Chapter 5
Futures studies, scenarios, and the "possibility-space" approach

by
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Riel Miller presents the field of futures studies, drawing a number of parallels with the study of history. He describes how the search for greater predictive accuracy involves risks. One is of adopting forecasting methods and models that depend too heavily on what happened in the past as if the future could be extrapolated; another is that preoccupation with what is likely to happen can obscure consideration of other futures which may be less likely but still possible and potentially more desirable. He discusses "trend-based" scenarios and "preference-based" scenarios as liable to such limitations, which limitations can impair strategic decision making. He presents the "possibility-space" approach as an alternative to them.

Thinking rigorously about the future

People think about the future all the time – in the morning when they wake-up and start planning the day ahead, at the dinner table when they discuss where to go on vacation, or which university the children should attend, or what will happen to the stock market. Most of these reflections are short-term, a few hours, days or months. Such conversations naturally mix together what people hope for with a wide range of expectations – from the probable to the improbable. Degrees of probability are handled more

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carefully by professional forecasters trying to predict tomorrow's weather or next year's economic growth. Professionals tend to focus on getting to the highest probability prediction that available data and models can provide. They generally steer away from considering the broader, less predictive question of what might be possible, as well as from the more normative question of what is desirable.

But the search for greater predictive accuracy involves certain trade-offs. On the one hand, there is a risk of adopting forecasting methods and models that depend too heavily on what happened in the past. Yesterday's parameters may do a good job of tracking past events but experience shows that this approach consistently misses major inflection points and transformative changes. On the other hand, a preoccupation with what is likely to happen tends to obscure things that may be unlikely but still possible and potentially more desirable. At best, the safety of extrapolation ignores what is not predictable; at worst it lulls us into a false sense of having exhausted the available options, thereby narrowing the set of available choices. This, in turn, can impair strategic decision making because it limits the capacity to imagine non-predictable ends and means. The "possibility-space" approach outlined in this chapter offers one avenue for overcoming such constraints.

What is futures studies?

Broad socio-economic changes are propelling the development of futures thinking. Compared to well-established academic disciplines, like economics, futures studies lack a coherent and widely accepted foundation. Most economists generally agree, after some two centuries of heated debate, that economics is the study of the allocation of scarce resources. The analyses of today's orthodox micro, macro, public, short-run, long-run, econometric and historical economists overwhelmingly originate in the root question – how do we allocate scarce resources?

Of course economics was not born a full-grown discipline. Nor at the outset was there much consensus regarding the fundamental analytical problem that connected all of the far-flung issues and theories that now fall under the rubric: mainstream economics. Adam Smith, arguably the founder of economics as a discipline, studied and taught moral philosophy and "*belles lettres*". Over time, however, economics evolved into an academic discipline driven by the development of markets and industry, the shift to generalised wage labour and the rise of highly complex and diversified systems for allocating resources. It developed into a field that addressed the analytical challenges posed by the increasing intricacy and ever growing variety of actually functioning markets.

In a similar fashion, the emergence of futures studies is closely linked to the growing complexity, diversity and freedom (or indeterminacy) that characterises today's answers to an equally fundamental question: how might we reproduce daily life in the future?[2] Futures studies is being pulled by, and to a certain extent helping to propel, an explosion in the plausible – although not necessarily either the probable or desirable – permutations of the ways in which everyday life is reproduced. In terms of how we live our lives, the daily question – what do I do now? – is becoming more open. It is this possibility of a future with greater freedom that calls for the development of more systematic and refined tools for thinking about the future.

What distinguishes futures studies from other disciplines is their preoccupation with how we create the future everyday and on this basis to analyse the prospects for change – be it one day or a century from now. This approach to thinking about the future contrasts markedly with more traditional and familiar modes like mystical prophecy, grand ideologically-inspired utopias and mechanistic predictive models. Not that horoscopes, messianic visions or efforts at building the perfect model will disappear. The yearning for predictive certainty responds to other needs. Those who are certain that human history will end with the coming of the Messiah or decide what clothes to wear because Jupiter is aligned with Mars are certainly thinking about the future. But they are seeking the opposite of what future studies are about. Most of futures studies focus on exposing how the future cannot be predicted because it is contingent on choices we make starting now. The aim is to evoke a much wider and deeper set of possible futures, in this sense entirely unlike the predictive traditions that depend very heavily on either continuity or on exogenous events like an apocalypse.

There is one part of future studies that *is* interested in short-term prediction, using empirical models. These studies look at situations where the inertia of the immediate past can be reasonably expected to restrict the degree of possible change. Short-run predictive models can be important when they provide insights into the specific variables (forces) that reproduce daily life – or that slice of daily life that interests the forecaster. Done properly, a forecast offers understanding of the causal factors that change

[2] North (1999) addressing the question "What are the limits to our understanding of the world around us?", suggests that gaining this understanding depends largely on addressing uncertainty. He proposes three kinds of uncertainty: uncertainty due to insufficient information and knowledge; uncertainty due to the fact that the world is non-ergodic – *i.e.* is undergoing continuous change; and uncertainty arising from the lack of adequate theories of continuous change.

daily life, of the way the different variables interact, and of how far the past is a good basis for looking into the future. But when forecasting bumps into the limits of its effective range, it provides a clear signal that efforts at prediction must give way to an exploration of what might be possible, before jumping into assessments of what and why particular outcomes are more or less probable.

Futures studies and history

Thus, the distinctiveness of future studies is in providing a rigorous approach to the plausibility of different configurations for the reproduction of daily life in the future. This task parallels those of the historian seeking to understand the key factors that altered (or not) daily life in the past, be it the decisions of kings, the outcome of wars, or the composition of peasant meals (Hawthorn, 1991, p. 8). Neither the historian nor the futurist has direct access to the reality they are analysing. Both futurists and historians seek clues in the present and the past in order to substantiate their analyses of why and how life did or might unfold, using methods and theories that take into account multiple layers of complex interaction and causality. Like history, futures studies are a polyvalent, neutral "social science" as it is a collection of methods, theories and findings that provides an analytical tool for people who hold different beliefs and goals (see for example: Booth *et al.*, 2004; Dator, 2002; Godet, 2001a and b; Keenan *et al.*, 2003; Ogilvy, 2002; Ringland, 2002; Van der Heijden, 2002).

There are, of course, some important contrasts. The work of a futurist may be tested one day by the arrival of tomorrow, while the historian must be forever content with the traces of the past that are more or less buried under the weight of time. Historians can consult the historical record to show definitively that a treaty was signed while futurists must use their imaginations to map what might be the global agreement of tomorrow. But both are map makers – trying to extract the essential features that may explain how life was, or will be lived. In many cases historians can track detailed records far into the past with considerable reliability, whereas futurists are more preoccupied with the seeds of tomorrow scattered in the overwhelming detail of the present. However, the challenge of developing convincing analyses of how daily life was or will be reproduced remains the same (Bruland, 2001).

Futures studies and history share five key axioms. First, whether looking to the past or the future, as the analysis moves farther away from the present uncertainty increases across a number of dimensions and the accuracy with which we can explain how a particular aspect of daily life is reproduced diminishes. In part this is because the quality of the raw data declines and in

part because the number of potential sources or causes that might account for change (or stasis) is, in most circumstances, bound to grow over time.

The second joint axiom is that the scale and pace of change need to be evaluated in both absolute and relative terms. Everyone knows that change from a very low base can be quite small in absolute terms but huge relative to the starting point or when the starting point is already large even a big absolute change may be small in relative terms. A good example of this is the projected population changes for India, which starts from a base of over 1 billion. As a result, despite a slower recent growth rate, India's total population in 2050 could be 500 million higher than in 2000 – overtaking China.[3]

The third axiom is that over time, whether looking backwards or forwards, many of the metrics and benchmarks we use to assess change also change. Not so long ago the metric for speed was not miles or kilometres per hour but the speed of a horse measured in furlongs – 1/8 of a mile. When it comes to benchmarks, the old Model T Ford was considered dangerous at over 45 mph. Today most cars are safe at much higher speeds. Judging speed today using the metrics and benchmarks of the equestrian or Model T eras makes no sense.

Fourth, and even trickier to detect and apply, are the more subjective, capacity-related shifts. The relevance and calibration of different measures and perceptions of events in daily life are shaped by a whole range of factors like the degree of literacy, the extent to which values are shared within the community, and the ease of access to information. Even if we are aware of these factors they make comparisons over time difficult. For instance, can we compare the widespread fear of nuclear war in the 1960s to people's fear of genetically modified organisms in the first decade of the 21st century?

There is a fifth axiom to bring the abstract potential for infinite variation down to a manageable range. In order to reduce the "degrees of freedom" in interpreting the past or imagining the future we turn to the facts and reasonable assumptions that restrict what is possible. First assumptions have to be made about uncertainly (the first axiom). Aliens could land on Earth tomorrow or we could be hit by an extinction scale meteor and all efforts to imagine future possibilities would be rendered moot and null. Futurists,

[3] The United Nations Estimates World Population Prospects 1950-2050 (The 2002 Revision), February 2003, shows that in the medium variant India's rate of population growth falls from an average of around 2% in the latter half of the 20th century to under 1% on average for the first half of the 21st century. However the total growth is close to 500 million.

particularly those interested in policy issues, do not need to devote too much attention to this kind of uncertainty since, though such exogenous events might happen, there is nothing much to say right now about the day after.

As for axioms two, three and four, absolute, relative and qualitative changes are all constrained, often in different ways, but nevertheless limited by key attributes of the physical, social and intellectual world. The average height and life-span of the human population may change, even rapidly, but within fairly important limits. Similarly in the realm of social organisation, be it economic, political or sociological, we assume that the range of options is relatively limited. Looking at societal change over the next 30 years it is probable that politics will be bounded on the range from despotism to democracy, economics from plan to market and social identity from undifferentiated to differentiated, with the long-run trend in all fields towards the latter ends of the spectrum. The strand of time that most historians and futurists usually consider exhibits a degree of continuity that makes meaningful analysis possible.

However, that the "degrees of freedom" of possible changes are within a manageable range for the purposes of in-depth analysis does not resolve in any way which particular methods or theories historians or futurists should use for such an analysis and here the choices remain very wide, with historians and futurists mostly going their separate ways. Futurists have a well established tool kit for developing scenarios, examining trends and polling expert opinion (see de Jouvenel, 2004; Ogilvy, 2002). The products of these analyses are used for a variety of purposes – from simply adding to the stock of knowledge to helping make action-oriented strategic decisions. However, as is to be expected in a field that is still young and evolving rapidly, innovations and debates about basic methods and goals still reign.

Trend- and preference-based scenarios

Scenarios or stories about distinct futures have the potential to overcome some of the pitfalls of predictive approaches. What scenarios lose in terms of calibrated probabilistic accuracy can be made up for by a greater openness to initially unlikely but nevertheless possible outcomes. This is why scenarios have often been used as a tool for strategic thinking, "strategic" in the sense of choosing where to go. The strategic choices involve the selection of overarching, sometimes long-run, goals. And strategic choices are the ones that make a significant difference in the direction of travel, towards or away from strategic goals. Scenarios are also well suited to helping decision makers think about institutional change. However, scenarios face a number of drawbacks, in particular how to

imagine and then select a few distinctive and pertinent stories about the long-term future from among the infinite number that is possible.

There are two familiar methods for solving the problem of how to choose scenarios. The first takes an initial starting point, for instance population or economic output, and then develops scenarios on the basis of a range of growth rates – low, medium and high – or trends (I call this the "baby bear, mama bear and papa bear" approach, or "Bear" for short.) The second approach focuses more on preferences and implicit expectations in order to sketch scenarios that capture what people consider to be: the most desirable, the least desirable, and the muddling through but most likely (I call this the GBU approach: good, bad and ugly.) Both of these methods have the virtue of selecting stories that are readily accessible since the factors that determine the main characteristics of each scenario are usually quite familiar and easy to grasp. We are well acquainted with trend scenarios for universities, for instance, that are distinguished by differences in enrolment growth rates or scenarios distinguished by the preferences that lead people to consider the "good" scenario to be one where universities are exclusively citadels of a pure search for knowledge, the "bad" scenario to be one where universities are exclusively driven by the commercial imperatives of funders from the private sector, and a muddling through or "ugly" scenario, usually seen as the most likely, to be one that combines both pure and commercial options.

The limitations of trend- and preference-based scenarios

Exercises based both on trends and values are generally empowering – giving participants a sense of perspective and reminding them of the potential for change (moving beyond current conflicts, zero-sum games, going over or around the wall instead of through it, etc.). They are useful empowerment techniques for promoting leadership. But both suffer from drawbacks that limit the utility of the stories.

The first problem *is the risk of narrowness and lack of imagination*. This is not an absolute characteristic as trends and preferences can be taken "far out", becoming highly imaginative (usually "unrealistic" too). However, these types of stories too often remain circumscribed by initial perceptions of trends and preferences. This may be compounded by the "hubris of the now": "I am alive now and everything is more difficult (or easier), faster (or slower), bigger (or smaller) than in the old days." This view fails to put trends and current views of the present in an historical perspective. Trend-based scenarios also narrow down the range of possibilities when the trends are identified not in terms of theories of change and hypotheses regarding causality but simply on the basis of already available data. Starting with

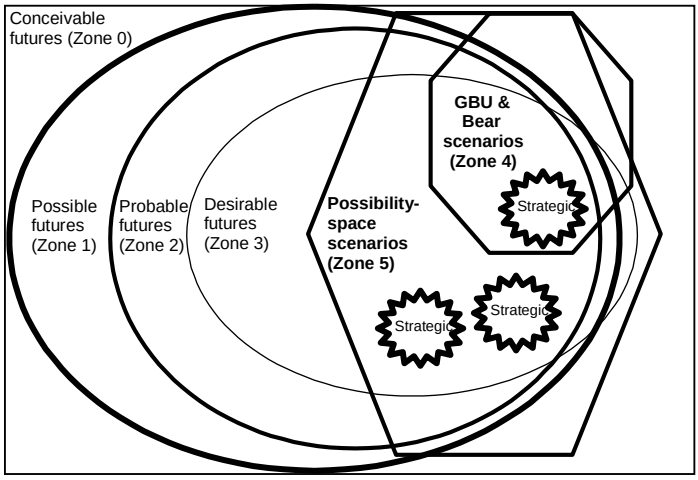
given trends and preferences makes it harder to take into account the compound, multi-dimensional nature of change. Change alters what is possible. A literate population can do things that were very difficult to imagine when the population was illiterate; the options open to a child are not the same as those of an adult – over time not only what a person can do, but what they want to do changes.

The second major limitation *is a lack of analytical precision.* Because the trends and preferences are usually taken as self-evident, even if the effort is made to quantify, categorise and mix the different elements of each story, the theoretical models of change (*i.e.* of causal inter-action) are most often not well developed. Lacking developed theories of change and charged with an overabundance of descriptive detail, it becomes difficult not only to extract analytically distinguishable stories but more crucially from a policy perspective to justify any particular selection of stories from amongst the vast possible range. Certainly Bear and GBU processes generate stories, in abundance, but such scenarios are usually of limited value for policy-making because of a lack of analytical foundations. So, the question becomes, is there a way to develop scenarios that expands the range of imaginable possibilities and that promises to improve analytical clarity in thinking about the future?

Possibility-space scenarios

Partial coverage of the full set of possible futures is inevitable as we cannot imagine every feasible outcome. Figure 5.1 illustrates the challenge. The largest set consists of what is possible. Within the set of possibilities are all probable futures and some of the desirable ones. Since desirability is in the eye of the beholder this set contains both good and bad scenarios and there are some desirable futures that do not fall within the realm of the possible. The preference-based scenarios are located within the set of desirable/undesirable possibilities while the scenarios based on trend extrapolations may be found across the possible, desirable and impossible futures. As these do not necessarily cover the full range of pertinent possibilities, are there methods to improve our exploration of the strategically-relevant range of possible futures?

Figure 5.1. Strategic scenarios and possibility-space futures



Source: Author.

The "possibility-space" approach elaborated below offers one way of generating a larger set of possible futures for consideration in scenario building through a three-step method. The first step is to determine or define the key attribute (variable A) of the scenario's subject. The second step is to sketch a space, perhaps multidimensional, using the primary attributes of change (a, b, c) in variable A. The third step is to identify distinct scenarios within the possibility space. Figure 5.2 illustrates this approach with a technological example of the pervasiveness of electricity. The three steps for arriving at this possibility space are as follows:

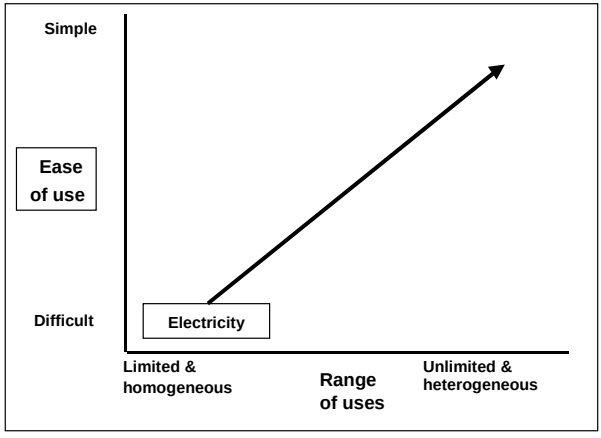
- *Step 1:* The subject of the scenario is technology pervasiveness (variable A), defined in terms of how widely a particular technology is diffused. When a technology is first invented or commercialised it is possible that it will not be picked up at all. Alternatively it might become very widely diffused, entering all aspects of life – from the workplace to the home.

- *Step 2:* Two of the key attributes of technology's pervasiveness are a) how easy it is to use, and b) to how many uses it can be put. As electricity becomes easier to use and is applied to more different uses, it moves from the lower left quadrant of the possibility space to the upper right.

- *Step 3:* Different scenarios can be developed by considering different points in the possibility space. We already know what has

happened to electricity but we do not know what is going to happen to many more recent technological breakthroughs. Will information technology, for instance, really succeed in becoming as easy to use and ambient as electricity?

Figure 5.2. Possibility-space illustration – pervasiveness of electricity



Source: Author.

Extracting scenarios from possibilities – a functionalist approach

Having enlarged the set of available possible futures for consideration when developing scenarios, the next challenge is to select particular scenarios from the vast space of possibilities. There are still the trend and preference approaches that could be applied immediately to the broader set of possibilities, as the basis for selecting from within the larger possibility space, either by taking the starting point and rates of change as givens or by imposing a specific set of values for differentiating end-points. Or, we may put off consideration of probabilities and preferences and continue for one more step with the neutrality of the possibility-space methodology by focusing on the functions and/or organisational attributes of the scenarios subject. Continuing with the example of electricity, imagine it as a technology that has not yet traced its path across time (see a discussion of counter-factuals in Booth, 2004). In the example used here there are three hypothetical functions and two basic organisational patterns that can be used to develop scenarios as per Table 5.1. The three imaginary functions of electrical power are as: i) weapon/tool of war; ii) local replacement for steam and water power in factories; and iii) autonomous power source for all

kinds of consumer products. The two organisational attributes are centralised and decentralised generation of electrical power. This imaginary "what-if" of the future of electricity generates six scenarios.

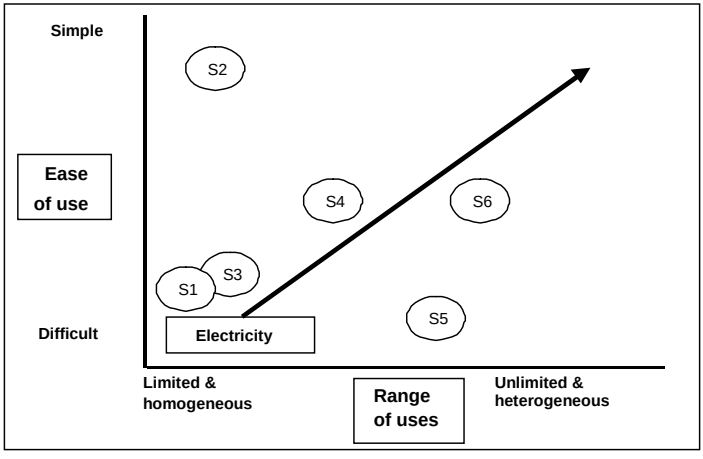
Table 5.1. Organisation and function scenarios for "what-if" electricity use scenarios

	Organisation	
Function	Centralised generation	Decentralised generation
Weapon	Scenario 1	Scenario 2
Industrial power	Scenario 3	Scenario 4
Consumer power	Scenario 5	Scenario 6

Source: Author.

Figure 5.3 shows the six scenarios mapped in a very approximate way onto the possibility space already depicted by Figure 5.2. This step underscores the contingency or dependency of the scenario's subject – the pervasiveness of electricity (variable A) – on changes in the underlying attributes of change [ease-of-use (a) and range of uses (b)], that are then used to locate particular scenarios within the possibility space.

Figure 5.3. Examples of functional technology scenarios



Source: Author.

Figure 5.3 shows scenarios S2, S4 and S6 mapped higher on the scale of ease-of-use on the grounds that decentralised generation implies a reduction in the technical difficulties of using power generation technologies (wind, solar, hydrogen, etc.). Scenarios S4, S5 and S6 are deemed to exhibit a wider range of uses since as a decentralised tool for industry (S4) and a

general tool for consumers (S5, S6), electricity is bound to be used in many different ways. In S1, where electricity is held exclusively by the military as a specialised weapon dependent on the centralised generation of power there would be little need to develop ease-of-use for either generation or applications, while the range of uses is very narrow. Hence S1 is in the lower left of the possibility space. Similarly S3 is closer to the lower left since big industry does its best to limit diffusion.

Electricity did not follow any of these scenarios since it diffused across all three functions and the ease-of-use problems on the application side were largely solved through centralised provision of electric current. Today electricity is located closer to the lower right quadrant, if ease-of-use is considered a composite indicator of both generation and application. Using this electricity pervasiveness possibility space to imagine a different outcome means, for instance, considering what it would take to get to the upper-right quadrant. Such an analysis would focus on a story where universal access and application is combined with simple decentralised power generators. This scenario might be chosen because people value highly universal access and application as well as local control. Or because there is a hypothesis that easy-to-use decentralised generation might allow for innovations in the spatial and temporal organisation of daily life.

Having determined that the scenario in the upper-right corresponds with people's values the next step is to analyse the attributes and conditions for the realisation of such a scenario. This takes us to the final step in the strategic possibility-space approach. The analysis now moves to estimating probability on the basis of assessments of how likely or not the choices deemed necessary to get to the goal will be chosen and effectively implemented. Choices have been defined by pushing the realm of the possible on the basis of clear analytical models. In this way decision making, the core of democracy, and the specific policies that are meant to follow through on democratic choices, come to the forefront.

These illustrations show how the possibility-space method opens up a wider set of possibilities for constructing scenarios. The possibility space creates an alternative range of options from which to construct strategic scenarios, by exploring the future more independently of initial views regarding probability and desirability. The task is still one of imagining the future – projecting forward into time. Possibility spaces make it easier to be imaginative, systematic and explicit about the hypothetical "what if". Modelling can help analyse which variables matter and, once the possibilities have been rigorously explored, modelling can be an important tool for deepening the analysis of the factors that might influence rates and directions of change as we have explored in moving towards quantifying a possibility-space scenario for the learning society (Miller and Bentley, 2003).

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