The long-waves and the evolution of futures practice and theory

Abstract

Futures studies explore potential consequences of present day actions, and help in formulating desirable visions of the future, to guide action in the present. Although these aims have remained roughly the same, the practices and implicit theories supporting them have varied through time. This article looks at the evolution of futures through the framework of the long-wave theory, discussing the results of thematic interviews of futures professionals in three geographic areas: Finland, South Korea, and California. The long-wave theory sees societies changing in forty to sixty year cycles driven by technological development, around which social practices evolve. There have been five socio-technical waves since 1780s.

Each wave brought about a set of policies and social models, and a shared mind-set. In the fourth wave, futures was mostly practiced with the spirit of the postwar economic expansion, techno-optimism, and linear worldview, with futures methods that reflected trust in scientific authority, and aimed at forecasting the most probable outcomes for the future. The fifth wave was defined by uncertainty, which was managed by using strategy tools like scenarios that prepared for various different short- and mid-term outcomes. For the sixth wave, futures practitioners are divided between the expertled quasi-predictive model that dominates especially in the technology forecasting work, and the systemic perspective, which questions the centrally organized process-view to futures. New methods, often developed outside the field, have in many ways inspired and shaped the intellectual space in which the evolution of both practices and theory may occur in the future.

Introduction

Futures studies[1] have as their mission to explore potential consequences of present day actions, and help in formulating desirable visions of the future, in order to guide meaningful action in the

[1] Futures studies, or futures, is used in this article as a general term, including all practices that aim at producing information about the future. For instance foresight, although a semi-independent tradition on its own, is here seen to be a subset under the general futures studies framework. The act of seeking information about futures is in this article referred to as futuring, mainly for a lack of better verb, keeping in mind that this term has also been criticiced in the literature (e.g. Marien 2010).

present. Information about the future[2] is typically searched for in a 1) systematic, organized process with a participatory element targeting either a group selected for their expertise, or in other approaches aiming at involving a wide set of stakeholders, 2) in order to create information about the futures that can be used as a basis for decision-making (e.g. European Commission Research Directorate General 2001, Piirainen & Gonzales 2015). The latter part emphasizes the aim to produce actionable results that are relevant for a given context. While drawing attention to critical aspects of futuring, issues that relate to how these aims can and should be reached are left to be decided by the practitioner. These include the choice of methods, the design of processes, and the selection of informants. Therefore, while the aims of the endeavor have remained roughly the same, throughout the history of modern futures research the practices and implicit theories supporting the aims have varied. In this study the focus is placed on understanding the historical linkages between practical anticipatory activities, and the theories informing them. Such an evolution is traced back by using the long-wave theory as an analytical framework. The second part of this article uses the theory as a framework for anticipating the futures of futures studies. This analysis bases on the experiences and views of futures professionals in three geographic areas: Finland, South Korea, and California. In the interviews, questions of what methods, approaches, and processes are seen as appropriate in creating understanding of the futures are analyzed in order to understand how the field of futures is seen to be developing. The futures professionals' views are compared to anticipations about the next long wave. The aim of this work is to understand the relationship between theory and practice in a field that famously is lamented to be lacking a theory.

Theory as the Achilles' heel of futures studies?

The growing popularity of futures studies approaches in recent years can be assumed to be in large part credited to the applicability of its methods to answering a wide number of research questions, in addition to producing knowledge about possible futures. This emphasis on methods development and practical futuring however makes the lack of a comprehensive "grand" theory guiding cumulative knowledge building stand out. Under-development of the theoretical side of futures studies is often pointed out as a central shortcoming, especially by those aiming to establish futures studies as a discipline[3].

Futures methodology can be understood as different lenses through which one can aspire to look into the future. Different methods produce different results, and each have relevance to a certain type of framing of the future, and for answering certain kinds of questions. (Slaughter 2001). Looking at the history of futures studies, methods and approaches have had their popularity's peak at a certain time. This article approaches the question of theory through examining futures practices in their historical contexts, and their relation to commonly shared ideas about the future in each time period. Why do certain ways of thinking and researching the future seem more plausible than others at a given time? Is there a relationship between the methods used, the prevailing societal mind-set, and the view of the future proposed?

[2] In this article, the output of any futures process or method is referred to as futures information, where the meaning of information is intended as "knowledge obtained from investigation, study, or instruction" (Merriam-Webster online dictionary), instead of using the term knowledge which in this context is epistemologically more contested.

[3] There is an ongoing debate on whether development towards an academic discipline should really be the aim of futures studies. (e.g. Marien 2010). The whole field of futures studies is merely 60 years old, and it may well be that these discussions, including the issue of a lack of theory within the field, are reflections of this, and will be solved as the field matures.

In the discussions about the theory of futures, what is referred to as theory ranges from epistemological and ontological considerations to the theory of conducting futures processes, and even to individuals' ability to assess the futures (see Piirainen & Gonzales 2015 for an extensive analysis of different levels of theory in futures studies and foresight). For the purposes of this article, theory is taken to mean an overall, shared understanding of what are the preconditions and limitations for producing information about the future (epistemology), what constitutes an effective futures process, what are the practical ways to explore the futures, and what are the best possible information sources for it (methodology). The proposition of this article is that the practitioners' views about each of these are in line with general anticipations about the future, specific to a particular historical moment.

Ultimately, the article explores an idea that the difficulties futurists have had with finding a definitive theory for futures studies result from the transitive nature of the theories employed within the field: the theories evolve and change as the ideas on what constitute the methods, approaches, and processes in creating understanding of the futures, develop. The two are intertwined to a point where theory is inseparable from practice. Due to the practice-dominated nature of the field, there is little pressure to articulate all the theoretical ideas affecting the practical work.

Futures studies in the context of the long-wave theory

Cycles in economic activity refer to regular fluctuations found in economic data, where a period of economic growth is followed by stagnation or depression. Cycles of different lengths have been identified by scholars. The shortest Kitchin cycle lasts about 40-49 months, and a Juglar cycle (regular business cycle) lasts from 3 to 7 years. Of the longer cycles the Kuznets cycle is estimated to be about 15-25 years, and the Kondratieff cycle lasts 40-60 years (e.g. Louçã & Reijnders 1999). An argument has been put forward that one Kondratieff cycle is a composite of two Kuznets cycles (Berry 1991). Especially for certain civilizational issues, like global hegemony and war, long cycles (of around 200 years) have been proposed (Goldstein 1988, Modelski & Thompson 1996). Theories of societal change based on the Kondratieff cycle often understand the 40-60 year waves to be defined by a characteristic set of technologies, social practices and organizational forms. Nikolai Kondratieff, whose name is identified with the theory was the most influential scholar among a number of late 19th and early 20th century thinkers interested in the long-wave phenomenon (Ayres 1990a, Louçã & Reijnders 1999). Notable 20th century authors interested in Kondratieff's findings include Joseph Schumpeter and Simon Kuznets, who both developed their work in the Kondratieffian framework. Especially Schumpeter's work has influenced long-wave thinkers since, by bringing up the idea that temporal clusters of major innovations create new opportunities that in turn accelerate economic growth. The long wave phenomenon was explored widely in the early 20th century, before attention turned to Keynesian economics, and left long wave theory to the position it occupies today on the fringes of mainstream economics. At least two main reasons can be presented for why the long-wave theories of economic development have remained outside the mainstream of economics: first, there is a lack of fully convincing theory of the underlying cause(s) of the waves, and secondly, for the waves themselves are difficult to observe using mainstream econometric methodology so that the structure of the waves could be objectively and unambiguously charted. Today, the long-wave fluctuations are a much debated field where discussions range from the mechanism generating the waves, to the most fruitful data to use for observing the phenomenon. The problematique surrounding long-wave research is well expressed in a quote from Joshua Goldstein:

> *"The study of long waves has generated heated controversy, contradiction, and irresolution for over sixty years without making much progress in "cumulating knowledge." Knowledge accumulation implies an established body of knowledge in the field, the frontiers of which may be expanded by ongoing research. In the long wave field there is no such body of knowledge, and no consensus exists on the central issues: the existence of long waves, their scope, and their causal dynamics. Instead, isolated research traditions create "pockets" of theory that are accepted only within their own tradition."* (Goldstein 1988, 23)

Despite the difficulties posed by the fluid nature of the phenomenon, the notion of history having a pattern that can be deciphered by looking at the data generated by modern economies has inspired important scholarly work in fields as different as history, technology studies, and of course also economics.

Most modern interpretations of long cycles are commentaries on the Schumpeterian view of the Kondratieff waves as an evolutionary model, where new innovation and creative destruction are the main reasons for long wave fluctuations (Modelski 2001). This approach, where innovation and technology are seen as key influencers of economic growth, has generated a school of thought among the long wave thinkers who try to find an explanation to the existence of the waves by analyzing clusters of technological innovation. In Kondratieff's work long-term fluctuations were found in economic indicators (namely commodity prices). This approach is still creating solid analyses of the phenomenon (e.g. Berry 1991). However, research has been steadily moving towards forming a more holistic view on the long-term fluctuations:

Mensch (1979) linked innovation with investment behavior in his influential metamorphosis model, arguing that prosperity leads to risk aversion on the part of investors, and only in conditions of stagnation or recession, where few low-risk opportunities are available, more radical innovations are able to get funding for their development.

Marchetti (1986) extended the analysis from monetary indicators to other fields of human activity, finding "pulsations" of 55 years (from a period of at least 200 years) in infrastructure building, innovation, and social phenomena such as violence (homicide and suicide rates). He also introduced the idea of mathematically formulated patterns allowing for quantitative forecasting. For Marchetti, the root cause of the pulsations was the networked nature of social information trading that follows basic biological patterns.

Ayres (1990a & b) pointed out a dynamic where key technologies develop in niches during the previous waves, and are taken up as the rising wave reorganises the society so that it can take advantage of the new technology. He suggested that societal practices and technology develop together and are equally important in shaping the contents of the rising wave. This is a significant step forward in the development of the long wave theory, as traditionally the co-evolution has been seen as a unidirectional process, where new technology and corresponding societal practices respond to technological, ecological and societal pressures (Modelski 2001). Especially important for the argument advanced in the article at hand is Ayres' concluding view that technological breakthroughs both advance existing technology, and at the same time change the entire technosphere by offering possibilities for a fusion of developments in different fields. This dynamic may also explain Ayres' suggestion that an important innovation contributes economically quite little

to the next upswing of the wave, but rather to the subsequent ones as a combination of continuation of a previous technology, and an innovation that brings it to the next level and spurs radical innovation in other areas.

Biology and learning are key themes also in other approaches aiming at broadening the understanding of the long waves, such as the generations approach to the long waves (Dator 1999, Nefiodow 2017, Mensch 2006, Linstone 2006, Dator 2006, Serra 2006), and analysing historical developments using population ecology models (Turchin 2003).

For the purposes of futures studies, the long waves phenomenon offers tempting frameworks for contextualizing long-range visioning. Yet, the difference in views about how to "time" the waves, resulting from the lack of consensus regarding the proper way to measure the onset and end of each wave, is arguably one of the most important challenges to the credibility of the theory, and a real hindrance to applying the theory to direct forecasting (Dator 1999). In this article, the timeline is based on an interpretation where the financial crisis of 2008 and its aftermath represent the final phase of the fifth K-wave, starting the transformation that is leading to a growth phase of the sixth wave. This view has been supported in the recent literature (e.g. Moody & Nogrady 2010, Wilenius & Kurki 2012, Akaev & Korotayev 2016, Nefiodow 2017). However, considering the plethora of interpretations especially considering the timing of the waves, it must be acknowledged that many key authors in the long-wave literature use a significantly different way to present the cycles (e.g. Devezas, Linstone & Santos 2005, Devezas 2010, Mager 1987). For instance, Carlota Perez, whose work on the waves in many ways resonates with the arguments presented here for the sixth wave, considers the phase that is now starting to be the deployment period of the fifth wave (Perez 2002).

The first wave (1780-1830) key technology was steam machine, the second (1830-1880) around the railroad, third (1880-1930) electricity and electrification of societies, in the fourth wave (1930-1970) the key dynamic was around mobility and automobiles, and in the fifth (1970-2010) around ICT (information and communications technology). Each technology brought about a distinct set of policies, and social models for organizing, which were condensed as a shared mind-set of "what makes sense", and what constitutes a good life (Perez 2016). Foresight, in this context, can be seen as a reflection of the prevailing societal mind-set of each wave, with implications to what foresight is assumed to help to achieve, and how: the choice of approaches needs to be compatible with what is seen to be rational, and in line with the mainstream academic thought, thus "making sense" in the contemporary society.[4] Scientific futures studies methodology has existed since the fourth wave. Next, the futures approaches in the previous waves are considered against the general spirit and socio-technical quality of the wave. As discussed in brief earlier, the relationship between a technology / technique and the wave it is embedded in is complex. Ayres (1990b) for instance notes

[4] This type of approach to theory would be pragmatist (see Kuusi 1999 for his arguments for pragmatism as a suitable philosophical stance for futures studies) in the extreme were it a conscious strategy. However, here one must exercise caution and note that the field now and in the past has been very heterogenic, and the theoretical sophistication of individual futurists has always varied. Here, looking at how the mainstream of practicing futurists has tended to use methods in a given historical context, will be a broad-brush generalization, and as such of course open to criticism. For instance, the Delphi-method, here placed under the fourth wave methods, is a continuing and evolving tradition cutting through different waves. On the other hand, the Delphi offers a prime example of how valuations and theoretical considerations have almost completely altered the method from the original, at least in some of its versions, like the policy Delphi approach.

that in the fourth wave, few of the technologies contributing to economic growth were new, but rather that the old technologies were used in a novel fashion. Freeman and Louçã (2002) have suggested that rapid growth period in many cases has been driven by the diffusion of important technologies that had been introduced much earlier, but had been left to the margins in the previous waves. Basic innovation thus is dependent on successful adaptation of the innovation to new purposes, and adoption in large scale. Analogically, a development in futures thinking may not produce direct consequences in the next wave, but the relationship is more nuanced, depending on other factors contributing to the evolution of the socio-technical sphere.

The development of scientific foresight methods was a part of a general expansion of the scientific base of societies of the fourth K-wave (e.g. Bell 2003). Technological solutions like the co-development of private automobiles and the petrochemical industry, were changing individual lives and the shape of cities and societies. In this phase the mainstream of foresight practices resonated with the techno-optimism of the time. The first wide-spread foresight methods relied on scientific authority, either as rudimentary computational methods that reflected a linear worldview in the form of trend-extrapolation, or by utilising techniques for forcing out consensus among expert judgments as a way to assess most probable outcomes for the future. The underlying philosophical stance of the time, also in futures studies, was that of positivism, and the aim was truly to predict outcomes of present trends and drivers in the future (understood as a singular state of affairs). Expert authority was rarely contested, and mathematical modelling and statistical analysis were trusted for revealing the true nature of future, like it had done for numerous other fields in the society.

The fifth wave was defined by the application of computing in business and for leisure. Adoption of personal computing, with its main innovations stemming from the fourth wave, was key to fifth wave dynamics, and communication was revolutionised first by business systems for communications, and later by mobile phones (likewise products of late fourth wave). The epitome of the fifth wave, the Internet, provided the metaphor for globally networked business and increasingly, private life. One aspect of this development was growth of complexity, and as a consequence, economies and businesses struggled with seemingly incessant uncertainty and change. Strategic management offered tools to make sense of this change, and to try to manage it. Foresight was one of the fields that in this period expanded from being a tool mostly used in military planning to one increasingly used by all kinds of organisations for preparing for the future that rarely was manifested as the kind of linear extrapolation from the past that it had been in the fourth wave. A method encapsulating the social mood as regards the futures (plural form adopted in the fifth wave foresight paradigm) is the scenario method, in which one aims to map out possible futures and as a result of this exercise, find ways to survive (or even take advantage of the change and flourish) in one of them. Philosophically, the positivist ethos pertaining to the early futures studies methodology had already shifted to a more constructivist understanding of the work as investigating the views of the futures of individuals in the present (e.g. Fuller and Loogma 2009). Postmodernism as the new concept with forward reaching qualities in the fifth wave, nested in the dramatically faster, multi-dimensional globalising world where the parting with the old ways seemed to be on-going in almost all its aspects, is well compatible with scenario thinking, which allows for consideration of multiple future realities, all possible and co-existing in the present.

The fourth and fifth wave have left a legacy that is in part path-dependently shaping the outcome for the sixth wave, but it is also providing incentives for structural transformation. In the next chapter, general drivers for the next wave will be explored.

Drivers for the next wave

A driver in futures studies has been defined as a "*phenomenon that lays behind "Trends" and "Megatrends", and is steering decision-making and choices. Driving force phenomena do not have a direction per se, but they still affect decision-making and choices, either at a conscious or subconscious level. They can be a set of assumptions, particular basic beliefs, singular facts, or events affecting organisations or individual actors*" (Heinonen, Kuusi & Salminen, 2018).

The fourth wave left behind urban structures designed to be navigated with private cars, and the oil based economy, as the most significant structural elements that are perceived as problematic from today's perspective. However, it is the changes occurring during the fifth wave regarding the communication tools, our understanding of the way knowledge is produced, the amount of information available, as well as the increased opportunities individuals have for influencing the societal system, that create the backdrop against which the sixth wave is starting to unfold. A growing sense of societies becoming increasingly complex and challenging to manage has already created tensions between techno-optimists and –pessimists, and a backlash of conservatism is growing amid techno-utopias. In addition, change is catalyzed by advances in understanding human behavior, and advanced statistical techniques enables making use of large amounts of data.

The sixth wave dynamics are anticipated to be driven by the search for sustainability and resource productivity, understood very widely as ranging from well-being to organizational practices and environmental protection (e.g. Wilenius & Kurki 2012). The need for finding sustainable solutions to the world problematique, and the worsening resource scarcity, are issues inherited from the previous waves' technospheres, where the abundant seeming energy and materials lead to pollution and excessive consumption. These issues have been identified, and have been a topic of mainstream concern from the the 1970s (fifth wave) onwards. However, the societal transformation that the social and environmental sustainability require is rooted in the digitalization, and the revolution of communication technologies and social practices ensuing from it (e.g. Perez 2014, Kurki & Wilenius 2016). The form of organization the Internet has promoted is often described as self-guided organizing without a formal, hierarchical structure. The internal logic of the web has already spread to many other practices related to information production. Digitalization has been connected with a novel ethos that places intrinsic value on sharing and participation (e.g. Benkler 2006). The peer-to-peer knowledge formation, often seen as the basic mechanism behind the vast expansion of reliable scientific knowledge, relies on a self-correcting mechanism, which means that each individual has an equal possibility to modify and produce contents. At the same time, a concern over the speed of the spreading of disinformation through social media competes with more optimistic ideas about the *wisdom of the crowds* -phenomenon, which refers to the observation that averaged estimates from a large population often are as good or better than singular experts' judgments (Surowiecki 2004).

At the core of factors influencing the next socio-technical wave is also the exponential expansion of available data, generated by individuals acting in the digital sphere. The term Big Data is used to refer both to the amount of data, and the new opportunities for its exploitation. The overarching idea is that from a large amount of data it is possible to infer things that would not be available from

smaller data samples. Data science has progressed rapidly due to the many economic benefits that are potentially attainable from it. During the past years, big data –inspired approaches and analysis are starting to be harnessed also as background for public policy-making. Big data researchers Cukier and Mayer-Schoenberger foresee an expansion of new approaches to value-production and problem-solving following from adopting Big Data based analysis in different walks of life. They see that realizing their full potential also requires a completely new attitude to fundamental issues that have to do with the nature of institutions, and individual identities (Cukier & Mayer-Schoenberger 2013). It is for these reasons Big Data can be assumed to be one of the important societal drivers of the next wave. It is accompanied by unprecedented advances in artificial intelligence and robotics that in combination have offered material for both utopian and dystopian futures scenarios, a feature that has been linked with anticipating the next wave (Curry 2014)[5].

Lateral power is a term popularized by Jeremy Rifkin (2011) for describing the development where new communication tools (the Internet, and especially the social media platforms) combined with new distributed energy production forms have an effect of increasingly moving institutionalized power to individuals. In his book "The Third Industrial Revolution"[6] Rifkin envisions a shift in the economy towards more democratic forms, as the new ways of producing the key goods in the economy: energy and information, will in the future require collaboration instead of competition. The roots of this thinking are embedded in the novel attitudes and operating models the Internet generation has adopted towards individual's possibilities, collaboration, and sharing. While Rifkin's vision is subject to criticism for instance in the light of strong opposing trends in the distribution of wealth and income in the past decades (e.g. Stiglitz 2016), it still resonates with many other practices that together anticipate the general systemic reorganization in the next socio-economic wave.

Novel challenges and opportunities for foresight

A key point of departure for this study is the assumption that the ways in which we use the future as a reflection point are in transition along with the changing socio-economic wave. It is far from a novel observation that the field of futures studies approaches and methodologies are tied in with their historical context, and thus subject to changes in order to avoid becoming irrelevant (Mermet, Fuller & van der Helm 2009, Kuosa 2011, Linstone 2011). Histories of the evolution of futures tend to outline the history as a procession from positivist-empirical forecasting, towards more interpretivist approaches (e.g. Inayatullah 2002).

Futures studies matured in the fifth wave, and as result the ideas from the fifth wave have been cemented almost as truisms defining the field. However, outlines of the next large reorganization of societies have been identified already early among futurists (e.g. Malaska 1999), as the potential for

[5] The list of drivers for the next wave is not conclusive, and further down the road for instance possibilities of genetic engineering as well as space exploration (asteroid mining) can be assumed to offer solutions for the aforementioned challenges of the sixth wave. However, the next wave, as hypothesized here, is expected to form around the basic drivers of intelligent technologies, data, and changes in the social ethos.

[6] As a reflection of the fast development of technology, visions of industrial revolutions have already passed on to envision the 4th industrial revolution, referring to the kinds of technological amalgamations that make the sixth wave technosphere possible. However, here the reference is to Rifkin's argument about distributed energy internet and the ensuing power shift. In this context it is argued to be still relevant, as it presents a clearly different societal futures view than the envisioned fourth Industrial revolution.

digital revolution to bring forward a more communicative organization of key areas in the society started to become more articulated. These ideas, originally presented for societal development, were simultaneously translated to the development of futures studies, for instance in the work of Ervin László (1985) and Mika Mannermaa (1992) They proposed a research agenda that would incorporate in full the findings from complexity science (e.g. László 1985, Mannermaa 1992, Kuosa 2009). Exploring the systems view further, Dufva (2015) brings forward the idea that foresight works best as a property of the network, not of certain individuals within it. Similar ideas have been promoted by the futures literacy –initiative (e.g. Miller 2007). Perhaps even more symptomatic of the rising popularity of an organic, systemic approach to futures studies is conceptualized as the anticipatory systems thinking, or anticipation in short. It approaches the question of theory in foresight from a meta-level, looking at all the activities that humans (also other organisms) have for forward looking, and concluding that these constitute a fundamental dimension in human thought, as a futures oriented species.

Voices questioning some of the key points of the fifth wave futures paradigm, like the impossibility of empirical research, have been heard from outside of the circle of bona fide futurists[7]. Especially relevant discussion that tangents key issues of foresight come from cognitive psychology and statistics. Both target especially expert judgment, and seek to show that regarding issues relating to mid- to long-term futures, expert judgment (that still is key to many foundational futures methods) is not a very reliable source of *forecasts*[8]. To remedy this found problem, the use of specific training to overcome bias is promoted (Tetlock 2015), or the use and development of statistical methods for topics that currently are overtly reliant on expert opinion (Silver 2012).

In this study the question is how the drivers for the sixth wave are changing the foresight practices. What kinds of views do the foresight professionals have about the futures of futures? Here, key questions include: How is the expansion of the potential sources for background data changing foresight? Who can take part in foresight processes, and what those processes are seen to comprise of? What is the relation between participatory processes, and expert evaluations when assessing the direction of change? And indeed, what should be the aim of futuring in the future: forecasting, anticipation, discussion, teaching or facilitating decision-making? To sum up, the rising trends on the other hand seem to emphasize inbuilt, systemic awareness and futures readiness, echoing the quote by Riel Miller (2011) "*The challenge is not finding ways to "know" the future, rather to find ways to live and act with not-knowing the future*". On the other hand, there are pressures to sharpen the limits of what can be approached as empirical questions about the future. These both follow logically from the anticipated dynamics of the next socio-technical wave, presented afore.

Methods and data

The data comes from thematic interviews exploring themes related to the futures of foresight. The interview procedure contained elements of the argumentative Delphi process, as arguments from previous interviews were presented for comments. However, the method does not qualify as a

[7] Marien (2010) noted in his typology of futurists that many central figures affecting the "field" have no formal or recognised affiliation to futures.

[8] Tetlock has been criticised for blaming futurist for failing at forecasting , even if it has been regarded a secondary goal for futures research methods since the fifth wave. For an in-depth discussion about the motivations for using the Delphi-method, the most important expert judgment based method in futures research (c.f. Linstone & Turoff 1975).

Delphi interview process as the main approach in the interviews was traditional thematic interviewing. In total 23 foresight experts participated in the thematic interviews, of whom nine were from Finland, 10 from the Republic of Korea, and four from the United States (California). Six interviewees were women. The selection of these specific geographic areas, each from a different continent, was done as a reflection on the historical phases of futures traditions: The US (arguably especially California) pioneered the practice of futuring, creating many of the methods and practices still in use starting from the fourth wave. Finland belongs to the group of countries where futures thinking on a larger scale was adopted from the 1970s onwards, and it also represents a country where futures institutions on the state level, existing as different policies and institutions dedicated to the practice, have been built. Republic of Korea has been influenced greatly by American foresight thinking after the Korean war, but the building of stronger resources for foresight and futures has only recently received significant attention within both the private sector and the government lead institutions. A factor reflecting on the quality of futures work practices in these countries is the role of industrial policy, where the US is an outlier in comparison to Finland and ROK, both practicing active industrial policy and related technology assessment work that often employs futures methods and processes.

The informants were selected by using a combination of help of a local informant and snowball sampling. Of the interviewees, five (four from Finland, one from California) are academics (A), nine (eight from the ROK, one from California) represent public or private sector (governmental) research institutes (R), and eight (five from Finland, two from California, and one from the ROK) are from the private sector (P). One interviewee divided his time evenly between academia (A) and public organization (R). All interviewees in Finland and California had over 10 years of experience from futures work, and all interviewees from the ROK were at the time of the interviewees engaged in futures projects. The background information is coded according to interviewees' predominant situation at the time of the interview (the earliest interviews were made in the 2012, while the bulk of the data has been collected between 2014 and 2015, and two last interviews are from the spring 2016). Interviews have been conducted in English, except for the interviews with the Finnish foresight experts, in which Finnish language was used. The Finnish quotations have been translated by the researcher. Material from all interviews is not quoted in this paper. Anonymised, transcribed interview data are available by request from the author. For this paper, the interviews were coded manually by searching for references to **impact of futures, methodological development, and nature of foresight processes** regarding the futures of futures work, a framework adopted in a modified form from a typology presented by Van Notten, Rotmans & Asselt (2003). The findings are presented as quotations, with key quotes selected that represent or encapsulate a view-point shared by several informants, or individuals with a view that is clearly different from the majority of views. Competing viewpoints are aggregated in table 1. Results in this study are not systematically analyzed by country or professional background, but rather the aim is the exposure of different views that are present in the foresight communities in the selected regions.

Results

Impact of futures

The discussion on the impact of futures had two poles, first a resurfaced debate about prediction, and secondly, the fate of futures as a field in the changing socio-technical landscape.

Importance placed on foresight, and the demands for concrete results, is generally seen to be on the rise.

> "*I believe we have witnessed a kind of change during the last few years […] that foresight has become an acute issue in a different way that it has been before. The change is related to ICT and the fast, unpredictable nature of change it entails. This unpredictability is also global. This issue is acute everywhere: why could not anyone see the financial crisis coming, or the conflict in Ukraine? This unpredictability has led to pressures to better guess the acute situations, this has resulted from the dynamics brought about by the Internet. […]"* (FI, P5)

The pressure to increase the impact of futures is not only external, but comes also from within the professional community, as expressed in this quote:

> *"I started to think about how many thousands of foresight processes have we made, and yet we are in this situation where we are. The equation does not work somehow. All foresight processes seem to live their own life, someway, we think about the future, gather knowledge, have good workshops, but they don't show up in the daily life. So we could be a little disappointed as well, we should be better prepared for surprises after all this. […]"* (FI, A4)

Especially in the responses from experts from the ROK, this accountability is taken to mean responsibility for producing successful predictions. This task is either taken for granted:

> *"Two or three years ago we assessed our results. First was (done) in 1995, it was until 2015. In 2010 we looked at how our assessments had been successful. 70 % of our estimates were correct. […] We will continue with our assessment but not this year […] Aim [of the work] is to predict (technology)".* (ROK, R2)

Or predicting is understood as a tool that *can* be strategically used:

> *"(The task of foresight is) first, just to promote the dialogue between the stakeholders (academia, government, civil society, industries). Second, to show what is the risk, what is the opportunity, the challenges you might face. Even though (these are) not predictions, sometimes (they) might be, sometimes they should be, if you need some preparation for the future."* (ROK, R3)

In some answers, taking on the challenge of producing measurable predictions was seen as beneficial for the development of the field:

> *"Arguably the biggest problem the futures has is the lack of incentives for being right, and finding clear standards about how you get better. I think (the search for predictive power) can be a step forwards, sure. (…) For me I think one of the big problems with futures is the absence of a clear standard of what separates good work from bad work. (…) If it is the case, once you back away from the idea … that prediction is impossible, and you shouldn't even try, the problem with that is that that offered a very clear standard for performance (…) There is no standard that I can use or that my peers can use for evaluating my work or anybody else's. I think that this really holds the field back as there are tremendous opportunities and new tools that are being developed in other professional communities that we*

have largely ignored, we've either largely ignored them or we've kind of co-opted them a little tiny bit as with ramification, but we've not yet made as part of that engaged in serious effort to think about where what they tell us about edge of what is knowable about the future versus what is unknowable, nor have we more deeply to ask in a world that in many ways feels quite different from the one where scenarios developed, are there new tools that we can develop that either tell us more about the future or will be more useful to our clients." (US, R1)

These views are in stark contrast with the majority of interviewees in both Finland and the US, who are emphasizing more traditional views, critical of any claims to foreseeing the future:

> *The problem of foretelling is not only that it is fake science, because no-one can predict, there is no formula where you could fit everything. It is even dangerous, as people will trust your prediction if it is presented too exactly. This will make them unable to see alternative possibilities.* (FI, P1)

> *"We should not focus on success in prediction, but rather the challenge is impacting decision making. (This is) the key issue in foresight and futures studies. Teaching strategic forward looking thinking in short-term, mid-term, and long-term, so that the decisions could be placed in a temporal framework. […]".* (FI, A1)

Also experts who are developing sophisticated algorithms for scenario testing tended to downplay the role of computing, and see it more as a way to facilitate expert judgment.

> *"[…] we are not predicting, so we're trying to use expert information in a different way. […] you're challenging people, when you ask people what's going to happen, it gets mixed up with either what they'd like to happen or what they worry about… so we do a lot of shifting the question, and the question becomes, "if you were going to do this, how might it go right or wrong?", which is designed to go around a lot of the biases, and a lot of the other failings of expert opinion. But you're basically asking questions about the system, how it works and might work in particular circumstances with particular filters on it."* (US, A1)

Regarding the discussion on whether the field should adopt new goals or interpretations about what its aim is, some of the experts reflected on the immaturity of the field, and how it can in certain issues lead to dogmatism, which is keeping the field from renewing:

> *The basic theses formulated by Bell and Amara are the paradigms of futures thinking that in philosophy and physics are discussed under determinism. If the world is one big causal process whose direction started from the Big Bang, why could it not be explained? This is a question of reductionism, determinism, world views, about freedom… I see that there is* plenty of *room for different futurists debating about whether it is possible or not to forecast things. (…) I* just think that today futures *as a field* is *so young and so full of group think that arguments against such big personalities as Bell, who was for a very long time the only book writing futurist* (even though he *was not even a futurist), and then Malaska's heritage, they have blind sighted us into thinking that this is the way it is, and there has been no-one strong enough to ask that what if it isn't. But we can, and we should think differently,*

because by so doing we will be better. If the power of futures thinking is opening up different views about the futures in order to make decisions better, so I believe the quality criteria for our field includes being able to give multiple explanations to the question of how are futures formed. (FI, R&A)

Increased interest to the field, and new kind of competition was also noted. These create pressures to come up with new approaches to the work:

We will have completely new kind of competition. If we have been thinking that we know this traditional futures research, we will be challenged by very agile actors from the digital sphere who are starting to get a hold of this in a completely different way. They know how to communicate, they are a little bit cooler than us, who are maybe a little bit dusty… (FI, P4)

In many answers, advancing futures thinking was seen as a pedagogical mission:

"The way I think about it is image you are a first grade teacher, every year those kids come in and they don't know how to read, and every year you have to teach them how to read, it's the same process you have to go through. Every year there is a new generation of policy makers, who don't know how to think multiply about the future.". (US, P1)

"(...) one of the things futures is really good at, at its best, telling interesting stories about the future. And there are various reasons those narratives have a kind of emotional value with clients that mere data sometimes does not. I think that to the degree that futures would wish to be or seek to remain an enterprise that is promotes kind of understanding of and responsible use of contingency and freedom, it would be necessary to figure out how to help clients or help audiences appreciate those things even as you're generating stuff that's, far more quantitative forecasts or predictions that have error bars, or certain percentages of certainty or uncertainty" (US, R1)

Methodological development

The methodological development discussion echoes some of the general themes present already in the overall discussion on the impact of the field in the future, namely how to incorporate methods and practices aiming to produce more accurate estimates of futures directions. Here, the experts were divided between those who thought novel, often computational methodology would bring advances for the whole field, and traditionalists, who find that classical methodology is serving the field well.

Some experts pointed out that technological advances enable fulfilling some of the ideas that were presented in the fourth wave methodological development. More advanced analytical capabilities were seen as bringing about a more efficient implementation of the old ideas, rather than representing any true paradigm shift:

"I tend to be a sort of neo-classicist in this, […] in the 50s there was this great explosion of quantitative methods […]. But my reading of a lot of the early work was "this is the way people think about this but we can't really do the math that way because we don't have the capabilities, and so let's simplify the problem, let's re-structure it", […] and now that the

information base and the technological capabilities are becoming so much richer, we can start to go back and provide analytic decision support, but in a way that is closer to the way that people actually thought about it (originally) […] before they started using tremendously useful but quite limited analytic capabilities". (US, A1)

"I mean in a way we're coming back; what the big data people are doing is a version of futurists were trying to do at the RAND corporation in the sixties. This is the kind of thing that Delphi thought it could produce. And arguably (…), they were working with too small a data set. But I think unfortunately the tendency (…) is to say you know well this whole data thing has been tried… Well, I mean, yes it was tried on machines, effectively, but there is a world of difference between a relatively small model of 1965 on punch cards versus the kind of stuff you can do today. I mean it's a bit like looking at a 747 and saying you know, in the 17th hundreds, people strapped wings around themselves and that didn't work. Well yes, BUT, it's a different set of tools even if it's the same intention." (US, R1)

The methods promoted often reflect quite directly the understanding of the aims of foresight, as for instance here:

"Focus is on technology foresight, how technology changes with time. We (want to) find out what is the future (of) technology. We are interested in all areas (of technology). For this the best method is the Delphi. We are also interested in how technology affects the society in certain topics. And after that we changed our method to scenario planning. Usually (we use) Delphi, but if interested in certain area of tech, we use the scenario method." (ROK, R8)

Novel approaches are either seen as an addition to the existing methods:

"In producing foresight information we have, in addition to expert knowledge, for instance crowdsourcing, which is very interesting […]. But also Big Data, quite interesting is the combination of experts, crowdsourcing, and big data… A big question mark, but very interesting". (FI, A1)

"(…) We understand that our heavy processes do not always work, and that we have to take a more experimental mode, with creative workshops, simulations, gamification, playfication, what are all the words used for this… There are different ways to produce this visionary knowledge. We have our basic toolbox, good that we have it, and that we know how to use it, but maybe we need to enrich our toolbox with creative methods, creative stuff…" (FI, P4)

…or as improvements to perceived shortcomings of the previous methods:

"In crowdsourcing one should be interested in the arguments that are used. The most esteemed experts are not the people who are going to take things forward. […] What I consider as good foresight: experts and crowds look out for weak signals, second level experts value the findings and try to shape a language that can describe them. […] There is value also in large Delphi studies, but the problem there is that the questions may miss the right formulation, but also that those are not good ways to identify change agents. The ones that really make things happen. The respondents are experts that look at the issue from afar, they may understand the technology very well, they may be overly optimistic. […] In these

kinds of studies, the idea of the leading edge is important. Not the quantity. Finding the best people who understand where the edge is". (FI, P3)

Some practitioners strongly argue that method development should be more sensitive to the technological development, and new opportunities should be more readily seized:

> *"We all have a good sense of those things that are highly predictable, right, the sun will come up tomorrow. And a third of the assumptions about things that simply cannot be predicted no matter what. And then there is this big in-between: […] when it becomes a big computational challenge versus when it becomes simply impossible. […] on one side of the envelope there are things that you can forecast using a variety of things, big data, crowd-sourcing, aggregation of expert opinion, what have you… and then on the other side there are things that no matter […] what techniques you are able to employ […] prediction is impossible. […]"* (US, R1)

Processes

A prevalent view is that a structure or a process should be put in place for foresight information to more effectively penetrate the whole decision-making structure:

> "*I've made several plans for arranging societal foresight […] for the governance. There are three layers or sectors: roughly the actors are civil servants, decision-makers, and citizens. Each should have access to their own spaces and tools, the information should benefit all, but it would accumulate to the decision-makers and civil servants. The citizens are in between evaluating and presenting new points of view. We were planning a portal for this discussion to take place in. The starting point is strategic foresight, creating a holistic understanding of the development […] looking for common drivers we need to tackle."* (FI, P2)

This approach is often related to a view where futures information is produced as a separate professional function in a society:

> *"There are methods for collecting foresight information, but there are three layers, as I see it: first is the production of foresight information, collecting, gathering, scanning, then the middle phase is processing the information, analysis, what are the potential impacts, interpretation […] and then the third phase is dissemination, which links with the impact of the work. The task of the foresight expert is never just to collect futures information but to process it, make conclusions, and disseminate it, it is a societal duty to make sure the information is disseminated as widely as possible, not just to some ministries, but to the whole of society, governance institutions, corporations, citizens, and the academic community."* (FI, A1)

Many foresight specialists emphasize the need to work directly at a specific issue, rather than approaching more general topics that are sometimes seen as too abstract:

> *"The way (foresight) should be conducted is directly tied to what is it that one wants to achieve. […] In small-scale projects the level of concreteness stays relevant for the level of decision-making. […] What I would want to see more of in foresight processes is […] concreteness."* (FI, A3)

> *"I'm very aware of the context: you want to define what you are doing foresight on […] in my mind, an organization will have a certain need, and you need to find meaningful information that fits that need. But if this trend-watching is universal, and only tried to be fitted to the needs of a certain organization afterwards, it is much more difficult than to define the need for information, creating the context, and then creating information that is meaningful."* (FI, P4)

For this approach, key to a successful futures process is involving the decision-makers in the process:

> *"The same group of people should be involved throughout the process. It cannot be so that there is one group that does the work, because the process of foresight is the thing that creates the insights. Decision-makers need to be involved, it is for them that the insights should accumulate to, not the researchers. They need to experience the aha-moments. And when they get that, foresight starts to have impact as well. […]".* (FI, P4)

However, there are views that see the systemic perspective as *de facto* the reality that makes such structures more or less obsolete:

> "*In the world we live in, and with all our imagined futures, how we will make it in that world, and when something completely new emerges, how will we be able to make it then. It is not a traditional planning approach, so that you will give the specifications for a given future, and then it is just a matter of implementation. It is a more … kind of biological view, and more cognitive, how to make sense of the world. […] Innovativeness and creativity are both with that view. […] The question is about what kinds of capabilities will you need in order to be able to do smart, positive things despite the fact that the world is unpredictable. […] I've taken in this Xerox park idea of the best way to predict the future is to invent it. […] Not trying to guess what the future will be like, but creating it as it would be interesting. And this leads to a different point of view."* (FI, P5)

To do foresight in this new world would then entail taking the systems perspective seriously, and understanding foresight as a specific tool for harnessing power in a network:

> *"How could foresight function as systemic activity […] a study from leadership in regional development networks. […] We divided power into three categories, in the order of importance: the most important form of power was interpretative power, affecting thinking, bringing new concepts to discussion, indirect. The other is network power, who are in, who are out. The third form is institutional power, to decide, direct money, give resources. The respondents […] had little of the institutional power, but for them the interpretative side was more important. There, foresight processes are important tools. […] Ideas lead, networks follow, money comes after. […] This is the same idea that Rifkin and others have been talking about, when the basic institutions, they have not disappeared but their power has diminished, then that power becomes more dispersed. Then the central issue is affecting the thinking of others, so that they would make independently the decisions they did not know they wanted to make. Foresight is a tool for power, should that be taken as a starting point, the process could be enhanced. Accepting that, certainly not playing by its rules.* (FI, A4)

At the extreme ends of the spectrum is the idea of an ultimately dispersed foresight system, amounting up to foresight capabilities being a part of one's common knowledge, or expertise in positions where foresight information is crucial:

> *"Just like I can clean up my own house, I can do my own foresight. I will not need a foresight expert"* (FI, A3)

> *"What I was talking about was not taking a perspective from the future towards the present, but rather about the micro processes, and the use of futures information in them. Maybe we'll have generations of people who are able to include futures knowledge into their leadership. At the moment they tend to be different people [those doing foresight and those leading], as there has not been basic training about the topic before."* (FI, A4)

Examples were given about specific contexts, where the kind of distributed foresight system already is claimed to exist:

> "(Typically) *The Silicon Valley companies […] they tend not to think about needing futurists. Especially venture capitalists, they need to know this, internally, and if they need outside advice then they really don't have any business being venture capitalists, (if they) have to rely on experts."* (US, P2)

Table 1. Three different interviewee profiles, condensed from the interviews.

Issue	Traditional approach	Quasi-predictive approach	Systemic approach
Impact, foresight aim	Challenge, add multiple views,	Predict	Train to live with the uncertainty
Methods	Expert judgment and argumentation Making scenarios	Novel methods based on advancing scientific understanding: Computational methods, statistical methods, expert training systems, simulations to aid expert judgment or decision-makers	Workshops, games and other experiential methods, usually with the aim of creatively opening up possible futures
Nature of foresight processes	Combination of crowd participation + expert judgment Foresight professional as analyst who packages and contextualizes the results	Structured singular process, foresight expert conducting the process	Decentralized, peer-to-peer network-based, creating the future approach, foresight as power to influence. Continuous process, mixture of citizen participation and expert analysis Futures expert as teacher of futures thinking.

Discussion and conclusions

On many levels, futures studies is a social science, able to utilize theories of societal change developed in other fields. However, the largely non-empirical nature of futures knowledge poses distinct challenges for the field, especially from the point of view of theory. In a nutshell, the analysis was inspired by the idea that methodological choices and the conclusions that are drawn from the data are a reflection of technosphere of each wave, and that there is a two-way relationship with the views posited about the future and the development of the particular *Weltanschaung*. Thus, futurists' understanding of societal change cannot exist independently of the forecasts, and so is subject to changes over time. Although this approach to theory in futures studies does not remove the criticism directed at much of the practical work that indeed may pay too little attention to grounding the futures exercises to any theory of societal change, it could still help in understanding why theory seems to be such a problematic issue for futures studies. Ultimately, exploring a world where forecasting and the forecasted are intertwined offers a glimpse into the dynamics of societal change, and possibly one more instance offering a chance to understand how the world shapes itself according to the ideas that are presented about it.

In this article, two ideas were explored that relate to the relationship between theory and practice in futures. First, it was suggested that futures theory is implicit in how the futures inquiry is conducted, meaning the methods and processes utilized are connected with the general ethos of a given historical context. This notion was analysed within a well-known theoretical framework of the long waves. One of the postulates of the long-wave theory framework is that organizational practices are subject to change as the socio-economic system reorganizes itself around new technologies and a new emerging mind-set. Therefore, in the second part of the article, the anticipated change in these practices, as expressed by futures professionals, were compared to more general level anticipations about the next long wave.

The expectation at the outset of this study was that the way foresight practitioners understand the direction of social change would be visible in their views regarding the future of foresight, and the methods they see as most fruitful. The differences might be perceived as an inclination to emphasize the importance of either expert evaluation or participatory processes, or specific decision-making processes over general awareness.

Based on the interview data one may conclude that foresight practitioners are currently divided between two competing paradigms: the *expert-led quasi-predictive model* that still dominates especially in the technology forecasting work and technical innovation policy orientation, and the *systemic perspective*, which questions the centrally organized process-view to foresight, and is more inclined to view foresight as a continuous, inclusive activity aiming to actively provide tools for influencing the direction of change. The scenario approach, encapsulating the key insight from the fifth wave regarding the multiplicity of potential futures, however seems not to divide respondents, but is rather adopted as a method in the standard toolbox across the divide, without eliciting any further epistemological concerns about the goals and purpose of foresight (unlike for instance methods that demonstrate a clear aim to predicting the future).

The majority of foresight practitioners interviewed for this study see the role of foresight in decision-making as relatively unproblematic, either as information gathering and dissemination task, or as a role of a strategic facilitator whose aim is to involve the decision-makers in the foresight process to support decision-making. Both of these views are focused on the expert - policy-maker -relationship, and the participatory element is assigned only a secondary role, mainly as a way to gather ideas and insights. Some practitioners do point to novel methods such as crowdsourcing, as ways to be able to find alternative sources for understanding the technologies and their progress. For instance, crowdsourcing can then be used for identifying change makers: people who are interested and passionate about certain technologies. It is argued that in more traditional methods such issues easily go undetected.

Yet, in the material there are traces of an approach that is more sensitive to the network logic of the social dynamics. There, the tendency is to think is that technology and innovation are essentially chaotic due to a qualitatively different mode we have entered since the digital technologies have started to effect societies. Within this third paradigm, agility, robustness, and futures literacy / anticipatory systems seem to prevail as solutions to survive. Policy-making in this situation is perceived as departing from the need to retain a sense of control over an essentially uncontrollable reality. However, for futuring creativity, experiments, and approaches that encourage "making the future" are seen as forming the core of the activity.

It can also be noted that for many foresight practitioners, supporting decision-making, and on the other hand participatory functions, exist in slightly parallel universes, where for instance widespread futures literacy may be regarded as a general goal for foresight, but for policy-making the discussion is confined to the policy-makers and experts. The plurality that many see as an essential quality in all futures processes then comes from involving a wide range of (expert) voices into the discussion.

There seems thus to be a somewhat unreconciled division between expert work, aiming essentially at producing futures information for decision-makers, and more participatory activities that would follow the logic of engaging the society into affecting the future. One can suspect the reasons for this stem from the history of the methods used, and especially with the decision-making consultation, the weight of traditional strategy literature over the futures studies tradition, where grass-roots participation, and mission oriented futures activism have been acknowledged goals already for a longer time.

Despite the growing understanding, and pressing needs to direct innovation towards more sustainable solutions, there is currently little evidence of novel approaches to encouraging it: foresight processes are still overwhelmingly driven by the more traditional understanding of technological change being best managed by top-down processes. Yet, there are signs of somewhat incompatible ideas affecting the thinking of practitioners, maybe indicating possible changes in approaches in the futures. Also, the digital technologies increasingly employed by foresight practitioners, may prove to have profound changes for the field. They may affect the reliance on substance experts for pure assessment of information, thus enabling the refocusing of the work.

Based on the empirical material, foresight practitioners are still groping for what would constitute foresight for the sixth wave. The demands of addressing ever expanding complexity have been noted, but are still in practice tackled with mostly by traditional methods. Those bringing up new kinds of approaches to e.g. systemic foresight seem to be still in the process of thinking up suitable

methodology to replace the existing one. Even if on the theoretical level it seems clear that as the scenario approach fails to capture all the relevant information that is needed to make informed decisions, a new approach, matching the level of complexity in the system by embracing a distributed model, should replace it. This emerging framework has been called, alternatively, anticipatory systems research, networked foresight, futures literacy, and reflexive foresight. All aim to describe a situation where foresight is embedded in the system on the level of individual decision-makers. Yet, the practical implications of how such a move would become feasible remain open, and the future will show how these approaches are adopted by professional foresight. Interviewees' comments regarding their practices suggest a two-way relationship between the thoughts about the practice ("theory") and actual methodologies, where thinking may precede practices that have yet to evolve to redeem the potential of new opportunities. A possibility, hinted at by some of the interviews, is that we'll see a truly systemic change in which the foresight professional the analyst will give way for the foresight pedagogue, for guiding a more embedded approach to foresight. For futures oriented decision-making, this would mean that the future would be present in the decision-making process in a much more profound manner than it has been to date.

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