative element, and Fishkin has conducted a number of these (mostly in the United States, but also in the United Kingdom, Australia, and Denmark). A phone survey is conducted, and then hundreds of respondents are invited to come together at a single location. When they gather, they deliberate on the issue and have an opportunity to work in small groups (each like a citizens' jury or planning cell), also spending time in plenary sessions when experts are questioned. At the end of the gathering (usually conducted over two to three days), participants are surveyed again. There is no pursuit toward consensus, and the responses are individual. The model has been successfully used by Ted Becker and Christa Slaton in the United States, Canada, and New Zealand (Becker & Slaton, 1981; Becker, 1981; Slaton, 1992).

A Selection of Local/Regional E-Democracy Projects and Pilots in Finland since mid-1990s

In the following list, there are some Web sites and other sources listed concerning the various local and regional e-democracy pilots conducted in Finland. Finland is considered to be one of the most modern and advanced countries in developing the use of ICT in the world. For example, eTampere has been internationally rewarded several times for its innovative applications for e-democracy in the City of Tampere, Finland.

- **OSKU:** Citizens' information society based on local resources, *OSKU—Learning Regions Project, http://www.oskut.net/english.html*
- **eTampere:** Ferguson and Baron (2002), *Local e-government now: A worldwide view,* report of Socitm

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I&DeA, June 2002, Executive Summary in *http://www.socitm.gov.uk/Public/international/local+e-gov+International.htm*

- **Selection of Web resources of the city of Tampere:**
    - Home page of the City of Tampere: *http://www.tampere.fi/*
    - Service Information System Project (Palvelutietojärjestelmäprojekti 1994–1998): *http://www.tampere.fi/projekti/pati/index.htm*
    - eTampere program: *http://www.etampere.fi/office/fi/index.tmpl*
    - WWW Service Point on Technical and Environmental Affairs: *http://www.tampere.fi/ytoteto/tepa/palvelup/neuvo.htm*
    - Net Café *Vuoltsu*: *http://www.info.tampere.fi/nettikahvila/*
    - *Vuoltsu* Activity Centre for the Young: *http://www.tampere.fi/nuoriso/vuoltsu.htm*
    - *NettiNysse*—the Internet bus: *http://www.tampere.fi/kirjasto/nettinysse/index.htm*
    - Access points and their locations in the city of Tampere: *http://www.tampere.fi/osallistu/nettipiste/*
    - Maps of Tampere: *http://www.tampere.fi/ytoteto/kami/paikkat/tre/index_uk.html*
- **Netti-Maunula:** *http://www.kaupunginosat.net/maunula/kehittaminen/osku_engl.htm*
- **KuorevESITORI:** Keskinen (1999): *Towards user empowerment, on development of use of ICT in decision making of administrations*, UNI Tampere (1999)
- **Learning Upper Karelia Project:** *http://www.joensuu.fi/ktl/projsoc/infosoc/upperka2.htm; http://www.glocal.fi/unk*
- **Espoo Youth Parliament:** Keskinen (2004): MIDEM (Models for Interactive Decision Making), *EJEG*, May 2004.
- **Varkaus Mobile Parliament:** Viherä and Viukari: A mobile panel to activate social capital: Case study of

the town of Varkaus, Proceedings of e-Challenges e-2003 Conference on October 25, 2003: *Building the Knowledge Economy. Issues, Applications, Case Studies.* Bologna. JOS Press, Ohmsha.

- **Kuusamo City Customer Service:** Ferguson and Baron (Eds.), *Local e-government now: A worldwide view,* Report of Socitm I&DeA, June 2002, Executive Summary, from *http://www.socitm.gov.uk/Public/international/local+e-gov+International.htm*
- **Helsinki Virtual Village—Arabia Shore (Arabianranta) Suburb:** *http://www.helsinkivirtualvillage.fi/Resource.phx/adc/inenglish.htx*; *http://www. wired.com/wired/archive/9.03/helsinki.html*

Multiphase Referendum

As an example for new possible deliberative and citizen-oriented methods, a multiphase referendum is now outlined. This type of approach could be used in local and regional decision-making arenas. The multiphase referendum has been discussed by Auli Keskinen (1997) and is described in Table 1.

The questions arising from this construct then are: where do the citizens participate? How? Who will coordinate the processes? In the case of deliberative and direct democracy citizens will participate through all phases starting from Phase 1. In participatory democracy they will participate in Phases 2, 5 and 6, and in representative democracy only in Phase 5.

New Technological Solutions for Better Citizens' Involvement?

For computer software development, the first and most important tasks in defining and constructing new technological solutions for better citizens' involvement can be stated as follows:

Table 1. Description of a multiphase referendum model and its phases

Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7
Agenda setting: About what will the opinion poll be organized? What for? The aim: binding or advisory?	What will be asked? Background research and results are disseminated. Dialogues, discussions, learning processes, developing the alternatives needed for Phase 3	What are the alternatives for the referendum?	What are the methods used in referendum? Technical solutions, alternative tools for opinion giving?	Referendum process	Presenting and disseminating the results, public dialogues and debates	Decisions based on the results, other actions or recursion starting from Phase 1

- *Task 1*: Create tools for continually collecting and analyzing huge amounts of input information given by millions of citizens. Any kinds of answers, whether they are zeros/ones, multiple hits, etc., must be transferred into simple and understandable tables giving scientifically meaningful figures.
- *Task 2*: Create tools for genuine dialogue. Notice that dialogue means not only information and opinion transfer but also transformation and synthesis of opinions into better common opinion. In dialogue, people are ready to compromise with their opinions in a process of creating new knowledge and new innovative alternative solutions.
- *Task 3*: Create tools for the citizens to monitor decision-makers' actions to add accountability. Text messages, digital TV, etc., can be used for instance. This can include an imperative mandate by citizens, changing representatives online, or anything else. This is an area where more R&D is clearly needed.

CHALLENGES OF CITIZEN-ORIENTED MODEL

The Question of Inclusiveness

Technology development itself is thought to be useful for empowerment increase of citizens in international, national and local levels. However, there are three different kinds of deficits that need to be addressed:

1. **Participation deficit:** Our main interest at the moment is the participation deficit—but there are no legally binding reaction needs for policy makers or noninstitutional decision-making procedures in policy making (Knight & Johnson, 1994, pp. 277–296; Rubin, 2000).
2. **Legal deficit:** Present legislation supporting our current forms of representative democracy has been progressively embedded over 200 years or so, and it has very limited flexibility toward any ad-hoc processes for managing common affairs. Local politics, though, have recently been opened up to more participatory methods, but the pace is very slow when compared to the development of societies, communications facilities, and their diversity (Woolpert, 1998).
3. **Representation deficit:** The representation deficit seems to be very difficult to solve, as long as mainly "elites" participate in deliberation processes and as long as there is limited research on present frames of public spheres. There is a large need for discourse on the role of representative or deliberative process

and how to guarantee inclusiveness in decisions. The development of tools without knowing the citizens' needs is a futile task. Actually, a question of whether citizens use letters to senators or online debates on the Web becomes secondary if the deficits outlined above prevail (Becker & Slaton, 1997; Schmidt, 1993).

The Question of Process

What can be done to activate a sufficient number of citizens to participate in the decision-making process? In order to enable citizens to participate in virtual communities, three requirements are to be filled: access, competence, and motivation (Viherä & Nurmela, 2001, pp. 245–266):

1. **Access:** Citizens must have universal access to information and communications means. Problems in this area include the scarcity or low quality of ICT networking capacity, the digital divide, and other equality deficits. For example, there are many people in developed societies with high Internet connectivity who do not see any need to access ICT.
2. **Competence:** There are many people who do not possess the adequate know-how to use ICT or who do not feel that they know enough about the various subject matters to participate in the public affairs.
3. **Motivation:** Without motivation, citizens will not participate in the affairs of the commons. To be motivated, people need to feel that their opinions are heard and that they can have an impact. They should also be able to feel part of the social community in preparing and agreeing with decisions. On the other hand, the "free-rider" problem decreases the motivation. Some people think that if all is going well without their interference, why should they bother? Also, a very basic social need is human face-to-face interaction and "doing-it-together." This need cannot completely be fulfilled by ICT. In the old days, voting and political farmhouse meetings were part of leisure time and social interaction, whereas today, the participation in politics has to compete with many new forms of social and work-based interaction.

The Question of Outcome

The development of e-democracy is still at an early stage. As societies have changed with the impact of ICT, many new questions have recently emerged in the public discussion and in academic research. Relevant questions to be studied could include the following: Does e-democr-

racy as described by the citizen-oriented model result in different decisions when compared to the more traditional democratic models? How does one define "better democracy" or "better decisions"? A fundamental question is: Has democracy a different content in the emerging future information society from how we perceive democracy operating today? What can be said about ontology (ethical and political questions) of e-democracy when compared to traditional democracy (Keskinen, 2001; Held, 1987)?

FUTURE CHALLENGES

Technically, the future models of democracy are very open, as almost all the current and emerging technologies can be used for implementation of models with increased participation. The question is more a political and social one rather than a technical or operational one: what type of citizenship models do the societies want to develop and for what types of decisions? The Citizen-Oriented Model can be created in technological or political sense, but is this type of participation wanted, and by whom and for what aim? More participation in every decision is not necessarily compatible with an efficient modern state, even a democratic one. The great challenge of the future for societal decision making is how to incorporate in a democratic manner the self-organizing ad-hoc decision making with the representative official decision-making processes (Rättilä, 1999; Becker & Slaton, 1997; Woolpert, 1998).

The basic elements of the teledemocracy paradigm for the 21st century are as follows (Becker & Slaton, 2000):

- Global direct democracy movement
- 21st century democratic communications methods— horizontal and interactive
- Modern mediator movement—heterarchy and transformational politics
- Internet-based transformational political organizations

Furthermore, much more tailored ICT tools are needed to create forums for public dialogue in accordance with the new needs of the 21st century. Should democracy be about creating the forums that encompass interested and motivated citizens as well as responsible political and societal decision makers, who form today's social network working for our common issues (Keskinen, 2001)? In this sense, it is useful to consider the words of the famous democracy advocate Benjamin Barber: "We must together govern our societies ourselves; there is no one else to govern for us."

REFERENCES

Albrow, M. (1997). *The global age: State and society beyond modernity*. Stanford, CA: Stanford University Press.

Axford, B. (1996). *The global system: Economics, politics and culture*. Cornwall: Polity Press.

Barber, B. (1984). *Strong democracy*. Los Angeles, CA: Berkley.

Becker, T. (1981). Televote. Measuring public opinion on complex policy issues. *Political Science 33*(1, July).

Becker, T. L. (1995). Etä-äänestämisestä teledemokratiaan—kokemuksia USA: sta ja Kanadasta. In A. Keskinen (Ed.) & Interaction Group: *Teledemokratia - tietoverkot ja yhteiskunta*, SILTA-sarja, Painatuskeskus Oy, Helsinki.

Becker, T. L., & Slaton, C.D. (1981). Hawaii televote: Measuring public opinion on complex policy issues. *Political Science* (NZ).

Becker, T., & Slaton, C. (1997). *Transforming modern representative democracy via advanced telecommunications. Voting from the home. Deliberative polling. Electronic town meetings. The Internet*. FUTU Publications, 7/97, Finland Futures Research Centre, Turku School of Economics and Business Administration. Available at *http://www.tukkk.fi/tutu/Julkaisut/futu/FUTU_7_97.pdf*

Becker, T., & Slaton, C. (2000). *The future of teledemocracy*. Westport, CT: Praeger.

Carson, L., & Martin, B. (1999). *Random selection in politics*. Westport, CT: Praeger.

Carson, L., White, S., Hendriks, C., & Palmer, J. (2002). Combining a televote and citizens' jury in a legislative review. In *The drawing board: An Australian review of public affairs*, 3(1, July). Available at *http://www.econ.usyd.edu.au/drawingboard/*

Carson, L., White, S., Hendriks, C., & Palmer, J. (2003). Combining a televote and citizens' jury in a legislative review. In J. Font (Ed.), *Citizen participation in public decision-making*, Institut de Ciències Polítiques i Socials, Barcelona.

Castells, M. (1996–1998). *The information age: Economy, society and culture, Vol. 1–3*. Malden, MA: Blackwell.

Ferguson, M., & Baron, F. (2002). *Local e-government now: A worldwide view*. Report of Socitm I&DeA, June.

Florida, R. (2002). *The rise of the creative class—And how it's transforming work, leisure, community and everyday life*. New York: Basic Books.

Held, D. (1987). *Models of democracy*. Cambridge: Polity Press.

Keskinen, A. (1997). Teledemocracy. Contribution for G7GOL. In S. Clift & O. Östberg (Eds.), White paper on electronic democracy, Report for G7 + EU Information Society Pilot: Government On-line (GOL). Available 1997, 1998, at *http://www.statskontoret.se/gol-democracy*

Keskinen, A. (1999). *Towards user empowerment. On development of utilisation of information and communications technology in decision making of administrations*. Studia Politica Tamperensis, No. 6, Tampere University. Available at *FUTU/KeskinenAuli.pdf*

Keskinen, A. (2001). Decision making and information networks. In A. Keskinen, T. Becker, C. Slaton, T. Ohlin, & M. Schmidt (Eds.), *Future democracy in the information society, FUTURES, 33* (3–4), 339–370, Elsevier Science.

Keskinen, A. (2004). MIDEM. Models for Interactive Decision Making, *EJEG—Electronic Journal of e-Government*, May.

Keskinen, A., Aaltonen, M., & Mitleton-Kelly, E. (2003). *Organisational complexity. Foreword by Stuart Kauffman.* FFRC Publications, 6/2003, Finland Futures Research Centre, Turku School of Economics and Business Administration, Helsinki, November. Available at *http://www.tukkk.fi/tutu/Julkaisut/pdf/Tutu_6_03.pdf*

Keskinen, A., Becker, T., Slaton, C., Ohlin, T., & Schmidt, M. (2001). Future democracy in the information society. Symposium in *FUTURES, 33*(3–4), 339–347.

Klein, N. (2001). *No logo*. London: Flamingo.

Knight, J., & Johnson, J. (1994). Aggregation and deliberation: On the possibility of democratic legitimacy. *Political Theory, 22*(2, May), 277–296.

Kuosa, T. (2001). Globalisaation käyttöala Suomessa. [The extension of globalisation, in Finnish]. *Politiikka* 3/2001, 257–269.

Kuosa, T. (2004). Yhteiskunnallisen murroksen kipupisteitä [Painspots of societal transformation, in Finnish]. *Futura* 2/2004, Helsinki.

OECD. (2001). *Citizens as partners: Information, consultation and public participation in policy-making*. Available at *http://oecdpublications.gfi-nb.com/cgi-bin/OECDBookShop.storefront/P/Product/View/42200113UE5*

Rättilä, T. (1999). Kaksi näkökulmaa poliittiseen osallistumiseen: performatiivinen politiikka ratio-naalisen tyylin haastajana (in Finnish). In Lappalainen Pertti (toim.), *Tyylikästä kansalaisaktiivisuutta*. Julkaisuja 11/1999. Tampere: Tampereen yliopisto. Politiikan tutkimuksen laitos, pp. 48–64.

Rifkin, J. (2001). *The age of access: How the shift from ownership to access is transforming modern life*. New York: Penguin Books.

Rubin, A. (2000). *Growing up in social transition: In search of a late modern identity*. Annales Universitatis Turkuensis. Ser. B. Tom. 234. Humaniora. University of Turku, Turku.

Santa Fe Institute. (2001). Available at *http://www.santafe.edu/sfi/indexResearch.html*

Schmidt, M. (1993). *Direkte demokrati i Danmark—om indførelse af et elektronisk andetkammer* (in Danish). Copenhagen: Nyt Nordisk Forlag Arnold Busck.

Slaton, C.D. (1992). *TELEVOTE. Expanding citizen participation in the quantum age*. New York: Praeger.

Viherä, M.-L., & Nurmela, J. (2001). Communication capability as an intrinsic determinant for information age. *FUTURES, 33*(3–4), 245–266, Elsevier Science.

Woolpert, S., Slaton, C. D., & Schwerin, E. (Eds.). (1998). *Transformational politics*. Albany: State University of New York Press.

KEY TERMS

Access: Access is one of the three preconditions for citizen participation in e-democracy (access–competence–motivation). Access to communication involves existence of technical and logical access point, communications device, and permission to access.

Citizens' Jury: The citizens' jury is a group of people selected for preparation of public opinion. The jury is typically selected using stratified sampling in order to match a profile of a given population. The participants (usually a group of 12 to 20) spend two to three days deliberating on a "charge" under the guidance of an impartial moderator. Participants have opportunities to question experts and to discuss the complexities of the issue and are asked to work toward a consensus response.

Citizen-Oriented Model: In a citizen-oriented model for e-democracy, citizens are considered to be decision makers with equal opportunities to reach representative decision makers. In this model, the citizens set the agenda,

not the politicians, or this process is interactive and based on win-win strategies. However, there has to be a procedure to coordinate this process and avoid the continuous need for voter input. The citizens should be able take part in strategic decision making, while "conventional" decision makers take the role of executive decision makers.

Competence: Competence is one of the three preconditions for citizen participation in e-democracy (access–competence–motivation). Communications competence means that a person has the ability to use channels of communication, opportunity, access, and skills to use the devices involved and to formulate messages.

Deliberative Poll, TELEVOTE: Deliberative poll or TELEVOTE is a scientific public opinion poll with a deliberative element. Generally, a phone survey is conducted, then hundreds of respondents are invited, using statistical sampling technology, to come together at a single location, or they are asked to deliberate among themselves and with other interested people and form opinions. When they gather, they deliberate on the issue and have an opportunity to work in small groups (each like a citizens' jury or planning cell), also spending time in plenary sessions when experts are questioned. At the end of the gathering (usually conducted over two to three days), participants are surveyed again. There is no movement toward consensus, and responses are individual.

E-Democracy, Teledemocracy: E-Democracy means the use of modern information and communications technologies as instruments to empower the people in a democracy to help set agendas, establish priorities, make important policies, and participate in decision making and implementation in an informed and deliberative way.

Electronic Town Meeting (ETM): In an electronic town meeting, there is discussion, deliberation among ordinary citizens, and a vote that determines the outcome.

Electronic media are used to facilitate the process. Generally, a combination of several electronic means is used: interactive TV, interactive radio, scientific deliberative polling, telephone voting, mobile phones, plus a wide variety of face-to-face meetings. The focus of the process is on problem issues or on involved planning or envisioning processes. ETM can be conducted at local, regional, or national levels.

Empowerment: Empowerment is a process of transferring power to enable people to govern their lives, not to gain power over other people or events. People are empowered when they are given the authority to make decisions in their daily work, using their own judgement to take apt actions in new situations, rather than consulting management.

Motivation: Motivation is one of the three preconditions for citizen participation in e-democracy (access–competence–motivation). The sender and recipient of communications must have a reason for sending messages and learning new skills. Human needs for self-expression, attachment, societal interaction, association, and control of one's own life are motivating reasons. In addition, to be motivated, people need to feel that their opinion is heard and can have an impact on decisions. Without motivation, citizens will not participate in the public issues.

Referendum: Referendum is a public opinion poll, where local, regional, or national authorities offer citizens the possibility to vote on a specific issue, generally on two alternatives—yes or no. The multiphase referendum uses deliberative agenda setting, feedback processes, and multiple choices.

Teledemocracy: See E-Democracy.

Televote: See deliberative poll.

ARTICLE 4

Kuosa, Tuomo

A Few Extensions to Path-Dependence and Emergence in Complex Social Systems.

Academic

A few extensions to path-dependence and emergence in complex social systems

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Eve Mitleton-Kelly has summarized the theories of complexity into five categories. Four of the categories arise from various natural sciences studying complex systems, and the fifth one mostly arises from economic and social studies, which deal with social systems path-dependence, increased returns and emergence. Mitleton-Kelly raises Brian W. Arthur's theory into the core of that fifth research area of complexity research. With this article, I want to broaden our understanding related to that area. Therefore, I here discuss three additional inter- or transdisciplinary theories, which deal with the same themes. The theories are: Malaska's theory, Naisbitt's theory, and the Theory of energy as the driver of all societal transformation. The theories may be considered as additional benchmarking views for the fifth area, or even its new independent parts.

Introduction

The theories of path-dependence and emergence in societal transformation will be in the focal point of this article. A dissection will be made in respect of Eve Mitleton-Kelly's (2003: 23-50) description of complex social systems theory, where the main research areas of complexity and its general characteristics, e.g., path-dependence and emergence, are discussed.

In her article, Eve Mitleton-Kelly has presented ten generic principles of complexity, which are: 1. Self-organization, 2. Emergence, 3. Connectivity, 4. Interdependence, 5. Feedback, 6. Far from equilibrium, 7. Space of possibilities, 8. Coevolution, 9. Historicity & time, 10. Path-dependence. As she wants to point out, all these characteristics together incorporate more than *complex adaptive systems* (CAS). That is why she has established a more appropriate term *complex evolving systems* (CES) for describing both the creation of new

order, and coevolutions within this whole social "ecosystem".

Alongside with the ten generic characteristics of complexity, Mitleton-Kelly (*ibid.*) has pointed out five main areas of complexity research, which are either under natural sciences or social sciences. The research areas under natural sciences are: 1. Dissipative structures, chemistry-physics (e.g., Prigogine 1984, 1989); 2. Complex Adaptive Systems, evolutionary biology (Kauffman, 1993, 1995); 3. Autopoiesis and Self-generation, biology/cognition (e.g., Varela & Maturana, 1992); and 4. Chaos theory. Under social sciences she has located Niklas Luhmann's (1990) work on autopoiesis' applications to social systems, and Lane & Maxfield (1997), Parker & Stacey (1994), and Stacey's (1995) work on strategy within complex social systems. Here, in relation to social sciences, Mitleton-Kelly especially emphasizes Brian Arthur's (1990, 1995, 2002) theory of path-dependence and increasing returns in economics, which she raises as the fifth main research area of complexity research (c.f. Hodgson, 2001).

The above lists and discussions around them (Mitleton-Kelly, 2003: 23-50) have formulated the theoretical framework for this article and predefined my approach. Hence, the article focuses on that fifth area of complexity research, path-dependence (and social emergence) and increasing returns in economics.

I think it is important to add new points of view and extensive information on the theme because I believe there is in general, firstly, not enough research that combines the approaches of complexity and social sciences, and, secondly, it is important to map the state of the art and its different angles in the field to be able to understand it further. Many processes, logics, and findings may remain hidden or unformulated to us as long as we are staying inside a single ontology – whatever it may be. It has been told that Albert Einstein used to

emphasise the necessity of using at least three totally different points of views with any issue that one might truly want to understand. That is also my understanding here, and therefore, I would like to recommend us to prefer the use of many additional inter- or transdisciplinary approaches, when we try to understand for instance the issues of social complexity, path-dependence, or societal emergence.

Thereby, I propose the following three inter- or transdisciplinary approaches as extensions to the fifth research area:

1. Pentti Malaska's theory[1] - funnel model, bifurcations, extensive, intensive and regenerative growth - emerging germs or seeds driven future;

2. John Naisbitt's theory - platforms, pieces, and bottom-up socio-technological demands - great masses driven future, and;

3. The theory of energy as the driver of societal change and emergence (e.g., Harold F. Blum, Jeremy Rifkin, Steven Johnson, McNeill & McNeill).

These three approaches are inter- or transdisciplinary in the sense that those are not in the fields of complexity research nor social science as such, but merely represent something else. But before going to the proposed extensions, I will briefly present the ground or the state of the art of the fifth research area, as discussed in Mitleton-Kelly (2003).

Path dependence and increasing returns by Brian W. Arthur

Brian W. Arthur's (1990, 2002) theory firstly argues the conventional principles of economics, which imply that in any growth curve there is an equilibrium point that is reached by negative feedback loops and diminishing returns – c.f. stabilizing effects. Thereby, conventional economics often works according to the principle of *ceteris paribus*, in which only certain factors are taken into con-

1 Here I call these approaches as theories. Whether they are full-fledged scientific theories or merely high quality summaries or popularizations, I will leave for the reader to judge.

sideration, while all the other factors that affect the phenomenon are closed outside. Here, the example given by Arthur is the high oil prices of the 1970's, which used to be explained by negative feedback loops and diminishing returns. Thus, high oil prices turned into lower level by early 1980's, owing to energy conservation and increased oil exploration, which caused a predictable increase in supply. In this classical case the conventional principle operated correctly, but very often the case is not such (Mitleton-Kelly, 2003: 38-40). Stabilizing forces do not always operate or dominate, instead positive feedback loops sometimes magnify the effects of a small economic shift, and increasing returns from positive feedbacks create many possible equilibrium points depending, of course, on the negative feedback loops that may also operate and stabilise in the same system simultaneously. For instance, early small gain in market share would improve the competitive position of one system and help it further increase its lead, which happened in the even match between Beta and VHS formats. Here, increasing returns refer to the increasing pull of new technology in the markets – if there starts to be more products, more friends using them, more retailers and support services etc. around one format, a self-reinforcing growth process has been started. This entity is a process, which Arthur calls path-dependence (Arthur, 1990).

To continue, Mitleton-Kelly (2003, 39) points out that "in physico-chemical systems, two or several simultaneously stable states could coexist under the same boundary conditions." Furthermore, as in physics, one given parameter can evolve to more than one stable states (Nicolis & Prigogine, 1989: 24). In other words, it is possible to say that past history affects future development, and there may be several possible paths or patterns that a system may follow. Therefore, future is not deterministic, not even in cases where there exists a set of strict boundary conditions, but the past does determine the possibilities or the possible patterns of the future to some extent (Aaltonen & Sanders, 2006). When it comes to economic transformation, it means that "markets and economies are complex systems

that coevolve, and dissipative (in the sense that they are irreversible and have a history), show emergence which refers here to self-organization + creation of new order (Kauffman, 1995), and explore their space of possibilities. As all these characteristics play out, the progression of any technology or market is not smooth" (Mitleton-Kelly, 2003: 39). As a conclusion, Arthur's first arguments on conventional economics can be defended, at least to some extent, by the selected findings from physics and complexity research.

To go back to Arthur's theory, he wants to show that there exists a constant interplay between positive and negative feedback loops, which are moving markets between periods of expansion and stability. He also emphasizes coevolution in the markets, the exploration of the adjacent possibilities and the emergence of new order in his theory (*ibid*.). In brief, he claims there have been technological, economical and societal eras, epochs and revolutions that were started with one or more technological innovations that eventually enabled a whole new cluster which finally changed the way entire business is done and society is conducted. Here, he provides examples, e.g., oil refineries, electrification, automobile production lines, modern assembly methods (Arthur, 2002).

At first, the new technology clusters attracted little notice, but later on they started to achieve successes in early demonstrations. Small companies may be set up based on the new ideas, and as the success increased, the competition became intense at this early turbulent phase. Eventually, when the promise of large profits becomes apparent, the public may start to speculate, and finally the speculation itself may have become a self-reinforcing process in the economy and the whole society. In certain cases this first exuberant phase is marked by a crash, for instance, railway industry crash in the UK in 1847; the Canal Mania of the 1790's; and the recent Internet crash (ibid). To conclude Arthur's point, he wants to show with his examples that an analogy between different historical phases can be drawn. At first, new clusters have often been ignored. In the second phase, there have been self-reinforcing speculations around the new clusters, then

the crash might have taken place, and finally a broad economic and technological growth around the speculated cluster has proceeded in the whole society. Hence, the latest finding of Arthur (2002) promises us that the major part of the economic growth due to Internet crash is yet to come.

View 1: Path-dependence and emergence in Malaska's theory

Arthur's theory and approach seems to contain many ontological similarities and mutual starting points with Malaska's understanding and theory. As the basic elements of Arthur's theory are technological innovations as seeds of new clusters of markets; periods of market stability and expansion; feedback loops; and emergence of new order and new logic of markets and society, Pentti Malaska's Funnel Model seems to be another organized way to present the same basic ideas. Malaska's theory's basic elements are a source (a germinating embryo/seed), nucleation, bifurcation[2], extensive exponential growth, intensive growth, cultural evolution, and the emergence of (eras) or "societies" with different kind of needs, occupations and modes of production. I have discussed and compared Malaska's theory to other theories of societal change more thoroughly in (Kuosa, 2005a).

In Malaska's theory, bifurcation refers to a branching point of development, where the critical mass of one kind of development reaches a peak and starts to lose its dominance and thus leaves room for something new to emerge. The bifurcation of the agricultural world leads to the industrial one. However, some nations have never reached this bifurcation point and perhaps never will. The term "post-industrial" society refers to a major bifurcation from industrial society to a new kind of society, that differs from industrial society

2 The origins of the word bifurcation is in physics and chemistry, where it refers to a point in which the matter can no longer evolve in its path and is therefore determined to change its state into another form. As a loan word for futures studies, which Malaska represents here, it means as well any phase where one path can not continue and there is a necessary transition period in the evolution of the issue.
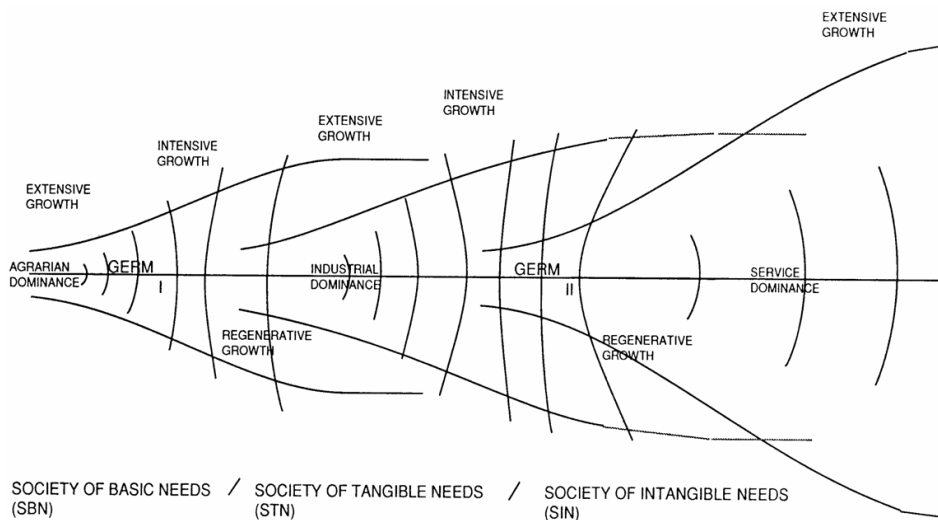
Figure 1 *The Transformational Dynamics of Societal Change. (Source: Malaska 1991b, 308).*

as much as ours differed from the previous agricultural one (Malaska, 1991a: 137-8).

According to Malaska (*ibid.*), any major bifurcation requires a source (a germinating embryo/seed) to begin the bifurcation process. The germination serves two purposes for development. Firstly, it has to benefit the dominant production mode, in particular it has to increase its productivity and efficiency. This has applications beyond its initial use and produces a new form of activity. This activity is very different to and, in a way, external to the dominant production mode itself. By producing new means (e.g., software, hardware) for the dominant mode, a cross-catalytic effect then transforms the dominant sector from a stage of extensive growth to one of intensive growth. During the period of intensive growth wealth and welfare are accumulated and thus new societal needs are created and can also be satisfied. These new needs stimulate a chain reaction in the developmental process. The other function of the activity based on the germination of the idea is autocatalytic growth that leads to it taking the role of the dominant production mode in society for satisfying new and old needs. This process, which Malaska calls the Chain of Development, and the transition periods between the different types of growth,

is illustrated in Figure 1. In the figure, the succeeding societies are classified according to their core needs, as; societies of basic needs (SBN), societies of tangible needs (STN) and societies of intangible needs (SIN) (see Kuosa 2005a).

The society of tangible needs

The intensive growth in agriculture leads to more and more economic growth and income from sources sectors other than agriculture. The contributing sector embraces a seed or a source, from which the new regenerative growth begins, these seeds then develop over time into the new dominant form (Malaska, 1991a: 145-8).

In a Society of Tangible needs, i.e., in an industrial society as we know it, goods are produced most efficiently by organized, large-scale industry where Fordism and Taylorism are embedded. Production is not based on craftwork as it was in the agricultural society. Industry and industrial progress facilitate the more immediate satisfaction of tangible needs for more people. Thus, the beginning of the industrial revolution began a time of strong extensive growth in the Western world's industry, when resources were not spared. Later on industrialists and politicians effectively re-
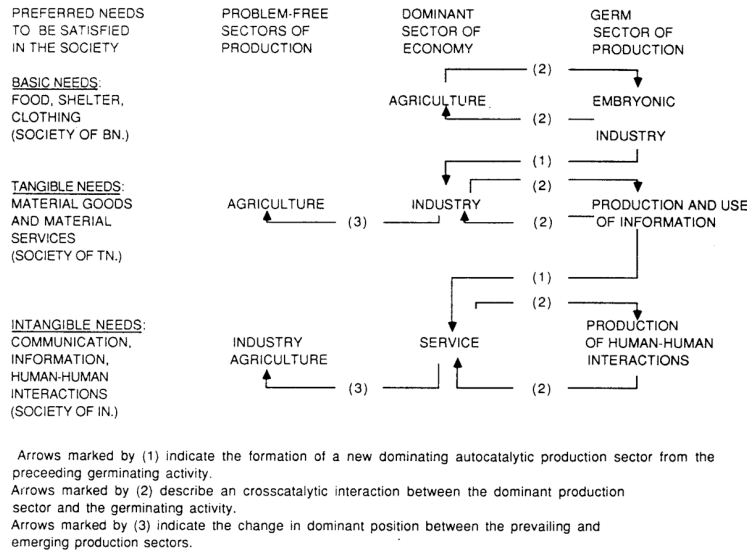
Figure 2 *The Process of Societal Transition. (Source: Malaska, 1991a: 141).*

designed its reality-concept and the values it created and finally industrial society began its intensive growth period (*ibid*.).

Intensive growth in industrial production means a stage, where the aim is to produce more from less: to save capital, labour, raw materials, energy, the environment and at the same time improve quality and service. (*ibid*.). According to Malaska, this happened in the 1970s (Malaska refers to Jean Voge, 1983 – which I haven't found). Now the world's societies are in, or are approaching a period of regenerative growth before a radical new development of society. New needs are emerging simultaneously with rapid improvements in productivity, in the dominant manufacturing industries as is the appearance of new production methods and new services (Malaska, 1991b: 312).

Emerging societies

In Figure 2 Malaska illustrates his idea of emerging societies. The arrow marked (1) indicates the formation of the renewed growth in the dominant production sector that resulted from the first germination of new ideas. The idea is created in the first place to benefit the present production mode and its increased productivity. Arrow (2) marks the forming of cycles, which describe the auto-catalyzing interaction between the dominant production mode and the functions of the new idea(s)- in short the dominant sector moves away from a state of equilibrium. Arrow (3) describes the crisis situation in which industry follows agriculture and becomes an unproblematic branch of production in the post-industrial society of intangible needs and indicates the changing of the dominant form of societal production.

View II: Path-dependence and emergence in John Naisbitt's theory[3]

According to John Naisbitt (2004), societal revolutions emerge rarely and always in clusters. The future is like a picture puzzle. It has its pieces, platform and its borders. As there are borders, the space for

3 The view expressed here do not necessarily reflect the total position of John Naisbitt. I have combined and interpreted the subject of the theory mainly from four different sources: 1. John Naisbitt's (2004) full day seminar presentation, which I wrote a report; 2. Mika Aaltonen's (2007) chapter 6, where Naisbitt's theory is discussed. 3. Discussions with Aaltonen, and Aaltonen's discussion with Naisbitt; 4. Naisbitt's books.

the pieces in puzzle is therefore limited. The platforms are established or enabled by certain drivers or catalysts, which emerged inside a previous phase of development. These drivers or catalysts determine both the general direction of development and the types of pieces looked for in the puzzle.

Inside one puzzle or phase of development, the transformation is steady once it has been started. There is a demand for a certain type of pieces in the puzzle, and other kinds of pieces are rejected, as they do not fit in. The pieces that are strongly looked for may be social ideas or technological innovations to solve a certain problem, demand or bottleneck of development. The pieces that are rejected may be ideas ahead of their time, or any other initiatives that do not gain support or demand by the platform's already existing pieces or its drivers. As the puzzle is general and represent the whole society, its pieces vary throughout all sectors of society. They may be related to politics, economics, geography, values, technology, natural environment, science, military, psychology or anything else (see picture 3). According to Naisbitt (*ibid.*), one may pick up any piece from the puzzle – regardless of whether the issue is big or small – to look at it more carefully, study its relations to other pieces, and then put it back to the puzzle. Thus, from the point of view of the whole puzzle, "smaller and larger issues can both be evaluated in detail according to the potentiality they represent and whether they are expected to change or remain as they are" (Aaltonen, 2007: Chapter 6).

The platforms construct chronological layers, where the newer and further developed layer could not exist without its historical less developed phases (see picture 4). Both between and inside a puzzle or a platform, the development alternates between "slowing bottlenecks" and phases of their solving. First, easier bottlenecks are solved, then the more demanding ones can be solved, but only if the time is ready for it. Hence, there can be said to be a strong belief in path-dependence in future's societal transformation in Naisbitt's (2004) theory.

Naisbitt understands the transformation of the future as a process towards qualita-
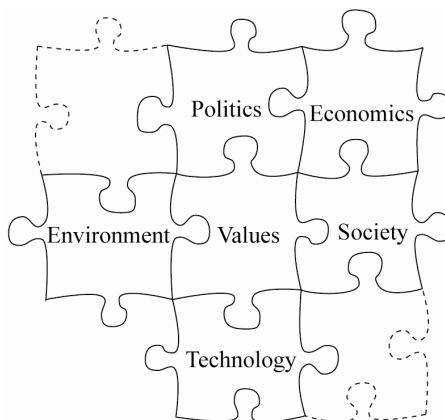

Figure 3 *Pieces and the Puzzle of the Future (see Aaltonen, 2007).*

tively higher or more developed levels of new order. Here, he emphasizes the role of the great masses and mega-trends (1982, 1991, 1997). He believes that single pieces, such as innovations, technologies, thoughts, ideas, possibilities, trends or their anti-trends, can not start any macro-level revolutions. A real revolution requires very large ideological, technological, geographical and economical support from the whole puzzle of the society (see Kuosa, 2005b, 2007). In recent history, such support has existed approximately every 100 years. As that has been the frequency of the major revolutions in recent history, that will most likely also be the frequency in the future, concludes Naisbitt (2004). Therefore, he does not believe there will be any societal revolutions where a new platform or order is formed before year 2050. However, before that year, Naisbitt believes, we will see many pieces, that are still missing from our current puzzle or platform, such as pilotless aeroplanes, all senses stimulating virtual technology, etc.

The Pre-Industrial Platform was primarily based on steam and coal engines, railways, telegraph and iron industry. However, inside its market's clusters and path-dependence logic, there emerged new founding and inventions, such as electricity, combustion engine (road transportation with cars), and radio (mass communication). Pre-Industrial Platform was replaced as these new discoveries
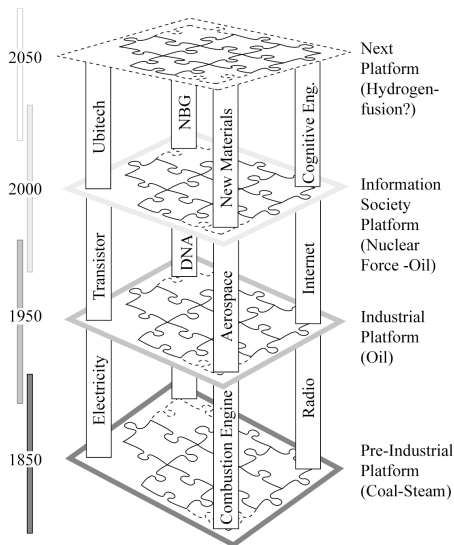
Figure 4 *Development of Platforms in Time.*

developed, clustered and eventually became a new platform in society by mid-20th century.

Furthermore, before the Industrial Platform's puzzle itself was solved, new emerging inventions and discoveries, which did not directly fit the current puzzle, took place. These inventions were for example, transistor, aerospace aviation, DNA structure, and Arpanet-Internet. Probably, around the end of 20st century, these inventions established the new platform of Information Society.

As Information Society is not going to be the end, we are able to map inventions, drivers or fields from our current puzzle, which are most likely to become the platform of the next era, as they do not seem to fit optimally into the present one. These non-fitting new issues may well be, for instance, ubiquitous technology, NBG (Nano, Bio, Gene), cognitive engineering (manipulation of human brain and consciousness), and new materials science, which combines findings from NBG to more conventional advantages of chemistry, physics, medicine, metallurgy, etc[4].

Naisbitt (2004) himself did not give name to the next platform, but Aaltonen

4 This is partly the author's interpretation of the current situations in respect to Naisbitt.

(2007: Chapter 6) has called it NBIC (Nano, Bio, Information Technology, Cognitive Science) platform, for example. Nevertheless, in respect to this theory's approach, I would instead prefer to call it *The Age of Conscious Technology* or the *Fusion Age.*

View III: Energy as the driver of societal change and emergence

Harold F. Blum (1968) can be considered as a pioneer of combining the laws of thermodynamics[5,6] into biological or other kinds of evolving systems. From the point of view of biology and social systems, his ground-breaking finding was, that all living things live far away from equilibrium (see Prigogine & Stengers, 1984: 131-176) by constantly absorbing free energy from their environment with which they are interconnected. If a living system's connection to its environment's energy sources is closed, the system will eventually die or move to an equilibrium state. When an organism lives (maintains its orderly existence or evolves) by absorbing free energy sources, it means, that there is a local process, where entropy is slightly decreased. To the environment, the effect of this process is a much larger increase of the overall entropy. Naturally, energy can only be transformed in one direction, from usable or warmer to unusable or colder, meaning towards entropy. How-

5 The first law of thermodynamics is often called the Law of Conservation of Energy. This law suggests that energy can be transferred from one system to another in many forms. However, it can not be created nor destroyed. Thus, the total amount of energy available in the Universe is constant.

6 The Second Law of Thermodynamics states, that heat can never pass spontaneously from a colder to a hotter body. As a result of this fact, natural processes that involve energy transfer must have one direction, and all natural processes are irreversible. This law also predicts that the entropy of an isolated system always increases with time. Entropy is the measure of the disorder or randomness of energy and matter in a system. Because of the second law of thermodynamics both energy and matter in the Universe are becoming less useful as time goes on. Perfect order in the Universe occurred the instance after the Big Bang when energy and matter and all of the forces of the Universe were unified (Physical. Geography.Net).

ever, it is possible to locally reverse entropy, to create or maintain order, but only by using up additional (or exponential amount of) energy in the process, which again of course increases the entropy of the whole environment.

According to Jeremy Rifkin (2002, 46-49), the sun is the source of free energy on the earth. Plants take up the sun's energy in photosynthesis and provide a source of concentrated energy that animals can then consume. The process of maintaining a non-equilibrium state is costly in terms of energy, and the more evolved the organism, the more energy it requires to sustain itself against equilibrium. Rifkin (*ibid*.) gives an example: consider the case of a simple food chain consisting grass, grasshoppers, frogs, trout, and humans. Grass is able to collect certain amount of solar energy, which the first level predator may use as its primary energy source. The first level predator is a prey to the second level predator, which again is a prey to the third level predator and so on. In each step of devouring the prey, about 80-90% of the energy is simply wasted and lost as heat to the environment. Therefore, only 10 to 20 percent of the energy of the prey is absorbed by the predator. "Three hundred trout are required to support one man for a year. The trout, in turn, must consume 90,000 frogs, which must consume 27 million grasshoppers, which live off of 1,000 tons of grass" (*ibid*.). In other words, the amount of energy needed to keep each more evolved species up the food chain alive, especially a man, is a very demanding task, which wastes repeated exponential amounts of solar energy and increases the overall entropy.

"*Evolution results in the creation of larger islands of order at the expense of the creation of even greater seas of disorder in the world. If this is true for species and ecosystems, it is equally the case for human social systems. Lest there be any doubt on this score, consider how much free energy is required to sustain the economic and social structures and lifestyles of Americans and how much entropy is created in the process*" (*ibid*.: 49).

McNeill & McNeill (2005: 330-350) have listed the changes in annual human energy consumption in history. An average adult's basic metabolism requires 3 to 5 Gigajoules per year. In hunter-gatherer societies the total average energy consumption per adult was 3 to 6 times bigger than basic metabolism. In agricultural societies the average energy consumption per adult rose up to 18 to 24 times bigger, and in average industrial society it ended up to be 70 to 80 time bigger than adult's basic metabolism (ibid). Furthermore, among industrial societies, the USA is another story, as pointed out. It is a home of less than 5% of the world's population, but it consumes approximately 25% of all energy that is produced in the whole world.

Both Steven Johnson (2003: 109-112) and Jeremy Rifkin (2002: 53-63) are using the Roman Empire as a case study of correlation between the laws of thermodynamics and the rise and fall of a social organization. Johnson (2003: 110-111) proposes us to:

"*Imagine a time-lapse of Western Europe, as seen by a satellite, with each decade compressed down to single second. Start the film at A.D. 100 and the continent is a hundred points of lights, humming with activity. Rome itself glows far brighter than anything else, but the rest of the continent is dotted with thriving provincial capitals. As the tape plays, though, the light begins to dim: cities sacked by invading nomads from the East, or withered away by the declining trade line of the Empire itself. (…) When the Visigoths finally conquer Rome in 476, the satellite image suggests that the power grid of Europe, and all of its lights faded dramatically. (…) It stays this way for five hundred years. And then suddenly, just after the turn of the millennium, the picture changes dramatically: the continent sprouts dozens of sizable towns, with populations in the tens of thousands. (…) The effect is not unlike watching a time-lapse film of an open field, lying dormant through the winter months, then in one sudden shift bursting with wildflowers. There is nothing gradual or linear about the change, it is sudden, and as emphatic, as turning on a light switch. (…) The Europe underwent a transition not unlike that*

between H20 molecules changing from the fluid state of water to the crystallized state of ice: for centuries the population is liquid and unsettled and then, suddenly, a network of towns comes into existence, possessing a stable structure... (…) Thus… start by taking analogies literally. Why does a field of wildflowers boom suddenly in the spring? (…) Leave a kettle of water sitting at room temperature in your kitchen, and it will retain its liquid form for weeks. But increase the flow of energy through the kettle by putting it on a hot stove, and within minutes you'll induce a phase transition in the water, transforming it into gas."

Rifkin (2002: 59) states that the popular conception is that the Roman Empire collapsed because of the decadence of its ruling class, the corruption of its leaders, the exploitations of its servants and slaves, and the superior military tactics of invading barbarian hordes. "While there is merit to this argument, the deeper cause of Rome's collapse lies in the declining fertility of its soil and the decrease in agricultural yields." Due to erosion and running out of sufficient forests, the agricultural or market production could finally not provide enough energy to maintain Rome's infrastructure and the welfare of its citizens. Furthermore, this is exactly the same what has happened with all great civilizations; greater energy-flow through, in turn, allows human settlements and population to grow, social life to become more dense and varied, and culture to advance. Societies collapse when the energy flow is suddenly ceased. The collapse characterized by a reduction of food, fuel and goods surpluses, means less stockpiles for the government to distribute public aid to the poor, and more winnowing of invest or repair the critical infrastructure, in addition with less capabilities to maintain government bureaucracy, sufficient army or educated civil servants, etc. A large population, whose numbers grew during the good times, suddenly enjoys less energy per capita even though the people are working longer and harder. Finally, this causes defiance and lawlessness, a breakdown in central authority, a depopulation of urban areas, and increasing invasions and pillaging by marauding groups of armies (ibid.: 53-57).

In their massive work on all human history, McNeill & McNeill (2005) are following exactly the same kind of storyline as Rifkin here. These historians' presentation goes from first showing what happened in history to explaining why these things happened that way after all. Their major point of view is to discuss the history of the evolving human network on the earth. In different parts of the earth, the human race has developed from hunter-gatherer groups to nomad and agricultural societies, and finally to more complex urban civilizations, which, however, have always eventually completely disappeared or fallen back to less complex societies (ibid.: 20-105). This has been an ever ongoing two-way process, which has been strongly related to climate changes (period of warmer or colder weather) (ibid.: 160-190), technological or social innovations (emergence or immergence [fading] of an innovation), and the strength of the human network (meaning especially the amount of goods, food, people, and ideas that are flowing from society to society, and the general division of labour – and the question where the core of flows is located) (ibid.: 170-190).

Energy[7] has been proven to be a vital driver for any emergence or immergence [fading] of human societies in history (ibid.: 460-475; Diamond, 2003: 85-100). Energy surplus gathering to the centres of societies has taken place either through just one of the above mentioned energy gathering factors or through multiple such factors occurring simultaneously in an area. To give one example, ploughing groups turned out to be the major driver of European development. They enabled efficient grain growing in all most all Western Europe's wet clay lands, which of course was followed by population growth and civilization growth. It strengthened the general confidence between people, which resulted in new economic innovations such as establishing limited companies. It enabled the establishment of chivalries, which ensured increasing inventories, investments and public security and stability. (McNeill & McNeill,

7 McNeill & McNeill (2005) are referring to energy or its flows in various ways, e.g., by words food, grain, firewood, coal, oil, solar energy, photosynthesis, topsoil, plants, goods, slaves, domestic animals.
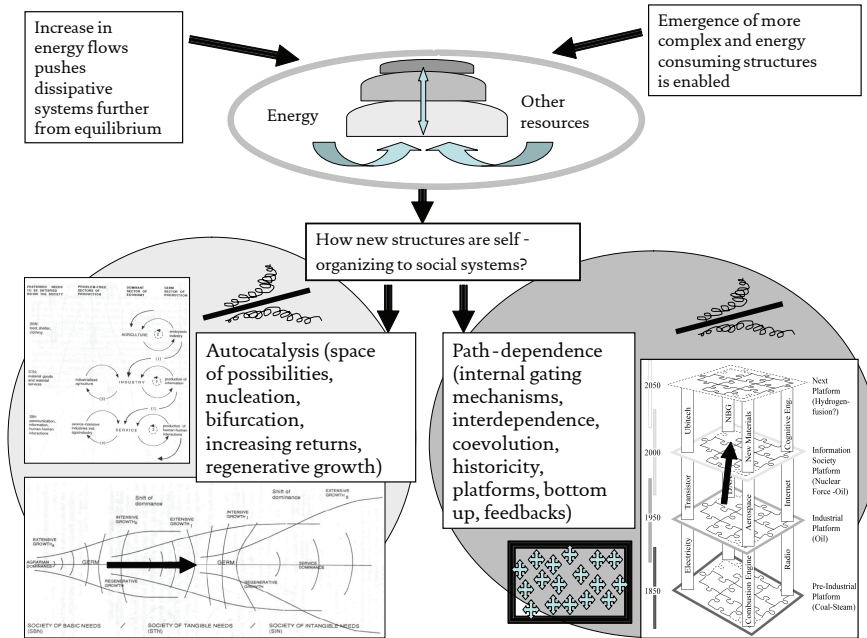
Figure 5 *Interconnections and deviations between the three theories*

2005: 195-230.) This economic and population growth, increased cooperation and trust, banking, free trade, decentralization to flexible city states, and the liberal Medici effect (Johansson, 2003) etc., finally enabled the replacement of the Middle Ages with the emergence of the Renaissance. As the Renaissance can be seen as being further from an equilibrium state than the Middle Ages, not only its emergence, but also its maintaining required additional energy flows.

As mentioned above, the further from equilibrium the organization is, and the higher the level of its complexity (meaning more links, nodes and flows), the more energy is required to maintain its structure. As the USA alone is consuming 25% of the world's energy production today, it is believable that its energy consuming structure may also be the most complex among the industrial countries.

According to Emmanuel Todd (2003: 78-120), the USA, as the "only" world Empire at the moment, has got its position, by becoming the core of the world economy's flows, where it has been possible to gather most of the world economy's surpluses, and therefore to strengthen itself. Its own industry has been practically declining since 1990, but its GDP has been growing strongly at the same time - how is this possible Todd asks?

In his study, Todd (*ibid.*) concludes[8] the answer as follows. The world has accepted the USA to take the position of the State in world economy. In Keynesian theory this position refers to the actor which constantly consumes and thereby ensures the demand in the national markets. Todd claims, that the USA's GDP is growing because its domestic enterprises have been able to gather more and more capital, and the volatility in the markets has been constantly growing. There, however, lays the underlying bubble of the USA economy. The USA trade deficit has been increasing in enormous speed for a long time. At the moment USA is borrowing $665 billion annually from foreign lenders to finance the gap, and the national debt is reaching a milestone of $10,000 billions quite soon. These trade deficit costs have been

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8 This is the authors attempt to compress Todd's longer conclusions.

hidden for the past few years, predominantly by the historically low interest rates, which resulted from the Federal Reserve's attempts to spur economic recovery after the 2001 (Economic Policy Institute 2006). In addition, the finance and insurance sectors' share of the GDP in USA has been growing faster than has been realistic to expect. Todd believes that the Enron bankruptcy and the Andersen bookkeeping scandal 2002 were only the tip of the iceberg in the USA's finance markets. Practically, USA has been financing its consumption by distributing and printing virtual currency to their trade partners, which is, according to Todd, just a more polite way to collect taxes to the elite in the centre of the Empire. In comparison, the Roman Empire had to use military forces to ensure its energy surplus gatherings from its reluctant provinces and neighboring countries (Todd, 2003: 95-110).

Interconnection and Deviations between the Three Theories

In this paper, I want to show both, how the three theories are intertwined in dissect of societal transformation, and how complexity research concepts, especially emergence, path-dependence and increasing returns, can be interconnected to such discussion[9].

The basic ideas illustrated in Figure 5 are:

1. If we want to explain any transformation in macro-level of complex evolving systems, it is not enough to isolate one principle or character such as self-organization or emergence and concentrate on it in exclusion of the others (Mitleton-Kelly, 2003: 25).

2. The laws of thermodynamics set a firm macro-level framework to any emergence [which means here self-organization + creation of new order (Kauffman, 1995)]

3. There can be selected at least two possible ways to explain irreversible emergence of more complex organizations in social systems or in societal transformation. The first one emphasizes, e.g., auto-catalysis and space of possibilities as Malaska's Funnel model and Arthur's theory. The second

9 This is author's interpretation.

one emphasizes, e.g., path-dependence and internal gating mechanisms as Naisbitt's Platforms and pieces model.

The top row of Figure 5 describes the principles of the third theory: Ultimately all emergence is enabled or blocked by the laws of thermodynamics and societal emergence makes no difference here. Increase in energy (and other resources) flows pushes also large and complex dissipative systems further from equilibrium, where interactions and speed of transfers are more intense and faster. That enables emergence of even more complex and energy consuming irreversible structures. In other words, increase of available "food/resources" in a system allows emergence of new levels to the "food chain". However, that leads us to another question. If the energy surpluses enable societal emergence, then how, in practical terms, the new structures are self-organizing to social systems?

As presented above, the first practical way to explain the irreversible emergence in social systems or societal transformation is to emphasize autocatalysis, bifurcations, adjacent possible, regenerative growth, nucleation, above the other generic principles of complexity. This approach can especially be seen in Malaska's theory, but also Brian W. Arthur's theory has similar characteristics. Here, the basic idea is, that in societal transformation, the macro-level transformation is usually started with a catalyzing invention which is beneficial in terms of the dominant mode. Once the catalysis in the markets is started by that beneficial invention, the system will be pushed further from equilibrium, and therefore, there will be a more diverse space of possibilities created (stronger aim into adjacent possible). Next, due to aim into adjacent possible and increasing returns in the process, there will be a necessary bifurcation period ahead (see the small figure with increasing returns leading away from equilibrium growth curve). Finally, the process will turn into auto-catalysis where the original invention changes the whole system. For instance, a small invention or a cluster of inventions, such as ICT, will eventually become a vital part of every fields of the society,

and furthermore, all processes of the society will be transformed into favorable form for the ICT.

The other approach for describing the emergence is to emphasize path-dependence, internal gating mechanisms, interdependence, coevolution, connections, historicity, platforms, bottom up clustering, and feedbacks, above the other generic principles of complexity. Here, instead of putting the stress on searching the space of possibilities, the focal interest is located on the role of internal gating mechanisms which hold together the internal structure and allow far from equilibrium in the transformation. These internal gating mechanisms base mostly on historicity, interdependence, connections and path-dependence, and they function as boundaries or gatekeepers to all clustering and emergence. However, due to interactions and feedback loops, these platforms or internal gating mechanisms allow many synchronic coevolutions, adaptations and minor (ad hoc) emergences, as long as the process remains within the boundaries (see the smaller platform figure in Figure 5).

In the previous paragraphs, basing on the study of the three theories, there was given two possible ways to explain irreversible emergence of more complex societal structures. Hence, it is crucial to ask, are these approaches just different ways to describe the very same phenomenon, or is there really some novelty for our understanding of complex evolving systems here? Are there situations where transformation sometimes follows more autocatalysis and search of space of possibilities, and it sometimes follows more path-dependence and attachment of internal gating mechanisms? And why would/wouldn't it go that way?

Conclusions

In the previous sections, I have presented three main theories or approaches, which deal with societal change. Each of the theories discuss the social emergence and path-dependence in social organization, and the logic of societal transformation. Neither of the theories can be considered as purely social science or complexity research – they rather represent

both, which here means that they are multi inter-, inter- or transdisciplinary approaches to the issue.

In Mitleton-Kelly (2003: 23-50), the original core of the complexity research's fifth research area was the Brian Arthur's theory. Here, I propose the following three theories to be considered as extensions or new benchmarking views to that research area. In the proposed first theory: Pentti Malaska appears to understand social emergence pretty much in the same way as Arthur - there are necessarily new seeds of transformation, which cluster and then start to change the entire market logic, if the time is favorable to it. However, Malaska's point of view to path-dependence deviates from Arthur's, as he emphasizes the social transformation's necessity to have alternating extensive, intensive, and regenerative growth periods, which also occur partly in parallel with each other.

In the second theory, John Naisbitt understands the role of social emergence to some extent in the same way as Arthur and Malaska. For Naisbitt, it refers to an (important) seed, which establishes a platform together with a few other (important) seeds, which together support each other relevantly. Another (minor) social emergence is subordinate to the platform – here the subordinate emergence may be either absorbed or rejected by the platform. In addition, there is a strong belief on path-dependence in Naisbitt's theory. There, the transformation is seen as a qualitative and chronological process where new platforms emerge, bottom-up, when the bottlenecks of previous level are fully fixed. In other words, when all of the platform's relevant pieces are relevantly put together.

In the third theory, which here has been named *energy as the driver of societal change and emergence*, societal emergence and path-dependence are both explained through energy, as the name indicates. Different systems are in different levels of complexity. The higher the system's complexity level is, and the further from equilibrium it is, the more energy gathering from the surrounding environment is required to maintain that position. Sudden or steady increase in flows of energy means ac-

celeration in volatility in any kind of system – reversible or irreversible. Thus, more energy to dissipative and irreversible structure allows, e.g., more connections and more intense non-linear flows between nodes and its local networks, which eventually forces the system into more unstable structure (Mitleton-Kelly, 2003: 41). Finally, that enables a phase transition into higher level of complexity (Johnson, 2003: 110-111). And in the contrary case, the phase transition is forced into opposite direction – into immergence.

Therefore, in the third theory, both social path-dependence and social emergence are bound to laws of thermodynamics, where all the other factors that are effecting the societal transformation can be seen as subordinate to energy. Thereby, these other factors' role is merely instrumental, as their true influence to transformation bases on the ability to advocate or prevent energy flows through the system.

To conclude, all three theories are dealing with social path-dependence and emergence in a way which allows us to add those to the fifth research area of complexity. The theories are congruent in some parts, but deviate in others. Together they provide a firm inter- or transdisciplinary ground for benchmarking issues of social systems complexity.

References

Aaltonen, M. (ed.) (2007). *The Third Lens: Multi-ontology, Sense-making and Strategic Decision-making*, ISBN 9780754647980.

Aaltonen, M. and Sanders, T. I. (2006). "Identifying systems' new initial Conditions as Influence Points for the future," *Foresight: The Journal of Futures Studies, Strategic Thinking and Policy*, ISSN 1463-6689, 8(3).

Artuhur, B. W. (1990). "Positive feedbacks in economy," *Scientific American*, ISSN 0036-8733, Feb.

Artuhur, B. W. (2002). "Is the information revolution over? If history is a guide, it is not," *Business 2.0*, March.

Diamond, J. (2003). *Guns, Germs, and Steel: The Fates of Human Societies*, ISBN 9780393061314 (2005).

Economic Policy Institute (2006). "Debt and Dollar: The United States damages future living standards by borrowing itself into a deceptively deep hole," http://www.epinet.org/content.cfm/Issuebrief203.

Blum, H.F. (1968). *Time's Arrow and Evolution*, ISBN 9780691023540.

Hodgson, G. M. (2001). "Is social Evolution Lamarckian or Darwinian?" J. Laurent & J. Nightingale (eds.), *Darwinism and Evolutionary Economics*, ISBN 9781840642094.

Johansson, F. (2004). *The Medici Effect: Breakthrough Insights at the Intersections of Ideas, Concepts and Cultures*, ISBN 9781591391869.

Johnson, S. (2001). *Emergence: The Connected Lives of Ants, Brains, Cities, and Software*, ISBN 9780140287752.

Kauffman, S. (1995). *At Home in the Universe: The Search for the Laws of Self-Organization and Complexity*, ISBN 9780195111309.

Kauffman, S. (2000). *Investigations*, ISBN 9780195121049.

Kuosa, T. (2005a). "Study on logics on society's macro-level Transformation: A macrohistorical comparison of Pentti Malaska's theory of societal change compared to other theories of transformation," *Journal of Futures Studies*, ISSN 1027-6084, 10(1): 15-30.

Kuosa, T. (2005b). "Weak signal or insignificant roaring: Pattern management as ontologically new approach to weak signals observations and reasoning," *Futura*, ISSN 1420-1917, 4: 115-120.

Kuosa, T. (2007). "Forms of reasoning in Pattern management and in strategic intelligence," proceedings of the COST A22 Conference, *From Oracles to Dialogues: Exploring New Ways to Explore the Future*, Athens July 9-11.

Lane, D. A. and Maxfield, R. (1997). "Foresight, complexity and strategy," in B. W. Arthur, S. Durlauf and D. A. Lane (eds). *The Economy as an Evolving Complex system II*, ISBN 9780195162592.

Luhmann, N. (1990). *Essays on Self-Reference*, ISBN 9780231063685.

Malaska, P. (1991a). "Economic and social evolution: The transformational dynamics approach," in E. Laszlo (ed.), *The New Evolutionary Paradigm: The World Futures General Evolution Studies*, ISBN 9782881243752.

Malaska, P. (1991b). A conceptual framework for the self-reliant transformation of Africa," in A. Lemma and P. Malaska (eds.), *Africa Beyond Famine: A Report to the Club of Rome, African Studies Review*, ISSN 0002-0206, 34(2): 158-159.

McNeill, J. R. and McNeill, W. H. (2005). *The Human Web: A Bird-Eye View of World History*, ISBN 9780393925685.

Mitleton-Kelly, E. (ed.)(2003). *Complex Systems and Evolutionary Perspectives on Organizations: The Application of Complexity Theory to Organizations*, ISBN 9780080439570.

Naisbitt, J. (1985). *Ten New Directions Transforming Our Lives*, ISBN 9780446329224.

Naisbitt, J. and Aburdene, P. (1991). *Mega-Trends 2000: Ten New Directions for the 1990s*, ISBN 9780380704378.

Naisbitt, J. (1997). *Megatrends Asia: The Eight Asian Megatrends that are Changing the World*, ISBN 9780684827063.

Naisbitt, J. (2004). "Preview of the future: Where is the world headed?" seminar given in Kalasta-jatorppa 15th December, Helsinki, Kontakti.net, unpublished report written by Tuomo Kuosa.

Nicolis, G. and Prigogine, I. (1989). *Exploring Complexity: An Introduction*, ISBN 9780716718598.

Prigogine, I. and Stengers, I. (1984). *Order out of Chaos: Man's New Dialogue with the Nature*, ISBN 9780394542041.

Rifkin, J. (2002). *The Hydrogen Economy: The Creation of the Worldwide Energy Web and the Redistribution of Power on Earth*, ISBN 9781585422548 (2003).

Todd, E. (2003). *After the Empire: The Breakdown of the American Order*, ISBN 9789525421125.

Varela, F. J. and Maturana, H. R. (1992). *The Tree of Knowledge*, ISBN 9780877736424.

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ARTICLE 5

Kuosa, Tuomo

Different Approaches of Pattern Management and Strategic Intelligence.

Different Approaches of Pattern Management and Strategic Intelligence

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Abstract

The world around us contains endless amounts of information. That information is mostly loose in our minds. Very often, it does not at first contact fit in with our conventional understanding, experience or any context we are used to. Hence, we may say that we are covered with piles of constantly changing raw data, and especially strategic actors tend to be short of more rapid, up-to-date, valid and in-depth understanding of the transforming business landscape and social environment. Strategic intelligence is an emerging field of business consulting, which aims to undertake the task of revealing large, complex or complicated issues of transformation in a more understandable form. Pattern management, however, can be seen as one field or one approach of Strategic intelligence. It is an approach that may, on the first hand, be more based on empiric data and formal structures than the other forms of Strategic intelligence, but, on the second hand, it is a very heuristic approach to integrate quantitative data, reasoning and narratives. The main attempts of this article are, firstly, to show, what are in general the most commonly used ways of managing, finding, drawing, reasoning or anticipating patterns from our environment, and secondly, to locate how the concept of pattern can be understood in different ways. From the gathered knowledge, this article presents three main categories of reasoning patterns: Empirical calculation (EC) is common especially in enterprise consulting. Theory proving with observations (TPO) is common especially in natural sciences, and real combining (RC) is common especially in qualitative research and in narrative.

Keywords: pattern management, emergence, reasoning, strategic intelligence, sense making, data mining, weak signals, complexity

Introduction

In mainstream literature, it has been common to describe strategic intelligence as the collection, processing, analysis, and dissemination of information that has high strategic relevance. More specifically, strategic intelligence has mostly been related to military planning, to national security intelligence, and to the strategic decision making of large companies. It has been used as a concept which is closely related to business, state security and military intelligence, business strategy, strategic sourcing, strategic competition observation and analysis, strategic alliances, strategic management, strategic consulting, and to strategic development or planning (c.f. Xu 2007; Russell 2007).

This article aims to broaden our understanding of strategic intelligence. Firstly, it emphasizes the possibility of a broader view of the concept. Any set of tools, services or consulting that might either help us to reveal large, complex or complicated issues or transformations in a more understandable form, or to get the most valid and up-to-date information on time – as well as any procedure which helps us to reveal something that is unseen from plain information alone –, can be considered as strategic intelligence of a complex phenomena. In other words, strategic intelligence should not be considered only as a characteristic of military, state security and corporate strategies, but as a more general way of managing knowledge. Hence, strategic intelligence is able to use modelling, simulations, visualisations, art, narrative, semiotics, fractal or statistical mathematics, graphs, metaphors and analogies etc. because these all are in some way able to express complicated or complex issues in a simplified way.

Secondly, it emphasizes the importance of selecting the right forms of reasoning or pattern management for a certain type of problems in a strategic intelligence process. This presentation contains four parts. The first part is a discussion of reasons behind our current difficulties in sense-making and anticipating social and economic phenomena. The discussion focuses on themes such as the reasons why the complex world leads us to the feeling of information overflow, and what can strategic intelligence and especially its dimension of pattern management offer to the reasoning of the complex world. After the discussion of the existence of the research field and the need for certain types of methods, an idea of managing patterns of change from raw data is presented. Next, both, the forms of reasoning attached to PM, and the "truths" or theoretical objectives that are searched for in certain types of intelligence processes – i.e. is a person looking for existing, changing, invented or emerging patterns – are debated. Fourthly, all these interrelated aspects are merged into a presentation of three pattern management categories according to my qualitative Real combining type of pattern management process: empirical calculation, theory proving with observations and real combining. Finally, based on the theoretical work, a few suggestions for the management and anticipation of complex issues are presented.

Why the complex world leads us to the feeling of information overflow

We tend to experience that our surrounding world is full of loose information? It has been said that an average person of the 15th century got the same amount of information about their world in their whole lifetime as we get from a single newspaper everyday (see Scholte 1996). The amount of information flowing constantly around us is huge, but only a small fraction of it is useful or valid for us as such. Not so long ago, information and knowledge were scarce and therefore very valuable. Nowadays, most information is free and easy to access, but a rapid understanding of it is rare (Weick 2001, 9-11). Hence, due to the information overflow, almost all current actors are experiencing some forms of lack to sense-make, or at least to anticipate the transformations of social phenomena (c.f. Foreman-Wernet 2003, 3-8; Johnson 2001, 126-129).

Why has the world become such place? Why does it appear to be more complex, interdependent, hectic, nonlinear, co-evolutive, less stable, and full of communication and loose information (e.g. Kauffman 2000; Casti 2000)? Firstly, it can be explained with social functions and agreements that we have obtained. In other words, the contemporary world can be said to be globalised in all of its dimensions and meanings, and this has implications to everything we experience from mass media to economy (Kuosa 2001). Secondly, it can be explained with structures and fundamental logics or "law-like" tendencies that the transformation follows. For example, due to Internet and globalisation, social issues can be said to involve, more easily than before, more and more intense and larger human actor networks around them (Johnson 2001). Such large scale networks can be categorized to three main levels. The entire network can be called as the macro-level of the network. On the middle-level, the whole network usually further self-organises itself into strongly networked local clusters which can be called "small worlds". These small worlds emerge because most micro-level autonomous agents, such as humans e.g., start to link more strongly with the agents close to them (c.f. Barabasi 2002). Some autonomous agents are more active in networking than others, making them local nodes of the network. When most agents and nodes of an area are networked more strongly with their neighbouring agents and nodes than to the nodes in distant locations a local cluster is established. (Cilliers 1998.) Once a local cluster starts to strengthen its local interactions through communication and other transactions, the cluster begins to live a life of its own. This happens because each cluster has many "willing and learning" agents who are able to share knowledge, learn basing on their non-linear local interactions and to rapidly change their behaviour and strategy (e.g. Mitleton-Kelly 2003, 3-5). When all of this happens simultaneously without any external control, the system inside the cluster can be called a *complex adaptive system* (CAS) (Kauffman 1995). Hence, CAS is a higher form of a system as it consists of many "learning and willing" systems, but evolves and renews itself as an independent entity.

This has implications to the amount and quality of information. Because the members of each network cluster share more knowledge in their local interaction, not all the clusters of the whole network have same information. The dissonance of information increases as the whole middle-level network grows. At the same time, however, the whole network's ability to preserve information is increasing due to the local clusters, CAS, links and delays (Cilliers 1998). Thus, the qualitative unbalance of information and delays and gaps in sharing the information set a challenge for data management, sense making or strategy

work in the world of large networks. And the challenge gets even greater if Malcolm Gladwell's point of view is considered. He claims that the spread of ideas, behaviour and the like between CAS, clusters, and the whole network can be compared to the contagiousness of viruses in a population, which makes any linear "ivory tower" predictions very difficult (Gladwell, 2000, 9; see also Barabasi 2002).

Another way to describe this "living" of such higher forms of "learning and willing" as a "law-like" tendency is to use the concept of autopoiesis, which was originally introduced by Maturana and Varela (e.g. 1992) in the field of biology to describe the ability of cells to self-reproduce. Autopoiesis refers to slow self-production, self-maintenance, self-renewal, and self-definition of a system's existence via the exclusion of areas that do not belong to the system (*autos* = self, automatic, *poiein* = to do, to produce, to maintain existence, to do again, to conceptualize). For instance, almost all cells in the human body are replaced over a period of two years, yet people can still be identified throughout their life (cf. Ståhle 2008).

Niklas Luhmann, a German sociologist, has expanded this theory and applied it to social systems (1990a; 1990b, 1995). He is convinced that social systems, such as companies, markets etc., are autopoietic, and the foundation of their existence and continuity lies in communication. By communication, Luhmann refers to activity or to an event rather than the spoken language of communication. Communication is based on contacts that are constantly created and renewed by the network of interaction and that cannot exist outside of the network (Luhmann 1990b, 3, 14). Luhmann states that a society is a co-evolutive and indeterministic system which has no dominating centres. The society contains several simultaneous autopoietic systems which all have only one function. The whole society self-organises itself in interactions between these function systems. Complexity may emerge to the function systems / sub-systems (the small worlds) of society (the macro-level) only if communication in society sets boundaries and rules that define them as sub-systems. The actual process of complexity increase follows the principles of autopoiesis where all elements of a system are reproduced in a communicating network interaction of the same kind of elements. Such autopoiesis is a functionally isolated self-referring process. In other words, all operations in the system are explained by referring first to something outside its own sub-system, and then referring back to its own operations. Hence, for Luhmann, autopoiesis in society is a way to describe how (1) the sub-systems are strongly dependent on the combined performance of the other sub-systems and are therefore co-evolutive and self-referring, (2) how the sub-systems self-reproduce, and (3) how these processes increase the society's overall complexity and interdependency. In other words, Luhmann's theory explains how a society becomes complex, and how its sub-system, e.g. a market area, defines itself, how it renews itself and reproduces through communication, and how it adapts to co-evolution with the whole society.

Strategic intelligence is difficult?

By using the approaches of three different scientific traditions, the previous chapter explained why the world appears to be so complex by its structures, so hectic by its

processes, and so overwhelming by its information flows. To conclude, the "living" autopoietic processes exist only via communication which increases exponentially, and the size and complexity of networks increase its abilities to produce and maintain information, but cause information delays while doing so.

What does all this mean for strategy work, foresight, or for the management of an organisation? We need to accept that no one can steer, determine or even predict the development beforehand, and it is very difficult to get all relevant information on time (Cilliers 1998). Furthermore, in this kind of environment, an actor cannot rely on a single strategy and single method anymore (Nicolis & Prigogine 1989, 65-75). Thus, appropriation of the change and proactive strategies require ever faster, broader and more in-depth understanding of general transformations (Luoma 2006), and this cannot be accomplished without proper methods of observing, reasoning, understanding and influencing the complex processes. Therefore, the use of multiple methods and multiple information sources is strongly encouraged.

This article focuses on one form of strategic intelligence, pattern management. It is an approach which may be more based on empirical data and formal structures than other forms of strategic intelligence, but at the same time it may be seen as a heuristic and creative approach. I locate the domain of pattern management into three categories which reveal different sides of its existence. The first category is *empirical calculation*, which is common especially in enterprise consulting. The second one, *theory proving with observations*, is especially common in natural sciences. The third one, *real combining,* can be considered common especially in qualitative research and in narrative. The categories vary according to their approaches to reasoning, methods used and especially the understanding of the "truth" or the type of pattern that is looked for.

Sense making in Pattern management

Pattern management (PM) is a fairly new concept. One of the first developments was Kamran Parsaye's 1999 article, where he drew a line between Data management and Pattern management. According to Parsaye, when recent data is put into operational system and merged with historical data gathered over time, we have Data management. When all this data analysed over time is being merged with historical *patterns* we have Pattern management. Thus, PM is not Knowledge management, data mining or construction of knowledge-based systems. PM deals with patterns after they have been discovered by data mining. Parsaye gives a simple analogy, "consider data as grapes and patterns of knowledge as wine. Data mining is then the wine-making process, (…) and the data mining tools are like wine-making equipment".

Parsaye's definition of PM is accurate from the point of view of managing knowledge, but it is possible to have a more versatile approach here as well. David Snowden (2002) has discussed the management of patterns as a more anticipatory and proactive process. From Snowden's point of view, patterns may even be seen as something more tangible than knowledge, understanding and beliefs alone.

"We need to identify the early signs of pattern formatting and disrupt those we find undesirable while stabilizing those we want. If we are really clever then we seed the space to encourage the formation of patterns that we can control. These patterns are, to use the language of complex adaptive systems theory, emergent properties of the interactions of various agents. By increasing information flow, variety and connectiveness either singly or in combination, we can break down existing patterns and create the conditions under which new patterns will emerge, although the nature of emergence is not predictable" (ibid, 107).

Snowden continues: "Most humans make decisions on the basis of past or perceived future patterns, not through rational choices between alternatives, an understanding of patterns, is therefore, key to managing behaviour within organizations and in relationship to markets and environmental factors" (ibid). Therefore, patterns are not only knowledge, an understanding, and beliefs of development, but also something more tangible such as proactivity with emerging paths and trends in complex environment. (See Kuosa 2007; Aaltonen 2007).

Other, even more versatile and tangible descriptions for patterns managed in the process can be given. In Kuosa (2005a), I have linked PM to the rugged landscape between the complex adaptive systems (see Kauffman 2000, 194-201; 1995, 172, Cilliers 1998), and to managing knowledge of physical objects and more tangible transformation processes (Luoma 2006). In this sense, Pattern can be understood as a phenomenon (Gladwell 2000, 7) or even an object, which may not be visible or tangible as such (see Csikszentmihalyi 1996, 22, 286-290), and it can also refer to an existing, changing or emerging path of transformation. Here, Management transforms finding the patterns into a process. It contains all the actions of observing, reasoning and understanding the issue at hand.

As an example of managing a phenomenon, a pattern can for example refer to findings in consumer behaviour. Those who buy diapers for babies will probably need to buy baby foods, milk and towels as well, and vice versa. The phenomenon of probable consumer types can also be rationally categorized according to consumers' age, sex, income, education, values, etc. In addition, the consumer types can also be drawn automatically from empirical data of customer purchases, given that many customers use loyalty cards. This kind of knowledge can be used efficiently in marketing and product placement.

The Main categories of Pattern Management

PM is, above all, a common logic of observing, reasoning and understanding our surrounding world. The theory of PM is not a closed and sophisticated collection of methods and procedures or a strict system description. It involves various forms of inductive, hypothetic-deductive, abductive, analogy or case-based reasoning used within various fields of everyday life and science. Reasoning is an old field of philosophy with many well-established theories alongside with its controversial issues. Rather than try to solve or further attend to these discussions, I attempt here to show how versatile but at the same time unifying PM can be. For classifying the different practical approaches,

theoretical forms of reasoning, and objectives related to PM, I have established [1] the following main categories for Pattern management.
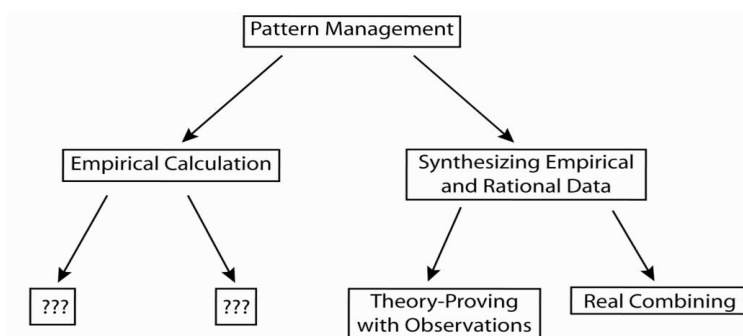

Figure 1: Main categories of Pattern management

Firstly, we can divide PM into two general categories. The first one is *empirical calculation* (EC), which refers to the quantitative search for increases or decreases with a large amount of data. The second one is *synthesizing empirical and rational data* (SER). This can be further divided into two special types, which are *theory proving with observations* (TPO), and *real combining* (RC).

Empirical calculation

By empirical calculation (EC) I mean the quantitative search for increases or decreases in the frequencies of certain issues with large amount of data. When the work is started according to EC, there does not have to be time series or any hypotheses of the possible findings in advance, but the research theme, database and the observing method are usually very well known. In other words, EC does not refer directly to time series analysis or statistical extrapolation. The logic of EC is more open and explorative and less fixed to historical findings. Nowadays EC, or data mining by its narrow name, is mostly done by computing, but it can be done by using human observations alone.

To give a few examples, IBM and Google are companies which use EC on a large scale in their enterprise consulting work. IBM, for instance, has developed many different

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[1] The three practical forms of PM (EC, TPO, EC) became established in my own theoretical work. I started the work by observing the different approaches which people tend to have either in science, consulting or in life in general. Once I had located the general approaches, I started to compare the approaches that the people had, to the formal forms of reasoning. Alongside with this comparison, I tried to reason, what kind of "truths" or objectives the people are looking for when they use certain types of approaches. Hence, the three forms of PM became established when I eventually had clustered the methods, the forms of reasoning, and the objectives of the reasoning into coherent categories. This was a qualitative work where the research material was gathered in an open "snowball sampling", which means that most of the material was not selected or specified before the work was started. The theoretical work continued until I believed that the saturation point was reached. The used research method could be characterized as real combining type of PM which is described in this article.

kinds of multi-phase data mining software tools for drawing rising peaks of development from large databases. IBM uses several methods, such as Public Image Monitoring, OmniFind, Web Fountain (IBM 2006), for pinpointing the rise or lowering of discussion topics from the Internet or for drawing the most interesting Internet sites from up-to-date download statistics. In addition, Google uses its own database, which is collected from Google's own search service, in order to make sense of the changes in topics people are interested in nationally or internationally. According to the founders of Google, Sergey Brin and Larry Page, Google's next grand goal is the re-organisation of world knowledge into one search engine. If this attempt will succeed, there may be a new renaissance of EC ahead.

Alongside with enterprise consulting, EC or data mining has been used in technology assessment. There, EC can be done by searching developing technology topics, for example, from refereed journals, patent applications, media discussion topics, internet downloads in order to try to estimate when the time is right to expect a breakthrough in something or to start one's own R&D project.

EC is very much an umbrella concept. It defines general approaches and logic behind them, but does not mark exact boundaries between life and science. It does not just - confine itself to some methods – such as data mining, some other approaches of automatic calculation, or specific forms of quantitative research – as insiders or outsiders either. Hence, we might say that we are talking about different kinds of wine-making equipment here, as Parsaye suggested. Nevertheless, it might be possible to try to divide EC into further subcategories.

Synthesizing empirical and rational data

The roots of the synthesizing empirical and rational data (SER) approach can be found in Immanuel Kant's (1724-1804) philosophy in which he wanted to combine rational and empirical reasoning. According to Kant, loose empirical knowledge is unhelpful unless we have the capability to reach conclusions and to discover the phenomena behind the findings. Thus, it is the representation that makes the object possible rather than the object that makes the representation possible (Kant 1783). Kant's approach introduced the human mind as an active originator of experience rather than just a passive recipient of perception (Ross 2002, 1-3). When we see a box as three-dimensional, the shape of the box may not be part of the box's nature. There needs to be not only empirical observations from the surrounding world but also synthesizing by an intelligent agent who can put the observed pieces together in order to make findings and reasoning. Here, Kant, and G.W.F. Hegel (1770–1831), were impressed the astronomy of their own time and the Copernican revolution. And the fact that the locations, formation, size and weight of planets could be drawn from the data of indirect observations from the surrounding space by reasoning and by synthesizing theories (Redding 2002).

Today, astronomy is more advanced compared to the time of Kant and Hegel, but very similar principles are still steering the rational and inductive processes of reaching for the phenomena behind the loose observations. How is the existence of black holes,

wormholes, dark matter or planets in distant solar systems deduced when no one can reach the substance under investigation or even get direct observations of the subject with telescopes? The answer is that the astronomers observe and collect data from the surrounding local space. Related to the research matter, they observe the changes in radiation, bending of light, compare gravitation fields, shadows and light spectrums, reflections of infrared light, etc. (Valtaoja 2002, 191-211; Hubblesite Newscenter 2006). Information about the kinds of findings that are needed to prove that a phenomenon exists is embedded in theories of astronomy. If the findings are not explained fully by the theories then the theories have to be changed. The scientific work of astronomy is one example of theory proving with observations, the first form of SER to be discussed.

Theory proving with observations

The approach of theory proving with observations (TPO) resembles the logical reasoning method of abduction more than the other forms of Pattern management. This reasoning method is more complex in its structure and can involve both inductive and deductive arguments. The main characteristic of abduction is an attempt to favour one conclusion above others by either attempting to falsify alternative explanations or by showing the likelihood of the favoured conclusion with a set of more or less disputable assumptions. As reasoning in TPO resembles abduction, it should also be noticed here that Karl Popper's (1902-1994) approach of critical rationalism – the principle of theory's falsifiability – should be strongly embedded in TPO as well. According to falsifiability, a theory can considered reliable only if there is an opportunity given for falsifying the theory by a contrary case. Nowadays, the principle of falsifiability is strongly embedded in mainstream scientific method.

Astronomy has already been suggested as a form of TPO. Quite recently (Hubblesite Newscenter 2006), the astronomers of Harvard-Smithsonian institute proved the existence of dark matter by locating its "finger print" from a location they called 1E0657-556.

Crime scene investigation (CSI) is another possible example here. Crime scene investigators try to figure out what really took place at the moment of a crime such as murder. At first, CSI tries to collect all valid data possibly related to the issue. They try to identify where the blood marks were found, what kind of splashes or hit angles, finger or foot prints, scratches, marks were found, who has the motive and who has the alibi. The collected information is then embedded into criminal psychological theories (Hare 1999, 30-38, 139-152). When all this information is put together, there will usually be several alternative scenarios for the crime. The final phases of the investigation process is a puzzle in which pieces of information must be put together in order to favour one conclusion above others by either attempting to falsify alternative explanations for the chain of events or showing the likelihood of the favoured conclusion with a set of more or less disputable assumptions. Furthermore, the favoured conclusion in CSI can be falsified by contrary observations.

Codebreaking can be seen as one form of TPO type of Pattern management. In cryptography, there is usually a mathematical model, a cryptographic key, used when a secret message is hidden into a message.

There are many forms of cryptography and codebreaking in the world. Karl Weick (2001, 8-9) described codebreaker's work in the following way: "The object of a codebreaker is to duplicate the exact pattern of colored pegs inserted into holes that has been created by codemaker but is concealed from the codebreaker by a shield. The codebreaker ventures hypotheses as to what the pattern might be and, on the basis of information supplied by codemaker, refines the hypothesis until the codebreaker hypothesis exactly matches the codemaker's original pattern".

Real combining

Real combining (RC) is another form of SER. The main difference between TPO and RC is in reasoning. TPO is based very much on abduction and falsifiability (or hypothetic deduction). RC relies mainly on the use of analogies, metaphors and other approaches for finding interconnectedness, similarities and possibilities to combine qualitative data into meta-knowledge, with a common storyline and understanding. Reasoning in analogical thinking goes, for example, from particular to another particular, or from a theory in one field to a theory in another field. Analogy refers to picking or pointing out one similarity between two things that are otherwise different. Metaphor itself is a rhetorical concept, which comprises the subset of analogy, and it is related to comparison between thoughts. In some cases, RC may also resemble inductive reasoning, when the attempt is to find theories which explain various particular things and interrelationships.

The form of reasoning and refining understanding, which I here call Real Combining, is common in narrative and some forms of literature as well as in many academic fields, especially in qualitative research. Here, I provide two different examples of reasoning according to RC. The first one is Amazon.com, which uses automatic RC. When one starts selecting books to a shopping cart in Amazon, the programme starts suggesting new books – even from new themes – which have often been purchased or viewed by other customers who bought the same books one has already selected to his/her shopping cart. Therefore, the software used by Amazon.com makes comparisons and finds relations between various themes automatically to point out some form of meta-knowledge, i.e., subjective meta-information (see Johnson 2001, 122-129).

Another example of RC could be The Kalevala (1835), the national epic of Finland. Elias Lönnrot used years of his life walking around Karelia, talking with people and gathering oral stories in his notebooks. In the end, he was able to conclude the common denominators of the stories and give them a literary and smoothly running storyline, creating one of the mightiest epics in the world, which in contrast to many other epics e.g. *The Iliad* and *The Odyssey* by Homer or *The Lord of the Rings* by J.R.R Tolkien, is more heavily based on the oral tradition of the people than the creative work of the author (Aaltonen 2007, chapter 6).

Existing, changing and invented patterns

Basing on my theoretical work, there are at least three kinds of patterns: existing, changing and emerging. Any of these can be managed with the types of Pattern management we have identified. However, some types of PM are more suitable for managing certain types of patterns than others. When EC is used, the pattern or "truth" is understood as something that is changing and can be reasoned with quantitative approaches. Therefore, EC can be used for locating existing patterns or for reasoning changing patterns, such as how the consumer types drawn from actual shopping change over time.

When the TPO approach is used, there is usually a belief that one "permanent" objective "truth" can be located, or that there is at least one "permanent" "truth" that is objectively less disputable than the others. Therefore, TPO is also suitable for reasoning out existing patterns – something that can be seen as objective or tangible: a finding, a pattern, a path, an object or a phenomenon.

As RC is a more subjective and qualitative form of Pattern management, the patterns drawn according to it may be different or more subjective. Should we call the patterns or the "truth" that is looked for in RC "invented"?
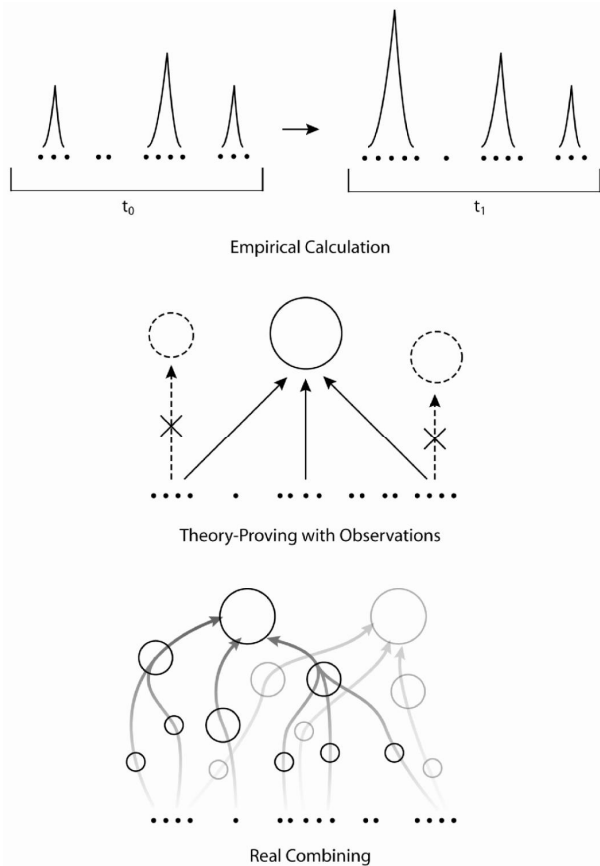
Figure 1: Three general types of reasoning in Pattern management

The dots in the pictures of figure 1 represent (loose) observations, weak signals [2], strong signals, pieces of insight or raw data. If the dots are very close to one another, they are believed to have some common denominators. If they are separated, they are believed to have less in common. In EC, the method of the management of observations into patterns is mostly quantitative. In TPO, the observations are used either for falsifying alternative explanations or showing the likelihood of the favoured conclusion by giving a set of more or less disputable assumptions. In RC, the method for drawing patterns from observations

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[2] The concept of weak signals refers to observations of the surrounding world which someone has subjectively reasoned to have some special foresight value. In this paper the concept is understood in a broader view. Weak signals can include any qualitative and somehow surprising observation of the world which help us to manage the patterns of chance. The weak signals can be attached to existing or emerging patterns or it can be used to invent a certain pattern. They can sometimes be used for reasoning potentially emerging patterns as well. However, it should be noticed that the value of one single signal should not be overemphasized in foresighting. The reasoning of emergence of a certain pattern requires clustering of many different types of patterns.

is mostly qualitative and structural. The observations are used as building blocks in order to obtain a common storyline or understanding of the issue.

Sense making of emerging patterns

In addition to the existing and changing patterns, there remains one more form of patterns: the patterns which are potentially emerging. The processes of managing emerging patterns takes us close to the fields and concepts of anticipation, pro-activity, prospective thinking, appropriation, foresight and futures research. However, it has been difficult to find any formalised descriptions or methods for such management of emerging patterns from these fields. I have not found descriptions of such an approach from the fields in the most well-known or recent sources, such as Glenn & Gordon (2003), Godet (1993 or 2000), Bell (2004), Armstrong (2001), Kamppinen, Kuusi and Söderlund (2002), or EFMN (2005) Usually, the need for the process seems to be understood, but the methods of management are lacking, or they do not fit such a process. (Kuosa 2005b).

Emerging pattern here refers to something that is only a potential seed of transformation at the moment, but which is shown to have good opportunities to start growing in the future. A simple physical example of an emerging "object type of pattern" could be an embryo, which is, according to all valid and accessible knowledge, believed to have a good chance of growing into adulthood. An example of an emerging "phenomenon type of pattern" could be virtual consuming. It is a minor field of consuming at the moment, but it is possible to locate many reasons, driving forces and supporting factors why it is conceivable that it will expand and partly change the world of consuming in the future. Time and place dependence is weakening in e.g. consuming, work and communication; the role of expertise has been growing in society; the youth's values are already different from those of the elders; the continuing development of ICT; software and games seem to be becoming more realistic and interesting. This approach resembles both RC and TPO.
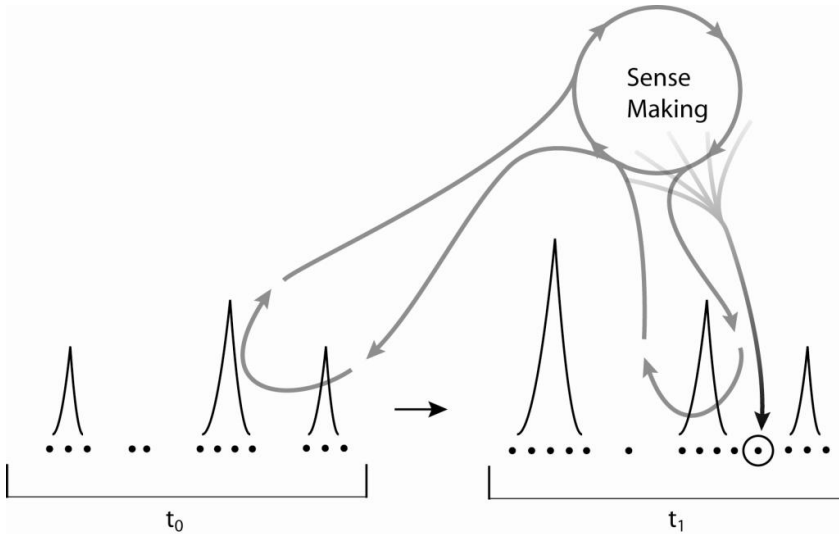
Making Sense of Emerging Patterns

Fig. 2: Managing an emerging pattern

In figure 2, the process of managing an emerging "phenomenon type of patterns" is shown from another point view. Here, the PM process starts with EC both in Time O and in Time 1, and is continued with the sense making process, which may here resemble RC more than TPO. In the figure, the located patterns are not the same in t0 and in t1. Some of the patterns are weakened and some are strengthened, something has emerged and something declined. When there is finally more understanding of changes in patterns in time, plus more understanding of the drivers of change, there is a fruitful stage for Sense-making emerging "phenomenon type of patterns". It may, therefore, be possible to locate something which is unformulated or weak at the moment but which nevertheless has very strong support, demand or capacity to be developed

The best examples of approaches and methods for managing emerging patterns I have found from the fields of Risk Assessment and Horizon Scanning, fashion and consumer behaviour intelligence, and from technological forecasting?. From the domain of Futures research and foresight, the best example of such work comes from John Naisbitt´s megatrend management (1985, 1991, 1997 and 2004). However, it should be noticed that the methodology of Naisbitt has been strongly criticized, as well (e.g. Slaughter 1999; 2004).

Naisbitt has a company, which goes through and analyses broad selections of world newspapers. The aim in his process has been to find knowledge, which tells us about the rising peaks behind raw data. Naisbitt and his colleagues set these peaks into a framework of platforms that claim to provide the knowledge of megatrends or other great changes (see Aaltonen 2007, chapter 6). Within his approach, changes are constructed from the bottom up, from the grass root level, by clustering – like in a puzzle. A new phenomenon or idea that does not manage to gain support in the ongoing development

process dies away – just like useless pieces are not put into a puzzle. Missing pieces are however looked after very hard.

Another example of PM of emerging patterns is found from trend analyses made in fashion houses or clothing industry in general. Here, we can utilize Naomi Klein´s (2001, 9, 75-86) description of the work of trend analysts or cool hunters in fashion houses like Nike and Tommy Hilfiger. According to Klein, such fashion houses have hired signals' detectors who observe and interview especially young avantgardist individuals from marginal groups. They also observe music videos of MTV, hip hop magazines such as Vibe. By young avantgardist individuals from marginal groups Klein refers for instance to big cities' black ghettos' poor young men, strong figures, who hang around basketball courts. They are influencing opinion shapers in their communities. When these people start representing something, using certain colours, styles, patterns, shapes, designs in their community first, their style is believed to be gradually adopted by the entire community, as people are group animals. Later on, the fashion of the ghetto will have an effect on the fashion of the whole country and even international clothing markets (see also Gladwell 2000, 3-9). What is fashionable among avantgardist groups in the spring might be fashion on the national or international level in the following fall. This synthesizing rational and inductive process made by the trend detectors, of course, requires very diverse observation work. The company could not trust observation just one 'ghetto' or one observing method (Klein 2001). There has to be lots of information collected from different sources, which needs to be embedded in the available theories of fashion and group behaviour.

Such trend detectors are used not only within the fashion business: Nokia (Trevor 2001, 21-30) uses anthropologists for observing people and their lifestyles in e.g. parks, streets and shopping malls. The observers are supposed to identify early information about psychological changes in human behaviour, individual value systems, key drivers of customers (what excites and motivates people and what are the ways people want to communicate and establish groups?). By synthesizing this information at an early enough stage, there is a better chance for a mobile phone company to be prepared for emerging or immerging (declining) consumer needs (Trevor 2001, 22-23).

Many intelligence agencies, such as the Pentagon and especially the Central Intelligence Agency (CIA 2006), have developed sophisticated systems for data gathering, analyzing and outlining the risks. There, all the forms of patterns (existing, reasoned and emerging) which seem to be used simultaneously, alongside with all the forms of PM's reasoning (EC, TPO and RC). To give one example of these approaches, the CIA tries to identify possible central nodes or figures in terrorist networks by searching subjects of sent e-mails or Internet downloads and connecting this information to certain people. It also uses anthropologists for observing and interviewing local people in possible crises areas, such as Iran. The stories that people tell there are especially important in the approach. In this way, the local silent knowledge (weak signals and emerging issues) at the grass root level is gathered in order to understand the early changes in public opinion. Certain paths in common storylines is believed to tell about a certain rising phenomenon in the social context (CIA 2000).

The CIA observes global statistics as well. It has a special interest, for instance, in the demand and supply chains of certain chemicals or equipment which can be considered necessary for preparing terrorist action. It has been said that, within this kind of statistical and multi-source information collection and synthesizing, the CIA has been able to expose a large-scale cocaine poisoning process which took place in Columbia. The poisoned cocaine was meant to be shipped to the North American markets. The work of the CIA could be given here as an example of multi-approach process, where all the Pattern management's forms of reasoning have been used simultaneously in order to ensure the reliability of the findings.

Conclusion

Reasoning is a mental process, which informs our imagination, perceptions, thoughts and feelings, and links our everyday experience with universal meanings. Thus, reasoning is a vital part of the process of sense-making, understanding and internalizing. In philosophy, there are many structured forms of reasoning under its main forms: inductive, deductive and abductive reasoning. In addition, there can be found some special approaches of reasoning such as analogies and its prominent everyday forms like case-based reasoning.

In this article, I have discussed and merged some theoretical forms of reasoning in philosophy with the findings of reasoning in some real life cases as well as with some practical methods or common sense approaches. In the process, some methods and approaches have appeared to have more common denominators with some forms of theoretical reasoning than with some others. An especially meaningful finding has been the deviation of the "aims or objects" in different approaches and processes. What kind is the "truth" or the form of the pattern that is looked for with reasoning?

Successful involvement in the present networked world, which is more hectic, interconnected, co-evolutive, unstable and full of loose and rapidly changing information, is difficult. It is especially difficult if we want to predict anything or if we are strategic actors or we want to manage an organisation proactively in this complex, evolving, rugged-landscape system. Strategic intelligence, and especially its most structured but open form, Pattern management, is a multi-approach attempt to answer or help to answer this challenge.

Discussion

This paper has discussed the reasons behind our experience of complexity, rapid change and information overflow in the contemporary world. I have presented the general categories of how people reason certain issues, and once they reason, what types of methods they have, and what types of answers they are looking for. Basing on the arguments, I want to state of few managerial implications. Firstly, if the strategic intelligence process of an organisation aims to help to draw a holistic view of a complex phenomenon, or if the process attempts to establish an efficient strategy to influence such issues, the organisation should not rely on a single strategy or single method. Instead, it

should aim to use a many-sided approach, which embeds different strategies and methods for different sides of the issue. The issue should be understood as something that is constantly evolving, "living", renewing itself, and that is constantly re-negotiated in a communication process. Thus, the use of linearity should be limited. Pattern management is a good way to reason certain types of patterns, but the types of patterns or "truths" that are looked for should be distinguished first. Once the objective is clarified, the right kind of management process can be selected. However, despite the fact that PM can help to get tangible insight of complex phenomena, it should be noticed that dynamically complex processes sometimes undergo fully random and chaotic periods, whose outcomes can not be predicted in any way. Yet, stable stages can be anticipated and sometimes even predicted, and this is good news for strategic intelligence.

References

Aaltonen, Mika (ed.) (2007): *The Third Lens. Multi-ontology, Sense-making and Strategic Decision-making*. London, Ashgate Publishing Ltd, ISBN-13 978-0-7546-4798-0

Armstrong, J. Scott (ed). (2001): *Principles of Forecasting: A Handbook for Researchers and Practitioners*. New York, Springer.

Barabasi, Albert-Laszlo (2003): *Linked: How everything is connected to everything else and what it means for business, science, and everything*. New York, Plume.

Bell, Wendell (2004): *Foundations of Futures Studies: Human science for a new era.* Vol. 2: Values, objectivity, and good society. New Brunswichk, NJ, Transaction Publishers.

Casti, L. John (2000): *Five more Golden Rules: Knots, Codes, Chaos, and Other Great Theories of 20th-Century Mathematics*. New York, John Wiley and sons, Inc.

CIA (2006): *Factbook on Intelligence*. The George Bush Center for Intelligence. Washington, DC. Office of Public Affairs CIA. http://www.cia.gov/cia/publications/facttell/index.html

CIA (2000): *International Crime Threat Assessment.* Office of Public Affairs CIA. 130 pages.

Cilliers, Paul (1998): *Complexity and Postmodernism: Understanding Complex Systems*. New York, Routledge.

Csikszentmihalyi, Mihaly (1996): *Creativity: Flow and the Psychology of Discovery and Investigations*. New York, HarperPerennial.

EFMN (2005): *Foresight in Europe and other regions of the world*. The EFMN (European Foresight Monitoring Network) Annual report 2004-2005.

Foreman-Wernet, Lois (2003): Rethinking Communication. In *Sense-Making Methodology Reader* by Brenda Dervin, Lois Foreman-Wernet and Eric Lauterbach (eds). New Jersey, Hampton Press Inc.

Gladwell, Malcolm (2000): *The Tipping Point: How little Things Can Make a Big Difference.* New York, Little Brown.

Glenn, Jeremy C. & Gordon, Theodor (2003): *Futures Research Methodologies* – V2.0. AC/UNU.

Godet, Michel (1993): *From Anticipation to Action: A Handbook of Strategic Prospective.* Unesco Publishing.

Godet, Michel ; Monti, Régine, Meunier, Franci and Robelat, Fabrice (2000) : *Scenarios and Strategies : A Toolbox for Scenario Planning*. Paris, Cahiers du LIPS, LIPS Working Papers.

Hare, D. Robert (1999): *Without Concience: The Disturbing World of the Psychopaths Among Us.* New York, Guilford Publications.

Hubblesite, Newscenter (2006): NASA Finds Direct Proof of Dark Matter, august 21 2006, http://hubblesite.org/newscenter/archive/releases/exotic/2006/39/fastfacts/

IBM (2006): Public Image Monitoring, *OmniFind*. http://www-306.ibm.com/software/data/integration/db2ii/editions_womnifind.html

Johnson, Steven (2001): *Emergence: The connected lives of ants, brains, cities, and software.* New York, Scribner, ISBN-13 978-0-140-28775-2.

Kamppinen, Matti; Kuusi, Osmo and Söderlund, Sari (eds.) (2002): *Futures studies: Principles and practices* (in Finnish). Helsinki, SKS.

Kant, Immanuel (1783) [1977] tr. by Paul Carus: *Prolegomena to Any Future Metaphysics That Will Be Able to Come Forward As Science*, (order from Amazon.com), Hackett.

Kauffman, Stuart (1995): *At Home in the Universe: The Search for the Laws of Self-Organization and Complexity.* New York, Oxford University Press, ISBN-13 978-0195111309.

Kauffman, Stuart (2000): *Investigations.* New York, Oxford University Press, ISBN 0-19-512104-x.

Klein, Naomi (2001): *No Logo*. London: Flamingo.

Kuosa, Tuomo (2005a): Weak signal or insignificant roaring: Pattern management as ontologically new approach to weak signals observations and reasoning (in Finnish). *Futura 4/2005*. ISSN 0785-5494, pp. 115-120.

Kuosa, Tuomo (2005b*): Study on Logics on Society's Macro-level Transformation: A Macrohistorical Comparison of Pentti Malaska's Theory of Societal Change Compaired to Other Theories of Transformation. *Journal of Futures Studies*. Vol. 10 (1) 2005, ISSN 1027-6084, pp. 15-30.

Kuosa, Tuomo (2007a): A Few Extensions to Path-dependence and Emergence in Complex Social Systems. *Emergence: Complexity& Organisations* (E:CO). Issue Vol. 9 No. 4 2007, pp. 3-16, ISSN 1521-3250.

Kuosa, Tuomo (2009): Futures Signals Sense-making Framework (FSSF): A Startup with tool for analysing and categorising Weak Signals, Wild Cards, Drivers, Trends and Any Other Types of Information. *Futures* (in referee process)

Luhmann, Niklas (1990a): *Ecological Communication* [Ökologische Kommukation, in German]. Westdeutscher Verlag, Oplanden/Wiesbaden.

Luhmann, Niklas (1990b): *Essays of Self Reference.* New York, Columbia University Press. ISBN: 02310636887.

Luhmann, Niklas (1995). Social systems. Stanford, CA. Stanford University Press.

Luoma, Mikko (2006): A Play in Four Arenas: How Complexity can serve Management Development. *Management Learning* Vol. 37 (1), Sage publications, pp. 101-123.

Lönnrot, Elias (1835): *Kalevala.*

Maturana, Humberto R. & Varela, Francisco J. (1992): *The Tree of Knowledge: The Biological Roots of Human Understanding.* London, Shambhala, ISBN-13: 978-0-87773642-4.

Merriden, Trevor (2001): *Business the Nokia way: Secrets of the World's Fastests Moving Company*. Oxford, Capstone Publishing.

Mitleton-Kelly, Eve (2003): Ten Principles of Complexity and Enabling Infrastructure. In Eve Mitleton-Kelly (ed): *Complex Systems and Evolutionary Perspectives on Organisations: The Application of Complexity Theory to Organisations.* Oxford, Pergamon, ISBN 0-08-043957-8.

Naisbitt, John (1985): *Ten New Directions Transforming Our Lives*. New York, Warner Books, ISBN 978-0446329224.

Naisbitt, John & Aburdene, Patricia (1991): *Megatrends 2000. Ten New Directions forth 1990s.* New York, Morrow, ISBN-13: 978-0380704378.

Naisbitt, John (1997): Megatrends Asia: *The Eight Asian Megatrends that are Changing the World.* London, Nichlolas Brealey Publishing, ISBN-13: 978-0684827063.

Naisbitt, John (2004): *Preview of the future – where is the world headed*? Naisbitt's seminar in Kalastajatorppa at 15.12.2004, Helsinki, Kontakti.net. (unpublished report written by Tuomo Kuosa)

Nicolis, Grégoire and Prigogine, Ilya (1989): *Exploring Complexity: An introduction.* New York, Freeman and Company. 65-75, fig. 30, 179-182, 257-263

Parsaye, Kamran (1999): From Data Management to Pattern Management. *DM Review Magazine*, January issue 1999.

Redding, Paul (2002): "Georg Wilhelm Friedrich Hegel", *The Stanford Encyclopedia of Philosophy (Summer 2002 Edition)*, Edward N. Zalta (ed.), URL = <http://plato.stanford.edu/archives/sum2002/entries/hegel/>.

Ross, L. Kelley (2002): *Immanuel Kant (1724-1804).* http://www.friesian.com/kant.htm http://en.wikipedia.org/wiki/Critique_of_Pure_Reason

Russell, Richard L. (2007): Sharpening Strategic Intelligence: Why the CIA Gets It Wrong and What Needs to Be Done to Get It Right. Cambridge University Press, ISBN-13: 978-0521702379.

Scholte, Jan A. (1996): Beyond the Buzzword: Towards a Critical Theory of Globalization. In Koffman, Eleonor & Youngs, Gillian (eds.): *Globalization: Theory and Practice.* London, Pinter.

Slaughter, Richard A. (1999): A New Framework for Environmental Scanning. *Foresight*, 1(5), October, pp. 442-45

Slaughter, Richard A. (2004): *Futures Beyond Dystopia*. London, Routledge Falmer.

Snowden, David (2002): Complex acts of knowing: Paradox and descriptive self-awareness. *Journal of Knowledge Management.* Vol. 6, (2), Emerald. pp. 100-111.

Valtaoja, Esko (2002): *At Home in the Universe* (in Finnish) Helsinki, Ursa.

Waldrop, M. Mitchell (1992): *Complexity: The emerging science at the edge of order and chaos*. New York, Simon & Schuster.

Weick, E. Karl (2001): *Making Sense of the Organization*. Oxford, Blackwell Publishers Inc.

Xu, Mark (ed.) (2007): *Managing Strategic Intelligence Techniques and Technologies*. Information Science Publishing, ISBN: 9781599042435.

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