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Trajectories

On theory building in Foresight and Futures Studies: A discussion note

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1. Introduction

A review of journals in the field(s) of Foresight and Futures Studies pointed to a tension in the relationship between Foresight and Futures theory and practice. This note aims to set the foundation for possible discussion topics to be taken up at an international conference. It does not aim or claim to be an exhaustive literature review, just a thought-provoking exercise.

Whether to treat "Foresight studies" and "Futures studies" as two different fields, or to treat them as one field and write "Foresight and Futures Studies" would probably be a matter of debate among the researchers [1–3]. Some even doubt whether a field of futures studies – or whatever one chooses to call it – even exists [4].

In this note, "Foresight and Futures Studies" will be used as suggested by one of the anonymous reviewers, "Foresight" part referring to process, and "Futures" part referring to the product of the process. Also, in this note, "Foresight" refers to the field, "foresight" refers to individual/organizational quality [5].

The Foresight and Futures Studies field has been criticised by some for the inadequacy of its theory.[1] Hideg [6] claimed that the existing different Foresight practices are not based on any theory of the Future, nor seem to have practical usefulness; as a consequence there is no feedback to Futures theory either. According to her, although future images and expectations have to be changed and future-forming decisions have to be made very frequently, we still lack a well-based theoretical–methodological background to these activities. She suggested that the study of different practices of Foresight and feedback of reflexive knowledge gained from research on futures could be the most valuable resource for the further development of Futures theory and the renewal of its practical use.

This criticism may be too harsh, as many building blocks of theory are already prevalent in the body of existing research [7], and the strength of futures studies has been claimed to be its epistemological pluralism and its capacity to help create new visions [8]. An international research *conference on Theory Building in Foresight and Futures Studies may contribute to careful organization of our thinking and prove that "...Futures work of this kind is clearly a scholarly discipline in its own right an done which properly belongs in a number of contexts... [9]*".

We may agree that there is no such thing as the Grand theory of Foresight and Futures Studies as of the first half of 2010. Rather, there are many theories that attempt to explain and predict how organizations and people in them will behave in their approach to future in various circumstances.

Some theories of Foresight and Futures Studies are compatible with and built upon others – in,
- what they explain or predict,
- the aspects of Foresight and Futures Studies they consider to be important,
- their assumptions about organization and the world at large from which they are created and
- the methods for studying Foresight and Futures that work well.

They tend to use the same language or jargon. We may call these groupings of compatible theories and theorists schools, perspectives, traditions, frameworks, models, paradigms, or occasionally eras of Foresight and Futures Studies. As expected, Foresight and Futures theorists from one school will quote each other's works regularly. However, they usually ignore

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[1] One of the anonymous reviewers posed the question "*What does a theory of foresight mean*?" and went on "*One could develop research tools to support theory building regarding some aspects of human behavior, institutional behavior, but that is not the same as developing theory regarding futures and foresight. Would theory be used to predict what methods a futurist would use or predict the outcome of the use of various methods*?."

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theorists and theories from other schools (on purpose or due to time and resource limitations!) or acknowledge them only negatively.

We may find that no single perspective deserves one's loyalty, that each contains important information and insights useful in differing circumstances. These schools exist only as intellectual constructs and as mutual support networks of Foresight and Futures theorists. They have the purpose of organizing and extending knowledge about Foresight and Futures and how to study them.

We may expect the academic work on the theory of Foresight and Futures Studies to draw from such disciplines as management, computer sciences, cultural anthropology, economics, history, industrial engineering (decision sciences), mathematics, philosophy and ethics, political science, psychology, public administration, social psychology, sociology, statistics, systems theory, etc. The Foresight and Futures Studies field must have a domain wherein it is autonomous. This is not to say that it must have a subject matter uniquely its own, but it must bring into focus a set of problems not included within the scope of other disciplines to which scientific techniques can be, and in fact are being, applied.

2. Theory and theorizing

2.1. Epistemological concerns

The claims of any school of thought to "knowledgehood" have been traced to the underlying cognitive enterprise on which the claims are founded (Rescher, 1992, 1998, cited in [10]). The theoretical cycle of cognitive coherence and the pragmatic cycle of empirical validation were referred to, each reinforcing and restraining the other.

The two cycles emphasize different modes of coherence. The former cycle uses coherence with available or emerging theoretical scheme, whereas the latter cycle looks to empirical evidence to judge the validity of truth claims. The first focuses on the intellectual aspect of description, explanation, and understanding, the second, the pragmatic aspect of prediction and control over nature. Both cycles are present in any epistemology, although the substance and emphases may vary from one epistemological platform to the other. In emerging fields, theoretical coherence may be weak, and there may be greater sensitivity to "facts", real or imagined [10].

Epistemological concerns for theory in Foresight and Futures Studies flow axiomatically from our overarching premise that the future is always a cognitive construction [10]. As the future is non-existent ontologically, empirical verification of any assertions about the future will have to wait for the future to unfold. Only in a totally deterministic world, would the future be causally encompassed in the present. The future is causally underdetermined by the realities of the present and is open to development of wholly unprecedented patterns due to the interactions and contingencies of actors and trends. The future as such, cannot exert any causal influence on the present – though of course our ideas about it will have a major formative in what we think and do. Confounding these ontological considerations is the fact that future may also be cognitively inaccessible due to the incompleteness of information [10].

2.2. Theory – product or process

Weick [11] raised the issue whether one should be concerned with theory as a product or as a process. Most theories approximate rather than realize the conditions necessary for a strong theory, because "hypotheses, data, lists, diagrams, references" have gradations of abstractness and generality.

Most products labeled theories actually approximate theory and approximations take at least four forms (Merton, 1967; cited in [11]):

1. general orientations in which broad frameworks specify types of variables people should take into account, without any specification of relationships among these variables,
2. analysis of concepts in which concepts are specified, clarified, and defined but not interrelated,
3. post-factum interpretation in which ad hoc hypotheses are derived from a single observation, with no effort to explore alternative explanations or new observations,
4. empirical generalization in which an isolated proposition summarizes the relationship between two variables, but further interrelations are not attempted.

We can actually take them as successive stages in theory development. The proposed international research conference may give us the opportunity to discuss at what stage the Foresight and Futures Studies field may be in 2010. Investigation of existing literature indicates we are mostly moving around in Stage 1, although we do have a few works in Stage 2, very few works in Stage 3, none in Stage 4.

Weick [11] further drew attention to how hard it is in a low-paradigm field to spot which of their efforts are theory and which are not. This difficulty arises because theory work can take a variety of forms, because there is a continuum, and because most verbally expressed theory leaves tacit some key portions of the originating insight. These considerations suggest that it is tough to judge whether something is a theory or not when only the product itself is examined. What one needs to know, instead, is more about the context in which the product lives. This is the process of theorizing. Theorizing encompasses research questions and research strategies.

Table 1
A framework for research methods [12].

			Source of Information used in the Research		
			NATURAL		ARTIFICIAL
			Direct Observation of Object Reality	**People's Perceptions of Object Reality**	**Artificial Reconstruction of Object Reality**
Epistemological Structu re of the Research Process	**RATIONAL**	**Axiomatic**			* Reason/Logic/Theorems * Normative Modeling * Descriptive Modeling
		Logical Positivist Empiricist	* Field Studies * Field experiments	* Structured Interviews * Survey Research	* Prototyping * Physical Modeling * Laboratory experiments * Simulation
	EXISTENTIAL	**Interpretive**	* Action Research * Case Studies	* Historical/ archival analysis * Delphi * Intensive Interviews * Expert panels * Futures/ scenarios	* Conceptual Modeling * Hermeneutics
		Critical Theory		* Introspective Reflection	

2.3. A framework for research methods

The classification by Meredith et al. [12] of research methods (Table 1) according to source of information in the research and epistemological structure of the research process may help us in our endeavour of theory developing in Foresight and Futures Studies. The readers are invited to try to place the academic papers on Foresight and Futures Studies in their personal PC-libraries in the cells of the table as an exercise.

2.3.1. The rational/existential dimension [12]

This dimension relates to the epistemological structure of the research process itself. It involves the benefits and limitations of the philosophical approach taken to generating knowledge; that is, the viewpoint of the researcher. At one extreme is rationalism, which uses a formal structure and pure logic as the ultimate measure of truth. At the other extreme is existentialism, the stance that knowledge is acquired through the human process of interacting with the environment. Thus, in existentialism an individual's unique capabilities, in concert with the environment, are regarded as the basis of knowledge. The former conforms to the traditional deductive approach to research; the latter to an inductive approach (cf. Fig. 1).

The rational/existential dimension includes four generic perspectives that structure the research by different degrees of formalism. These four perspectives in order of degree of formal structure, are *axiomatic, logical positivist/empiricist, interpretive,* and *critical theory*.

The *axiomatic* perspective represents the theorem-proof world of research. A high degree of knowledge is assumed.

The *logical positivist/empiricist* perspective assumes that the phenomenon under study can be isolated from the context in which it occurs and that facts or observations are independent of the laws and theories used to explain them. This is the basis for most survey research [14,15].

The *interpretive* perspective includes the *context* of the phenomenon as part of the object of study. Interpretive researchers study people rather than objects, with a focus on meanings and interpretations rather than behavior. The purpose is to understand how others construe, conceptualize, and understand events and concepts. In contrast to the implicit absolutism of positivism, interpretivism is relativistic because facts are not considered independent of the

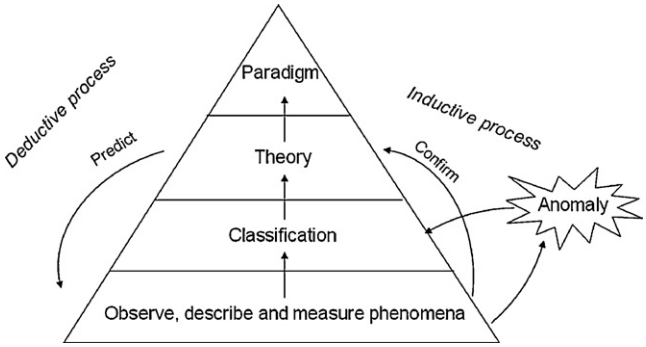


Fig. 1. The process by which theory is built [13].

theory or the observer. Interpretive researchers explain by placing behaviors in a broader context in which the behaviors make sense.

Critical theory is an influential contribution to post-positivist thought, primarily through the work of Habermas. The critical theory perspective is an attempt to synthesize the positivist and interpretive perspectives and get past their dichotomy by placing knowledge in a broader context of its contribution to social evolution. The positivist and interpretivist perspectives are considered dialectically interrelated. Critical theorists transcend the contradiction between the way people behave in practice and the way they understand themselves to be acting.

A number of measures can be placed on this dimension that help clarify the continuum. At the rational pole, the research process:

1. tends to be deductive,
2. is more formally structured,
3. entails a high degree of objectivity,
4. is methodologically prescribed,
5. restricts environmental interaction lest the findings be biased by the researcher's orientation,
6. requires a priori assumptions concerning primary constructs,
7. establishes the truth of its findings by coherence with the truth of other statements or "laws."

This contrasts with the existential pole where the process is more inductive, less structured, typically subjective, and requires more interaction with the environment. Further, researchers at this pole are concerned more about the correspondence of their findings to the real world than their coherence with existing theories or laws.

2.3.2. The natural/artificial dimension [12]

This second dimension concerns the source and kind of information used in the research. At the natural end of the continuum is empiricism (deriving explanation from concrete, objective data), while at the artificial end is subjectivism (deriving explanation from interpretation and artificial reconstruction of reality). The progression from natural to artificial on this dimension parallels the historical periods found in literature.

The researcher's perception of reality is molded by the mechanisms used to study the phenomenon. In a very broad sense, these mechanisms may be classified into three categories:

Object reality, people's perceptions of object reality, and artificial reconstruction of object reality.

Object reality refers to direct observation by the researcher of the phenomenon. It assumes that there *is* an objective reality and that human senses can detect it. It corresponds to the pure empiricism extremum exemplified by Locke. As with the other categories, the observation may be subjected to formal structured analysis (or axiomatization, as in econometric studies) or to interpretation using critical theory.

People's perceptions of object reality relate to research conducted "through somebody else's eyes, "as in surveys, interviews, or many laboratory experiments. Thus, the primary concern is with the perception or abstract representation of the reality of *individuals* exposed to the phenomenon.

These are second source methods, but may be the only efficient or effective way to obtain information about the phenomenon of interest. A number of constructs in Foresight and Futures Studies are difficult to study through direct observation. In such situations, an assessment of people's perceptions may yield significant insights into the underlying explanation of the phenomenon. Descriptive information about the phenomenon, as well as people's constructs/models about what relationships are operative, can be ascertained through these second source methods.

An *artificial reconstruction of object reality* is attempted in almost all the modeling and systems analytic efforts. These approaches recast the object reality, as originally determined from one of the above two categories (usually the researcher's own belief concerning the object reality), into another form that is more appropriate for testing and experimentation, such as analytical models, computer simulations [16], or information constructs.

As with the rational/existential dimension, there are a number of measures that describe this dimension. At the artificial pole, the research:

1. uses highly abstracted and simplified models such as linear representations;
2. tends to yield conclusions with high reliability and internal consistency;
3. is often characterized by a significant separation of the phenomenon from the researcher, as with an abstract representation;
4. is highly controlled since the researcher uses a priori constructs or models to specify the information to be collected;
5. process is highly efficient since aberrations (classified as "noise") do not have any causal source;
6. is dated (future-oriented), since the specification of the constructs or models takes most of the researcher's time and pushes the natural phenomenon further into the past (future).

This contrasts with the natural pole where the research process is more directly concerned with the real phenomenon, less concerned with reliability and more with externally generalizable validity, closer to reality, less controllable, less efficient, and more current. The critical issue here is the balance between reliability and external validity. Survey instruments provide very reliable data but their validity in actually measuring constructs is suspect. Clearly, the most valid information is that obtained by direct involvement with the phenomenon.

The possibility that current research in Foresight and Futures Studies may have limited not only the phenomena that can be researched effectively, but also the utility of the findings, needs to be elaborated on and discussed. One can detect easily the methods widely used in Foresight and Futures Studies in Table 1.

2.4. Definitions, terms and constructs

Wacker [17] developed the need for formal conceptual definitions (sometimes called nominal definitions) and discussed how to develop better measurement instruments for theory building.

He developed the underlying theory for 'good' formal conceptual definitions by defining terms, demonstrating that formal conceptual definitions are needed for all theory-building empirical research. He explained how and why 'good' formal conceptual definitions are used to develop properties and their measures, and last, logically explained that good formal conceptual definitions are necessary conditions for construct validity (content validity, criterion validity, convergent validity, and discriminant validity) while statistical tests are sufficient conditions for validity.

His theory development explained why formal conceptual definitions are necessary before any traditional statistical empirical validity tests are performed. Wacker [17] suggested that any statistical validity tests are not meaningful if the concept is not formally defined.

Based on Wacker's [17] work, one may claim that the time has come for the Foresight and Futures Studies to focus on the definitions of the concepts used in the field. The few examples given below point to the difficulty we face as regards the definitions of foresight/Foresight and futures/Futures and related concepts and their measurement (i.e., their operationalization).

Whitehead (1933, cited in [18])

> "Foresight is the crucial feature of the competent business mind. Business organizations need to cultivate foresight in order to cope with the relently change that modernity generates.
>
> Foresight is rooted in deep understanding. It marks the ability to see through the apparent confusion, to spot developments before they become trends, to see patterns before they fully emerge, and to grasp the relevant features of social currents that are likely to shape the direction of future events."

Slaughter [9]

> "...environmental scanning functions; critical trend/event analysisfunctions; scenario-building functions and early-warning functions. These could all be gathered under the heading of "foresight[2]".

Coyle [3]

> "...We shall use predict to mean a statement that something is practically certain to happen and forecast to mean a statement that certain broad trends or sequences of events may ocur, for reasons that can be explained. ...Thus, forecasting means to think systematically about the unknowable future in such a way as to generate understanding to support effective intervention in, or protection against, events yet to occur."

Inayatullah [19]

> "...futures studies is many things: forecasting, social foresight, transformative politics, and utopian imaging..."

Drucker [20]

> "Foresight ... as a synthesis of future and past.... Analysis of trends as the future that has already happened..."

[2] According to the approach of this note, "Foresight" should have been written in place of "foresight".

Makridakis [21]

> "The role of foresight is to provide business executives and government policy makers with ways of seeing the future with different eyes and fully understanding the possible implications of alternative technological/societal paths.
>
> The purpose of foresight is neither to provide recipes nor specific forecasts.
> Its aim is to enhance an organization's ability to consider varios future scenarios without any preconceptions, debate their implications, examine the risks involved, estimate potential benefits, predic the cost/investments involved to arrive with practical alternatives that can be translated into executable actions."

Tsoukas, Shepherd [22]

> "Foresightful action is inextricably linked to learning and sense making.
> Dealing effectively with the future is not so much about getting it right ex-ante as about preparing for it.
> An actor is foresightful when s/he has the propensity to act in a manner that coherently connects past, present and future.
> Foresightfulness becomes an organizational skill when future-oriented thinking ceases to be a specialized activity undertaken by experts and/or senior managers, in which they engage from time to time in order to deal with something called "the future", bu acquires the status of expertise that is widely distributed throughout the organization and is spontaneously put in action."

Different authors emphasize different terms in their definitions of constructs, thereby clearly making their operationalization difficult.

2.5. Research questions and research strategies [23]

Yin [23] criticised the conception that the various research strategies should be arrayed hierarchically, e.g., that case studies are only appropriate for the exploratory phase of an investigation, that surveys and histories are appropriate for the descriptive phase, and that experiments are the only way of doing explanatory or causal inquiries.

According to Yin [23], the more appropriate view of these different strategies would be an inclusive and pluralistic one. Each strategy can be used for all three purposes – exploratory, descriptive, or explanatory. The following three conditions should distinguish the strategies:

1. the type of research question posed,
2. the extent of control an investigator has over actual behavioral events, and
3. the degree of focus on contemporary as opposed to historical events.

In the case of Foresight and Futures Studies, we may add a fourth condition:

3.b. the degree of focus on future as opposed to contemporary and/or historical events.

The first condition covers the research questions for which a basic categorization scheme is the familiar series: "who", "what", "where", "how", and "why" (Table 2).

If research questions focus mainly on "what" questions, two possibilities arise. First, some types of "what" questions are exploratory, such as, "*What can be learned from a study of successful Foresight project?*" [24] This type of question is a justifiable rationale for conducting an exploratory study, the goal being to develop pertinent hypotheses and propositions for further inquiry. However, as an exploratory study, any of the five research strategies can be used – e.g., an exploratory survey, an exploratory experiment, or an exploratory case study.

The second type of "what" question is actually a form of a "how many" or "how much" line of inquiry – e.g., "*What have been the outcomes from the corporate Foresight project?*" identifying such outcomes is more likely to favor survey or archival strategies than others. For example, a survey can be readily designed to enumerate the "what".

"Who" and "where" questions are likely to favor survey strategies or the analysis of archival records, as in economic research. These strategies are advantageous when the research goal is to describe the incidence or prevalence of a phenomenon or when it is to be predictive about certain outcomes.

In contrast, "how" and "why" questions are more explanatory and likely to lead to the use of case studies, histories, and experiments as preferred research strategies. This is because such questions deal with operational links needing to be traced over time, rather than mere frequencies or incidence.

Table 2
Relevant situations for different research strategies ([23] p. 5).

Strategy	Form of research question	Requires control of behavioral events?	Focuses on contemporary
Experiment	How, why?	Yes	Yes
Survey	Who, what, where, how many, how much?	No	Yes
Archival analysis	Who, what, where, how many, how much?	No	Yes/no
History	How, why?	No	No
Case study	How, why?	No	Yes

Assuming that "how" and "why" questions are to be the focus of study, a further distinction among the research strategies is the extent of the investigator's control over and access to actual behavioral events. Histories are the preferred strategy when there is virtually no access or control. The distinctive contribution of the historical method is in dealing with the "dead" past – i.e., when no relevant persons are alive to report, even retrospectively, what occurred and when, an investigator must rely on primary documents, secondary documents, and cultural and physical artifacts as the main sources of evidence. Histories can, of course, be done about contemporary events; in this situation, the strategy begins to overlap with that of the case study.

In Foresight and Futures Studies, the need to deal with the "yet to come" future is very intriguing in formulating and answering research questions [10,22,24–33].

3. Three research themes

Since 1960s, several research themes have been investigated in field of the Foresight and Futures Studies. Below, three of them will be briefly discussed.

3.1. Time perspectives: past, present, future

Time plays an important role in Foresight and Futures Studies. Cunha [34] suggested that organizational foresight, instead of being focused exclusively on the future, may refer to managing the links between the past, present, and future. This raises the issue of quantification of different measures of time, an example of which can be found in Fig. 2.

An important dimension of the Integrated Foresight Management Model [27] is the time period associated with each level. Graf (1999, cited in [27]) distinguished these levels based on the work of Bleicher (1991, cited in [27]) and shows that, on the normative level, the required time perspective for foresight is 10 years and more, whereas on the strategic level, it is bounded by 5 years, as in Fig. 2. Operative management is concerned with a time frame of up to one-and-a-half years. Knowledge is divided into two parts. Knowledge about the past is "analysis" and knowledge about the future is "foresight". This underlies the different work packages which should be done in an analysis study and a foresight study. Each management level requires both studies with similar timeframes and different information needs (Graf, 1999; cited in [27]).

Slaughter (1996a, b, c; cited in [27]) discusses the same issue by elaborating on the extended "present" in Fig. 2. According to his definition, the "present" depends on the activity pursued by the human beings and hence different activities require different "presents". This distinction between different activities and timeframes can help in defining the content of foresight studies for different goals and objectives.

According to his definition, six different "presents" could be developed, as seen in Table 3. While all "presents" are designed such that they cover the next "*x*" years, only "200 years" includes the previous and the next 100 years. This approach is very similar to Graf (1999, cited in [27]). "One year present" is appropriate for some goals but it is too short. "10 years" is not enough to assess the medium-to-long-term impacts of the related decision; "20 years" is required for the analysis of the themes such as economic reform, life standards and social security; "50 years" is necessary to understand themes such as environment and cultural change. While "100 years" is required for developing historical and futuristic theories, "200 years" provides a macroview of history.

While Bleicher (1991, cited in [27]) combines the levels of the integrated management model with different timeframes, Slaughter (1996a,b,c, cited in [27]) introduces a much more integrated concept of "present" which is extended depending on the activity. These two approaches could be synthesized to generate a more comprehensive timeframe such that it also fulfils the requirements of the foresight studies, strategic management decision and operative actions based on the levels and "presents".

The normative level includes a timeframe from eight to 30 years which has a median value of 19 years and is very close to the 20 years time period of many national foresight exercises. This approach includes also the "present" approach of Slaughter (1996a,b,c, cited in [27]) and enables the discussion, not for the next 20 years, but also a

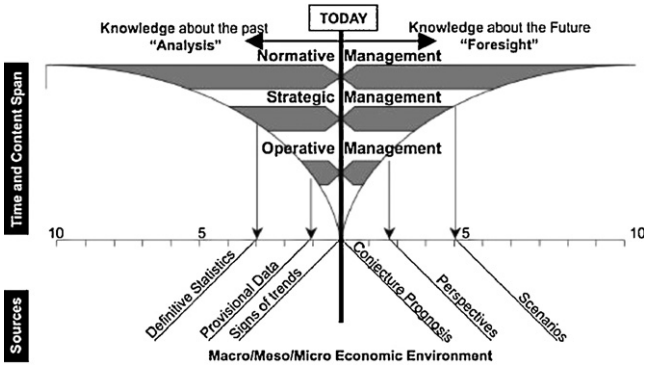


Fig. 2. Management levels with different time perspectives.

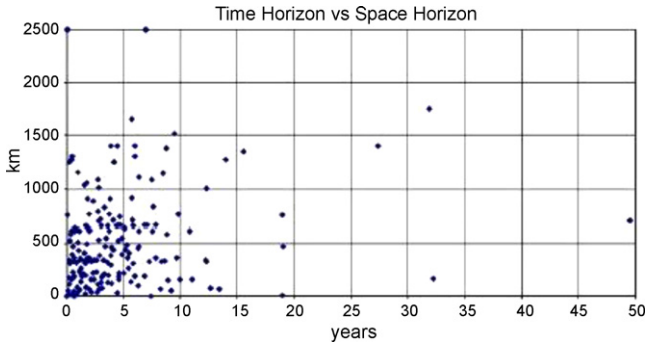


Fig. 3. Space-time perspectives of individuals [30].

discussion which includes 10 years before and after. On the strategic level, the timeframe from 3 to 7 years has a median value of about 5 years, with 2 years as the interval before and after. On the operative level, the median value of from 1 to 3 years is one-and-a-half years with the same duration as the interval before and after. This is also quite relevant for business decisions since most of the budget planning starts from two quarters or half a year before the next planning period.

At this point it would also be wise to remember what Davis (1986, cited in [27]) mentioned about foresight. He argues that "foresight" is anticipating which events are likely to occur more than 1 min into the future. This definition includes all future with unlimited time horizon.

Göl and Öner [30] were able to empirically reproduce the work of Meadows et al. (1972, cited in [35]) by operationalizing the space and time perspectives of individuals (cf. Fig. 3). According to Meadows et al., although the perspectives of the people vary in space and time, every human concern falls somewhere on the space-time graph. The majority of the people are concerned with matters that affect only family or friends over a short period of time. Others look farther in time or over a larger area – a city or a nation. Only a very few people have a global perspective that extends far into the future.

3.2. Youth foresight and images of future

As young people will be builders of any society in the future, investigating their images of the future has significant implications for the future.

Hideg [6] mentioned that images of the future have to be changed. Ono [36] defined, measured and discussed several aspects of images of the future (Table 4).

Table 3
Different definitions of "Present" [27].

1-Year present	The time it takes planet earth to circle the sun once Cycle of seasons Unit of time measurement for human lives Farming and crop rotation
10-Year present	Sizeable chunk of a human lifetime Long enough to provide insight into dynamic processes Ideal for noting environmental and ecological factors A reasonable horizon for testing new products and services The time it takes to plan and build major infrastructure items
20-Year present	Cycle of generations for human beings: (Veterans, 1922–1943); (Baby Boomers, 1943–1960); (Generation Xs, 1960–1980); The Nexters (1980–2000) Long enough to observe the economics and social impact of strategic R&D activities, e.g., the identification of CFCs Scientifically and the sign of the international contract to take precautionary measures (1974–1990)
50-Year present	Incorporates some major concerns of a technologically advanced culture Culturally significant period to understand trends and change processes Enough to judge the impacts and implications of existing and new technologies
100-Year present	Boundary of a single lifetime Long cycles can be distinguished The rise and fall of regions, industries and ecosystems Theories and history and futures begin to flourish
200-Year present	Ideal timeframe for cultures in transition A time with which generations are linked Enough to develop intergenerational biography and dialogue The rise and fall of cultures, empires and entire ecosystems Macro view of history; the panorama of the centuries

Table 4
Key aspects of an image (modified from [36], p. 741).

Aspect	Variation			
1. Time	a. Past	b. Present	c. Near [8] future	*d. Distant future*
2. Proximity	a. Short range	b. Long range		
3. Nature	a. Positive	b. Negative		
4. Scale	a. Personal	b. National	c. Global	
5. Familiarity	a. Familiar	b. Unfamiliar		
5. Occurrence	a. Possible	b. Probable	c. Preferable	d. Prospective [37]

According to Ono [36], an image of the future that an individual holds determines what attitude s/he holds towards the future and how s/he behaves in the present. These in turn would increase the probability to make the image realized as imagined in the future.

With a survey of two groups of university students in Taiwan and the US, Ono [36] looked into various aspects of images, explored message sources influencing the formation of the images, identified values embedded in the images, and explored the relationships between the images and the students' understanding of the present.

From the text of Ono [36], the causal relationships depicted in Fig. 4 are drawn as an example of dynamic relationships which may be examined empirically in the field of Foresight and Futures studies. The line on an arrow indicates a delay.

3.3. Technology futures: risk, uncertainty, ambiguity, ignorance [38]

The unknown character of the futures introduces the study of *uncertainty*, *ambiguity* and *ignorance* as a possible research theme in Foresight and Futures Studies, possibly with reference to different technologies.

Stirling [38], examined, by reference to the electricity sector, the contrasts between 'risk-based' and 'precautionary' approaches to the governance of risk, paying particular attention to the problems of intractable uncertainties and divergent values, which are relevant and valid for all Foresight and Futures Studies.

Table 5 provides a schematic illustration of the relationships between these formal definitions for the concepts of *risk*, *uncertainty*, *ambiguity* and *ignorance*. It is quite normal, even in specialist discussion, for the full breadth and depth of these issues to be conflated in the simple concepts of '*risk*' or '*uncertainty*', thus, seriously understating the difficulties involved. In order to avoid confusion between the strict definitions of the terms *risk* and *uncertainty*, and the looser colloquial usages, the term '*incertitude*' can be used in a broad overarching sense to subsume all four subordinate conditions.

A fundamental problem underlying the social appraisal of technological risks concerns incomplete information. It is a central feature of 'risk-based' approaches to technology appraisal that incompleteness in empirical and theoretical knowledge is addressed by applying quantitative probabilistic methods. Indeed, in economics and utility theory, this is the essence of the well-established formal definition of *risk* itself.

Here '*risk*' is, by definition, a condition under which it is possible both to define a comprehensive set of all possible outcomes and to resolve a discrete set of probabilities (or a density function) across this array of possibilities. This is illustrated in the top left hand corner of Table 5. It is a domain under which the various techniques of risk-assessment are applicable, permitting (in theory) the full characterisation and ordering of the different options under appraisal.

The strict sense of the term *uncertainty*, by contrast, applies to a condition under which there is confidence in the completeness of the defined set of outcomes, but where there is acknowledged to exist no valid theoretical or empirical basis confidently to assign probabilities to these outcomes. This is found in the lower left hand corner of Table 5. Here, the analytical armoury is less well developed, with the various sorts of sensitivity and *scenario analysis* being the

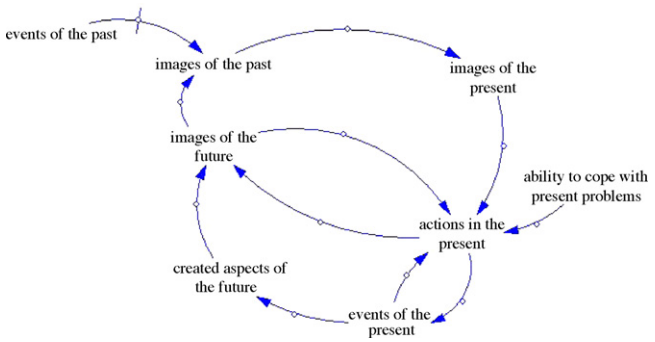


Fig. 4. Causal loop diagram drawn from the text of Ono [36].

best that can usually be managed. Whilst the different options under appraisal may still be broadly characterised, they cannot be ranked even in ordinal terms without some knowledge of the relative likelihoods of the different outcomes.

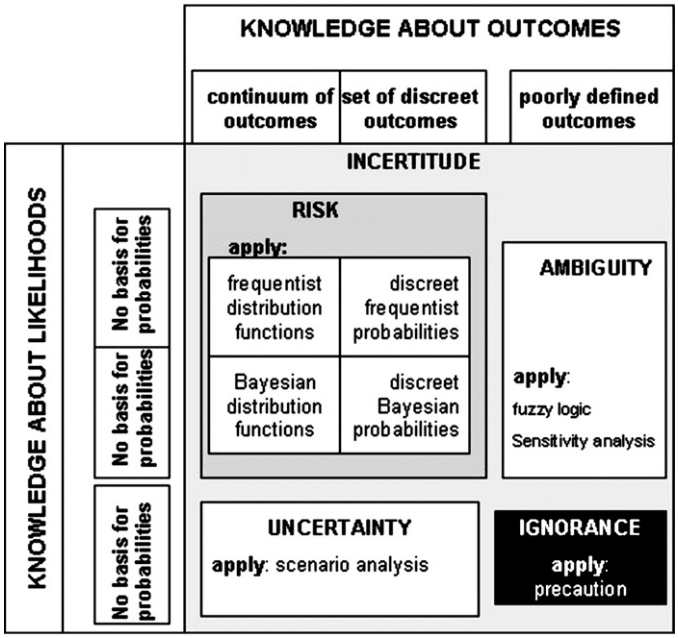
Both *risk* and *uncertainty*, in the strict senses of the terms, require that the different possible outcomes be clearly characterisable or subject to measurement. This is often not the case, the complexity and scope of the different forms of environmental risk and the different ways of framing and prioritising these, can all, too-easily render *ambiguous* the definitive characterisation of outcomes (top right corner of Table 5). Where these problems are combined with the difficulties in applying the concept of probability, we face a condition which is formally defined as *ignorance*. This applies in circumstances where there not only exists no basis for the assigning of probabilities (as under *uncertainty*), but where the definition of a complete set of outcomes is also problematic. In short, recognition of the condition of *ignorance* is an acknowledgement of the *possibility of surprise*. Under such circumstances, not only is it impossible definitively to rank the different options, but even their full characterisation is difficult. Under a state of *ignorance* (in this strict sense), it is always possible that there are effects (outcomes) which have been entirely excluded from consideration.

It is not difficult to see that it is the formal concepts of *ignorance* and strict *uncertainty* (rather than *risk*) which best describe the salient features of risk governance (and futures studies). Some of the main technologically induced 'risks' of our time (such as stratospheric ozone depletion, endocrine disrupting chemicals and BSE) are all cases where the problem lay not so much in the determination of likelihoods, but in the anticipation of the very possibilities themselves. They were effectively surprises. In the energy sector, imponderables such as those associated with global climate change, geological diffusion models for high level radioactive waste repositories and even the long-term effects of major dependencies on renewables like biomass are all as much matters of *ignorance* and *uncertainty* as they are of *risk* in the strict sense. Even where there is some confidence over the broad likelihood of an overall phenomenon like global climate change, there are still crucial questions over the implications for any specific region or human activity, invoking the formal condition of '*ambiguity*' in the top right corner of Table 5.

The curious thing is that these and other sources of intractable *uncertainty* and *ignorance* are routinely treated in the appraisal of technology by using the probabilistic techniques of risk-assessment. Given the manifest inapplicability of probabilistic techniques under conditions of *uncertainty* and *ignorance*, this is a serious and remarkable error. For all the seductive elegance and facility of probabilistic calculus, it remains the case that judgements concerning the extent to which "*we do not know what we do not know*", no matter how well informed, are ultimately and unavoidably qualitative and subjective.

The treatment of *uncertainty* and *ignorance* as if they were mere *risk* effectively amounts to the "pretence at knowledge". Far from displaying a respect for science in technology appraisal, the effect of such scientistic oversimplification is actually to ignore and undermine scientific principles. In a plural society, a unitary 'sound scientific' basis for the governance of technological risk is a fundamental contradiction in terms.

Table 5
The formal definitions of risk, uncertainty, ambiguity and ignorance [38].



4. Classics of Foresight and Futures Studies

The field of Foresight and Futures Studies gained intellectual substance and tradition only in the second half of the twentieth century [7]. Foresight and Futures theory lay largely dormant over the centuries. Contributions to Foresight and Futures theories varied and still vary over time and across cultures [39]. The authors were/are offering the society an abstract guidance for those who know where they wanted go but did not quite know how to get there.

In order to truly understand Foresight and Futures theories as they exist in 2010, one must appreciate the historical contexts through which they have developed and the cultural milieus during which important contributions were made to its body of knowledge.

To help the researchers in the field there is need for placing writings in their historical contexts. "*A Chronology of* Foresight and Futures Studies", a review of the major events and publications in the field is needed, as it has been done in other fields [40] and complete the work started by WFSF [41]. We need to agree on the answers to the following question: *"Which authors (and their basic themes) should the serious student of* Foresight and Futures Studies *be expected to identify?"* The writers and selections to be chosen may be the ones that are among the most widely quoted and reprinted in the field.

The time for a detailed bibliometric study has come. As a first step towards that end, the readers are invited to participate in a survey http://www.surveymonkey.com/s/foresight_and_futures_studies_research_field the results of which will be presented at Yeditepe International Research Conference of Foresight 2011 (http://marc.yeditepe.edu.tr/yircof11.htm).

5. Conclusions

There may not be strong consensus on the body of knowledge in Foresight and Futures Studies. In order the facilitate the process of consensus building, researchers and other interested parties are invited to join the Yeditepe International Research Conference on Foresight and Futures (http://marc.yeditepe.edu.tr/yircof11.htm) to be held on August 24–26, 2011 in Istanbul, Turkey with the main theme of "*Theory Building in Foresight and Futures Studies*".

It is hoped that the quality of participants will disprove Henshel's (1981, cited in [1]) remark that a "*contemporary futures conference attracts more frauds and phonies than any other form of meeting*".

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