

Myths of the Future and Scenario Archetypes

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Abstract

We employ tools from the social cognition and Cultural Theory literatures to explore images, concerns, expectations and attitudes towards the future among the general public. Via an online survey of 950 Australian citizens, we identify five well-defined Myths of the Future: 'Social Crisis', 'Eco-Crisis', 'Techno-optimism', 'Power and Economic Inequality' and 'Social Transformation'. We discuss how these myths relate to the Scenario Archetypes as commonly employed in Foresight literature, how this analysis can contribute to the literature and how some of these ideas could be incorporated in the running of foresight exercises. Among the 5 myths, Techno-Optimism describes beliefs that science and technology are likely to create innovations which can improve our quality of life. It provides a firm anchor between Scenario Archetypes, Myths of the Future and the STEEP (social, technological, economic, environmental and political) framework holding a similar meaning in all three settings. Our analysis also elucidates how attitudes towards technological development are not value-free, being influenced by beliefs regarding how society and the environment should be managed, and to what extent technology itself can be a positive or negative force in this management.

1 Introduction

One of the purposes of forecasting exercises is to explore the range of possible futures ahead of us. When these exercises are carried out in a workshop setting, it is often useful to group imagined futures into a fairly small number of future 'archetypes', where each archetype can be treated as representing variations on a common theme. As an example, a 'disruptive technological breakthrough' future archetype may represent a family of alternative future scenarios comprising different kinds of technological breakthroughs (medical vs industrial vs scientific, etc) whose consequence on social and economical development can be jointly explored.

There are a number of reasons why this approach is useful. In some cases, the purpose of a specific forecasting exercise may be to study the interaction of a small number of preselected drivers, which naturally define the future archetypes of interest [1-6]. When the purpose of the forecasting exercise is less defined, considering several future trends (technological, social, political, military, etc), potentially disruptive events (wars, financial crises, pandemics, etc), alternative political environments (free trade, protectionism, etc) and other drivers of change, leads to a combinatorial explosion in the number of future scenarios under analysis. Grouping these scenarios according to some similarity criterion is a natural way to cope with the otherwise unmanageable task.

The forecasting literature suggests that the *number* of future scenarios suitable for a future study is between three and six [1, 7, 8], often converging to a choice of four. Furthermore, an established tradition [4-7, 9-21] has identified a set of scenario archetypes which seem to be shared by different cultures in a wide range of contexts. However, recommendations on *which* set of archetypes should be employed vary, as we review in the next section. To our knowledge, the identification of the scenario archetypes has occurred via considerable experience accumulated within the emerging discipline of futures-studies, but there have been limited attempts to test these ideas against knowledge and

experience from other disciplines. Here we contribute to this literature by discussing one such experimental work.

At the core of this work lie one observation and one hypothesis. The observation is that several archetype choices discussed in the forecasting and future study literature closely resemble the typology described in the Cultural Theory literature ('Myths of Physical Nature' and 'Myths of Human Nature'). We discuss this in Section 3. The hypothesis is that if this resemblance is more than coincidental, and originates from common psychological and cognitive roots, then i) the set of future archetypes should indeed be culturally shared, ii) this set should be fairly general (that is, not strongly dependent on the context of a future study) and iii) the set should be identifiable even outside a future study workshop. We aim to test the hypothesis and ask: i) is there a 'natural' set of 'Myths of the Future' among the general public? In other words, if we ask the general public to express broad opinions about 'the future', can a well defined structure be identified? ii) if so, how many and what Myths of the Future emerge? and finally iii) what is the relation between these Myths of the Future and the Scenario Archetypes commonly discussed in the forecasting literature. To address these questions we begin by reviewing common scenarios and archetype choices from the Future Studies literature and by introducing the concepts of Myths of Physical Nature and Myths of Human Nature from the Cultural Theory literature. We proceed by describing the questionnaire we used in an online survey of 950 Australian citizens and how the proposed Myths of the Future emerged from the survey analysis. We then discuss these Myths of the Future in relation to the Scenario Archetypes and conclude by highlighting how this analysis can contribute to the Future studies literature and how some of these ideas could be incorporated in the running of Future studies exercises.

2 Scenarios and Archetypes

The future studies literature includes a rich vocabulary, useful to express different meanings and interpretations pertinent to a wide range of applications and purposes. Because the scope of our work is very broad, we adopt a less nuanced vocabulary. In this work, we define a scenario as in [1, 20, 22] '*scenarios are plausible, challenging, and relevant stories about how the future might unfold*'. We define a scenario archetype as a group of futures which are deemed 'similar' according to the purpose of a specific analysis, as in [20].

The foresight literature has proposed a number of frameworks to develop future scenarios and a wide range of scenario choices. The interested reader can gain a good overview of this extensive literature via a few comprehensive review papers ([1, 16, 20, 22-24]).

Table 1 shows a number of archetype choices. Each row includes one set of archetypes, chosen by different future study practitioners (column 1) as representative of the scenarios described in the future studies the practitioners reviewed (ranging from 8 scenarios in [25] to 160+ in [20]). As a result, cumulatively, the archetypes in Table 1 can be seen as representative of 1000+ scenarios, from hundreds of future exercises, carried out in different countries, addressing different issues, over several decades. By exploiting obvious similarities between the archetypes in Table 1, we further divide them into 6 broad groups, or meta-archetypes (columns 2-7). To keep the terminology simple, in the rest of the document we refer to these 6 meta-archetypes as Scenario Archetypes. Because most future exercises focus on a choice of four scenarios, no archetype set in Table 1 contains members from all the 6 Scenario Archetypes.

Table 1. Each row shows a set of archetypes as proposed in the study in Column 1. The top row (red font) shows 6 meta-archetype we selected by grouping the archetypes by similarity. In the rest of the document these meta-archetypes are referred to as Scenario Archetypes.

	Markets Dominate	Institutional Reforms	Deep Transformation	Local Focus	Decline	Technology Drivers
[20]	Market Forces,	Policy Reform, triple bottom line focus	New Sustainability Paradigm, very different future	Fortress World	Catastrophe, civilisation breaking point	

[22], as redefined in [20]	A world that evolves gradually, shaped by dominant driving forces	A world that is influenced by a strong policy push for sustainability	A world where new human values and new approaches to development emerge	A world that succumbs to fragmentation, environmental collapse and institutional failure.	
[26]	Global Orchestration , worldwide, connected global markets.	Adapting Mosaic , local ecosystem management & institutions.		Order from Strength , fragmented, concerned world	TechnoGarden , globally connected, technological development
[25]	The Global Market , total dominance of international markets, low regulation	Global Sustainability , a globalised world high level of regulation and technological change	Regional Sustainability , regionalised world, bottom-up environmental sustainability	Continental Barriers , regionalised world , growing gap between rich and poor, crime & violence	
[27]	GO for Growth , economic growth continues.		CONNECT for Life , vast global networks of local communities	KEEP it Local , nations feeding and providing for themselves	SUCCEED through Science , global economy driven by innovation
[28]	Continued growth , rich, abundant, and liberal society	A conserver society manages shrinkage rather than growth.	The transformational society , ‘birth-like’ process, new moral, institutional, and technological arrangements		Societal collapse , shortages, disasters and political ineptness
Development of [28], described in [23]	Continued growth	Disciplined society			Decline & stagnation
[29]	Keep the Economy Growing!	Towards Disciplined, Evolvable (Sustainable) Societies	Transformational Visions		Severe Challenges , energy, environmental, and economic
[23]	Continued growth , best estimate, “official future”		Visionary Futures		What could go wrong , hard times and serious challenges
[16]	Growth , ‘business as usual’, globalisation and free trade	Restraint, government oversighting economic and environmental priorities	Transformation a very different future from technological, environmental, moral or social forces		Catastrophe a breaking point, as a result of environmental, social or moral stresses.

As far as we understand from the literature, practitioners have used two broad approaches to select their archetype set. The archetype sets in the top of Table 1 (white background) appear to arise from scenarios developed in future study exercises in which participants are asked to identify the most critical and uncertain drivers of change and develop scenarios by analysing their interplay [20]. The double uncertainty, grid or 2x2 matrix approach [1-6, 9], in which the two most important and uncertain issues define the axes of a 2D plane is an example of this approach. In the rest of the document, we will refer to this 2D plane as the Futures Plane.

The archetype sets in the bottom part of Table 1 (grey background) were originally developed via a different approach, which is described in [23] and we summarise here. [30] differentiated between what *futurists and experts vs laymen* think the future may be. Drawing on experience of future study exercises in different regions of the world, [30] suggested that people’s views of the future can be captured by 10 visions or images. To highlight the folk nature of these visions, each was labelled with a line from a song, a movie or a popular saying (Table 2). These visions were later condensed into archetypes shown at the bottom of Table 1.

Table 2. Folk images of the future as proposed in [30] (first column). Interpretation as proposed in [23] (second column). Related worldviews from the Cultural Theory literature, as described in Section 3 (third column).

Line	Explanation	Worldview
<i>Que sera, sera</i>	Whether because it's in God's hands or there's no discernible pattern	Fatalistic
<i>As It Was In the Beginning Is Now and Ever Shall Be, World Without Change, Amen</i>	Traditionally people don't concern themselves with the future as change comes slowly	Individualistic
<i>If Winter Comes, Can Spring Be Far Behind?</i>	Everything has its season, to predict the future, all you need to know is what cycle we're in.	Hierarchical
<i>Why Don't You Make Something of Yourself?</i>	An industrial society view that posit that we have permanently broken out of the traditional cycle and are "developing," growing forever, led by the appropriate elites	Hierarchical
<i>After the Revolution.....!</i>	A Marxist view that the revolution is needed for development to continue	Egalitarian
<i>We Are Entering a New Dark Ages</i>	We will soon reach, or have already passed, our limits to growth. We face an immediate future of wars, famines, internal strife, followed by a new and lengthy Dark Ages	Fatalistic
<i>Toward a Steady-State For Spaceship Earth</i>	Stop growth now, create more decentralized, ecologically balanced, more human and stable communities	Egalitarian
<i>Let's Return to the Garden of Eden</i>	Back-to-nature, reversing industrial society	Egalitarian
<i>I think I'm Going Out of My Head</i>	The future has no reality beyond the images in our consciousness: prayer, meditation and consciousness are necessary for self-realization	<i>unclear</i>
<i>Machines of Loving Grace</i>	Where ever enhancing social and physical technologies are put to effective use	Individualistic

The above discussion leads us naturally to ask what makes a 'good' set of archetypes. The foresight literature has proposed a number of criteria to assess the quality of *scenarios* [31]. [15] summarises them in terms of Plausibility, Consistency, Utility/Relevance, Challenge/Novelty and Differentiation, while [7] suggests Pertinence, Coherency, Likelihood, Importance, and Transparency and [32] emphasises Plausibility within a fairly rigorous causal framework. [20] focus specifically on *archetypes* and require these be sufficiently diverse, clearly defined, internally consistent, and meaningful in terms of the STEEP drivers (social, technological, economic, environmental and political) and sufficiently robust to be relevant to forecasting exercises carried out at different times. In addition, a 'good' choice of archetypes should provide a framework and a starting point for forecasting exercises [16, 20, 23]. Under time constraints, some studies cannot afford the lengthy discussions often necessary to allow a team to converge on a small number of scenarios. Lengthy discussions may occur because experts can have strong opinions on what scenarios are of interest, while less experienced participants can find their first encounter with this approach challenging. Choosing a set of pre-defined archetypes may provide a starting point and a framework which integrates several decades of experience in the field. The archetypes can then be tuned to fit the specific problem at hand. This describes a two-way process in which first extensive experience leads experts to identify archetypes from countless scenarios, and then archetypes help practitioners defining specific scenarios as needed.

3 Future Archetypes and Myths of (Human) Nature

Some insight on the nature of archetypes may be gained by analysing the Futures' Plane (as defined in the previous section) often used to visualise scenarios and archetypes. Table 3 (top, white background rows) shows several examples of axes choices as used in future studies. These choices are extremely consistent. With the exception of [33], in all cases the first axis maps amount of regulation, ranging from a global, interdependent, cooperative to a regional, autonomous, uncooperative future. With the

exception of [9], the second axis maps social values and priorities, ranging from a self-interested, individualistic, materialistic to a communitarian and sharing future.

The bottom rows of Table 3 (grey background) show the axes choices used by the cultural theory [34-38] and social cognition literatures [39-41]. An in-depth analysis of the origins and relations between these two literatures can be found in [37]. They define what are often referred to as Myths of Physical Nature and Myths of Human Nature. The Myths of Physical Nature describe 4 broad beliefs about how Nature works and how the relation between human activities and the environment should be managed. Nature can be perceived as i) ‘capricious and unpredictable’, invalidating any attempt at managing it, ii) ‘tolerant and stable within limits’, highlighting the importance of regulation, iii) ‘benign and overall stable’, allowing for essentially unlimited exploitation or iv) ‘fragile’, requiring fundamental behavioural and social changes. These myths correspond to four worldviews, which describe our understanding, at times unconscious, of how the world around us functions and our place within it. These worldviews are commonly referred to as ‘fatalistic’, ‘hierarchical’, ‘individualistic’ and ‘egalitarian’, respectively. A relation between these worldviews and the folk images of the future as proposed in [30] is proposed in the last column in Table 2. In a similar vein, the Myths of Human Nature describe 4 broad beliefs on how society functions and should be managed. Humans can be seen as i) controlled, unjust and unworthy, ii) flawed, but potentially improvable by social institutions, iii) self-serving, ambitious and competitive and iv) altruistic, but potentially corruptible by social institutions. While the relation between Myths of Physical Nature and Myths of Human Nature is complex and yet to be fully clarified [37], it is often claimed that a strong correspondence between these myths can be found, implying that people’s attitudes towards the environment and human nature share the same roots and that their opinions on how Nature and society should be managed are often related.

Given the similarity among the axes in Table 3, it is natural to ask whether the same approach used to empirically identify the Myths of Physical Nature and Myths of Human Nature could also identify some ‘Myths of the Future’. If so, we could then ask to what extent these Myths of the Future match the future archetypes described above.

Table 3. Examples of axes chosen to represents scenario/archetype differences in future studies (white background) and ideologies in Cultural Theory (grey background).

Reference	Axis 1	Axis 2
[42]	Global → Regional	Self interest → Solidarity
[25]	Global → Regional	Self interest, Reactive → Solidarity, Pro-active
[8]	Global → Regional	Material → Socio-Environmental welfare
[43]	Interdependence → Autonomy	Individual → Community
[5, 44]	Interdependence → Autonomy	Consumerism → Community
[6]	Bottom Up → Top Down	My Identity → Our Identity
[33]	Fast → Slow Tech Change	Unconcerned → Concerned
[9]	Cooperation → Isolationism	Abundance → Scarcity
[40]	Egalitarianism → Hierarchy	Individualism → Communitarism
[36, 45]	Low → High Degree of social regulation	Individualistic → Collectivised

4 Methods

A survey was conducted in June 2014 with 950 Australian participants recruited nationally using an on-line research only internet panel¹. A detailed description of the survey can be found in [46]. A copy

¹ The panel used is administered by ORU, an online fieldwork company with QSOAP 'Gold Standard' and the new Global ISO 26362 standard accreditation. The ORU has a database of over 300,000 individuals from across Australia (<http://www.theoru.com/>). The online panel consisted of a group of community members who have

of the questionnaire used in this survey is available at http://www.per.marine.csiro.au/staff/Fabio.Boschetti/Surveys/Myth_Future_Survey.pdf. It includes a range of different constructs and cognitive measures we had tested in previous work [37, 47] as well as measures specifically designed for this study:

Myths of Human and Physical Nature and Political Ideology. The Myths of Human Nature and Myths of Physical Nature were assessed by asking participants to indicate their levels of agreement with

- 1) twelve statements from the Cultural Environmental Bias measure of environmental worldview [48]. These define two beliefs according to which Nature can be perceived as ‘ductile’ to human pressure, requiring collective action to conserve the environment or as ‘elastic’ to human pressure, justifying its exploitation. See Section 6 “Environmental worldview scale” in the online questionnaire at http://www.per.marine.csiro.au/staff/Fabio.Boschetti/Surveys/Myth_Future_Survey.pdf.
- 2) thirteen statements from the short-form Cultural Cognition measure of societal worldview adapted to the Australian context ([49]), which define participants’ worldviews along the egalitarianism-hierarchy and individualism-communitarianism axes. See Section 7 “Worldview about society” in the online questionnaire;
- 3) four items from the short-form Social Dominance Orientation [50] (Section 8) and
- 4) six items from the short-form Right-Wing Authoritarianism measure [51] (Section 9).

Time orientation. A widely-used construct to study the propensity of individuals to focus on current vs future concerns is the Consideration of Future Consequences [52]. This includes items like ‘*I only act to satisfy immediate concerns, figuring the future will take care of itself*’ and ‘*I think it is important to take warnings about negative outcomes seriously even if the negative outcome will not occur for many years*’ (Section 12 in the online questionnaire).

Expectation about the future evolution of Australia society. Following [53], we asked whether respondents believe that by 2050 Australian society will be more or less safe, skilled, wealthy, honest and friendly. In addition, we also asked in what condition they believe science and technology, the environment, society, the economy and the political system will be by 2050 (Section 2 “Australia 2050 - Future Societal Perceptions” in the online questionnaire).

Economic Trade-offs. To explicitly gauge the respondents’ preference for economic growth vs environmental conservation and social welfare, we asked “*Some people believe that the economy and the environment cannot flourish together and some tough choices are needed. If this was the case, what would you give priority to?*”. We then asked the same question by replacing ‘the environment’ with ‘society’. See Section 3 “Scenarios” in the online questionnaire.

Perceived Need for Change. Within a STEEP framework, we asked how much participants believe science and technology, the environment, society, the economy and the political system need to change and where these change should occur (Individuals, Community groups, Local governments, International organisations, etc). See Section 4 “Need for Change” and Section 5 “Scale of change” in the online questionnaire.

Myths of the Future. We developed a list of 95 statements describing a range of potential outcomes in relation to the five STEEP domains. Participants were asked to “*Please indicate whether you think the following outcomes are likely to happen in the future*”. A seven point scale was used that is derived from the IPCC probability statements associated with likelihood values and uncertainties [54] (1=extremely unlikely to 7=extremely likely). These statements reflect broad, simple (possibly superficial) beliefs about future development (referred to as ‘litanies’ in [55]), commonly found among members of the general public. These have been identified in the futures literature and news media [55-58] and they refer to ‘megatrends’ [59] or changes occurring nationally and internationally

explicitly agreed to take part in web-based surveys from time to time. In return they are offered a small non-cash incentive for completing such tasks, such as points towards shopping credits. The gender and age profile of the sample accords with the known population characteristics of Australians

that may lead to a restructuring of society. The statements describe potential visible characteristics of alternative futures or growth projections, as well as a range of scenarios of different types of society, technology, environment and polity based on different economies. The statements are framed in the future tense and are optimistic, neutral or pessimistic in roughly equal proportions. Examples of the statements include: “*Natural habitats, plant species, and animal species will decline or become extinct*”; “*Scientific innovations will improve medicine so that it is preventive and personalized*”; “*Democracy will not work, and a new better political system will take its place*”; and “*The world's economy will shift from west to east, and north to south*”. The full list can be found in Section 1 “Litanies” in the online questionnaire.

5 Results – the Myths of the Future

A detailed description of the data analysis can be found in [46]. Here we summarise the results pertinent to the identification of the Myths of the Future and their relation to the Scenario Archetypes. We used factor analysis to reduce the 95 statements in Section 1 of the questionnaire (Litanies) to meaningful constructs. Exploratory factor analysis identified the seven factors shown in Figure 1. Subsequent confirmatory factor analysis showed good fit for the first five: 'Social Crisis', 'Eco-Crisis', 'Techno-optimism', 'Power and Economic Inequality' and 'Social Transformation'. "The remaining two, labelled ‘Traditionalist Environmentalism’ and ‘Science Fiction’, showed poorer fit and are not considered further.

The Social Crisis myth describes beliefs that traditional values, social order and human competence are likely to decline in the future. The Eco-Crisis myth describes beliefs that environmental conditions and natural habitats are likely to decline and lead to social unrest. The Techno-Optimism myth describes beliefs that science, and technology are likely to create innovations which improve quality of life. The Power and Economic Inequality myth describes beliefs that big business and governments are likely to become more powerful and cause social inequality and economic crisis. Finally, the Social Transformation myth describes beliefs that society is likely to become more decentralized, caring and collectively empowered. Table 4 shows the items from the online questionnaire which best characterise the meaning of each of the Myths.

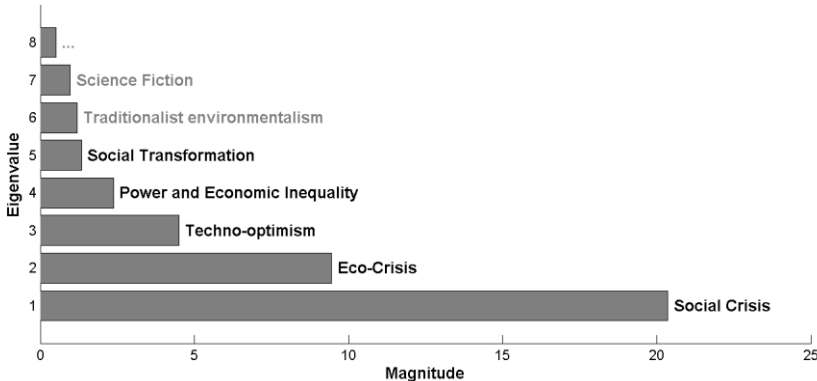


Figure 1. Magnitude (% of total variance) of the 7 largest factors obtained via factor analysis. The first 5 factors (dark font) proved robust to Confirmatory Factor Analyses and represent the Myths of the Future. The sixth and seventh eigenvalues (grey font) are not confirmed by Confirmatory Factor Analyses and are not included in the set of Myths.

Both the Social Crisis and Eco-Crisis myths show features of the Decline archetype in Table 1. However the focus on traditional social values vs environmental conservation reveals a considerable difference between these two myths. Table 5 (grey background) shows the correlations between each Myth of the Future. We can see Social Crisis and Eco-Crisis are negatively correlated, which means that an individual who identifies with the Social Crisis myth is less likely to also identify with the Eco-

Crisis myth. This difference is well captured by the Cultural Theory literature [37] and is further emphasised in Table 5 (white background). The correlations of these two myths with the measured cognitive constructs (Social Dominance Orientation, Rightwing Authoritarianism, Environment Ductile, Environment Elastic, Egalitarianism-Hierarchy, Individualism-Communitarianism and Concern for Future Consequences) are all of opposite sign as is the preferred trade-off between economic development and ecological conservation. While they both share similar expectations for the Australian future and desire for change (Table 5 row 5 and bottom two rows), and similar attitudes towards technological development and power and economic inequality, they do so for very different reasons.

The Power and Economic Inequality myth is positively correlated to the Eco-Crisis myth (with which it also shares all correlation signs in Table 5) while the opposite is true for its relation to the Social Crisis myth. This is also not surprising within the Cultural Theory framework according to which concerns for the environment and social equality are often related but opposite to concerns about traditional social values.

The three myths discussed so far share a pessimistic view of what the future may bring, motivated by either social, ecological or economic reasons. It is not surprising that they are all negatively correlated to the Social Transformation myth, which describes a better future via a shared, communitarian effort to address core human needs.

Table 4: Myths of the Future

<p>Social crisis:</p> <ul style="list-style-type: none"> • Crime and drug abuse will increase • Traditional morals and family values will decline • Society will be so involved in the internet and virtual world that it will lose touch of reality • Law and order will decline • Society will become more ignorant because of changes in technology and education <p>Eco-crisis:</p> <ul style="list-style-type: none"> • Natural habitats, plant species, and animal species will decline or become extinct • Pollution, rubbish and chemical contamination will build to dangerous levels • Continued economic growth will be at the expense of the environment • Environmental destruction in the developing world will lead to violence • Rainforests will be cut down to make way for agriculture <p>Techno-Optimism:</p> <ul style="list-style-type: none"> • Genetic technology will create more effective medicine and agriculture • Scientific innovations will improve medicine so that it is preventive and personalized • The coming decades will see new exciting economic markets emerge • There will be new improved ways to produce food and feed the world • The internet will make education available for all <p>Power and Economic inequality:</p> <ul style="list-style-type: none"> • Multi-national corporations will become alarmingly powerful • Continued economic growth will result in social inequality • Companies and governments will collect public data to control or influence people • A poorly regulated financial sector will result in another global economic crisis • The difference between the rich and poor will continue to grow <p>Social Transformation:</p> <ul style="list-style-type: none"> • Society will meet the human needs which the government can't or won't • National happiness will become more important than economic growth • There will be more community-owned businesses
<p>Traditionalist environmentalism:</p> <ul style="list-style-type: none"> • By learning how to live simply, humanity will become happier • People will return to traditional old-fashioned ways of living • Genetic engineering will create new risks for humans and the environment • Reduced poverty will minimise the human impact on the environment • Nanotechnology will create risks for the environment and our bodies <p>Science-fiction:</p> <ul style="list-style-type: none"> • The world will be so overcrowded that people will populate new planets

- Resources will be extracted from other planets and the moon
- Earth's atmosphere and temperature will be controlled through new technologies

We left the Techno-Optimism myth to the last because at first sight it may appear that beliefs in technological development originate solely from perceptions about the potential or limitation of technical or scientific development rather than from cognitive roots. However, the correlations with the other myths and with other cognitive constructs show how technological development may be perceived through different lenses. Table 5 (top, grey rows) shows the correlations between the Techno-Optimism myth and the other Myths of the Future. We notice a significant split in terms of optimism (in the positive correlation between Techno-Optimism and Social Transformation) vs pessimism (in the negative correlations with Social Crisis, Eco-Crisis and Power and Economic inequality). The Cultural Theory explains these relations: Table 5 (bottom, white rows) shows how optimism originates in associating Techno-Optimism with the beliefs that ecological crises can be avoided (negative correlation with Environment Ductile and positive correlation with Environment Elastic). Techno-Optimism is also associated with less concern for inequality (positive correlation with Social Dominance Orientation and preference for a Hierarchical approach to governance), possibly motivated by the belief that technology can improve the life of the less affluent even in a very unequal society. Techno-Optimism is positively associated with preference for economically, rather than environmentally or socially, motivated choices (Economic Trade-offs) and with an optimistic vision of Australia society in 2050. Of particular interest, and possibly counter-intuitive, is Techno-Optimism's focus in the present rather than in the future, as shown by the negative correlation with the Concern for Future consequences and the fact that Techno-Optimism reflects low Perceived Need for Change.

Table 5. Correlations among the Myths of the Future (grey background) and correlations between the Myths of the Future and other constructs (white background).

	Social Crisis	Eco-Crisis	Techno-optimism	Power and Economic inequality	Social Transformation
Social Crisis	-				
Eco-Crisis	-.11**	-			
Techno-optimism	-.51**	-.57**	-		
Power and Economic Inequality	-.05	.31**	-.51**	-	
Social Transformation	-.28**	-.50**	.32**	-.57**	-
Social Dominance Orientation	.09**	-.22**	.09**	-.26**	.28**
Rightwing Authoritarianism	.21**	-.06	-.02	.12**	-.28**
Environment Ductile	-.21**	.50**	-.26**	.32**	-.27**
Environment Elastic	.04	-.37**	.17**	-.25**	.37**
Egalitarianism-Hierarchy	.24**	-.28**	.08*	-.20**	.11**
Individualism-Communitarianism	-.27**	.20**	.04	.07*	-.03
Concern for Future Consequences	-.10**	.22**	-.09**	.28**	-.28**
Economic Trade-offs	-.21**	.39**	-.23**	.27**	-.14**
2050 Expectations	-.44**	-.37**	.61**	-.36**	.42**
Perceived Need for Change	.07*	.27**	-.29**	.27**	-.25**

6 Comparison of Myths of the Future and Scenario Archetypes

The strongest relation between the Myths of the Future and the Scenario Archetypes is given by the similarity between the Technology archetype and the Techno-Optimism myth. They describe a very similar process of technological development, perceived as a positive force. As discussed above, the Decline archetype includes several potential paths to decline, while the EcoCrisis and Social Crisis myths are specific in identifying the drivers of decline and in expressing different worldviews. Among the paths to positive social change, the archetype which most closely resembles the Social Transformation myth appears to be Deep Transformation, since it specifically addresses values and social organisation rather than political or institutional reforms. Of particular interest is the relation between the Economic Growth archetype and the Power and Economic Inequality myth. Commonly, the Economic Growth archetype focuses on economic growth, trade expansion and their implications for human wealth, international relations, resource use and environmental conservation. It can have either positive or negative connotations depending on the specific scenario exercise and audience. The Power & Economic Inequality myth clearly places emphasis on power relations and the impact of economic growth on social structure. It also has a clear negative connotation. A similar emphasis on the potentially negative consequences of economic growth, as opposed to the pursuit of economic growth itself, was observed in another future study involving representatives of the Australian population [60], which was carried out via a number of focus groups rather than via online survey as in this study.

Overall, Myths of the Future and the Scenario Archetypes display an overall resemblance, but not a precise match. Here it is useful to discuss some possible reasons for this. First, our results are based on a fairly large sample of Australian citizens, while the Scenario Archetypes have been developed through the accumulated experience of many future study practitioners and scholars working in different contexts and with different audiences. It would be interesting to extend the approach described in this work to other nationalities and cultures to see whether similar patterns are found.

Second, the Scenario Archetypes have been developed over several decades while our study was carried out at a single point in time (June 2014). It is quite likely that this may have affected its outcome. For example, the impact of the fairly recent GFC and the often discussed widening wealth gap in all western countries may have led to a less optimistic view of economic growth compared to a few decades ago. Similarly, discussions of climate change and peak oil may have brought environmental concerns to a level not seen since the mid 70s. Carrying out a survey of the type described in this work at regular time intervals may help clarify what components of the myths are robust to change and which are strongly affected by global events.

Third, future study exercises are usually team-based, occur in a workshop setting and are often designed to address a specific issue or concern. Our online survey targeted individuals working in isolation and did not address any specific issue or concern, besides general attitudes towards the future. Both these differences could affect the outcome of the exercises. Running our survey before and after a traditional future exercise, either inside or outside a workshop session, could reveal what attitudes are developed, or strengthened, specifically by participating in a future exercise within a workshop setting.

We conclude with a more speculative, but potentially more fundamental difference between Scenario Archetypes and Myths of the Future. As described in Section 2, a scenario (and thus an archetype which represents it) is supposed to be a story about how the future might unfold. [20] also describe archetypes as ‘world end points’ or future world states. However, some archetypes (Market Forces, Policy Reform and Restraint, for example) could equally be understood as drivers of change. The Myths of the Future more clearly represent concerns and hopes or expectations, which may explain why they differ fairly clearly along a positive vs negative axis. They tell us that when it comes to the future, the citizens we surveyed differ the most on the extent they are concerned about power balance

and social equity, environmental conservation, the respect of traditional values and on the extent they believe that technological development and social change will ameliorate our future.

7 Implications for the Future Study literature

The future study community has accumulated a considerable expertise in categorising the way people from different cultures think of the future in terms of end states or drivers of change. This expertise has been collected by observing and studying the outcomes of countless future study exercises, workshops and focus groups. An alternative approach, based on a Cultural Theory framework, suggests that a different categorisation can be achieved based on shared concerns and hopes. This leads to the identification of the five ‘robust’ Myths of the Future discussed above, with the possible addition of two further myths ‘Traditional Environmentalism’ and ‘Science-Fiction’. These myths have been identified by surveying a large sample of Australian citizens using methods well established in the social sciences. Nevertheless, the Cultural Theory framework is currently undergoing both conceptual and empirical development [37] and it is important that our results are further explored with samples from different cultures and with different surveying methods. In the meantime, we believe the results presented in this study can inform the foresight community in a number of ways. First, by paying attention to the cognitive roots underlying some scenario archetypes we may further explore their meaning. For example, while a scenario describing decline, collapse or catastrophe may include diverse drivers and manifestations of decline (environmental disaster, war, social conflict, etc), concerns for a *specific* type of decline (environmental vs social vs moral) reveal very different worldviews. This may have practical implications: in a workshop setting, a sub-group asked to explore a decline scenario, as in [60], is likely to reflect different attitudes and beliefs, especially if the subgroup is self-selected. As a result, while it may be reasonable to group several decline scenarios into the same archetype given the specific context of a foresight exercise, it may also be important for the practitioner to be aware of implications of different types of decline for different participants. Another example of how the analysis of the cognitive roots may elucidate the meaning of an archetype is given by the Power & Economic Inequality myth. In terms of Myths of the Future, economic development per se and international trade relations do not appear to be either a main concern or an aspiration, while they are common features of scenario choices in future studies, as shown in Table 1, under both the Economic Growth and Local Focus archetypes. Whether this difference is important may depend on the purpose of a future study and the targeted audience.

Following an approach described in [47], the survey presented in the work could be used before a futures exercise to reveal the extent to which the workshop participants are a representative sample of a larger population (the Australian citizens in our case). As an example, a strong emphasis on science-fiction-like futures would probably reveal the workshop audience is not representative of the general public, given the Science-Fiction myth is not a robust outcome of our survey analysis. Obviously, this does not imply that a focus on a science-fiction scenario is necessarily misplaced, since it could be justified by the specific context and purpose of the futures exercise, but it may be important to be aware that it may not represent the concerns of a larger sample of the population.

Both the foresight and Cultural Theory literatures have made extensive use of 2*2 or double uncertainty plots based on similar axis. This observation has partly motivated this study. Nevertheless, the use of the 2*2 plot in Cultural Theory is not problem-free and we refer the reader to [37] for an extensive discussion. We suggest that, unless justified by the context of a specific study, a 2*2 plot should not be used uncritically. This is particularly true if its use pre-imposes the number of scenarios under analysis. Our first attempt to plot both Scenario Archetypes and Myths of the Future on a 2*2 plot (not described) has faced difficulties which we will address elsewhere.

At first sight, the 5 Myths of the Future have a reasonable correspondence with the 5 elements of the STEEP framework. This may not be surprising, given that the STEEP framework was one of the inspirations for the questionnaire development. However, we find the similarities between the Myths

of the Future and the STEEP elements less revealing than the differences. Among the STEEP elements, Technology, Environment and Social correspond fairly well to the Techno-Optimism, Eco-Crisis and Social Transformation myths. The other 2 elements (Economy and Politics) are less clearly identified in the Myths of the Future. The latter highlight mistrust towards these two drivers of change and focus on lack of equity and moral values as synonyms for Economy and Politics. A similar attitude was also noticed in [60].

We conclude by noticing that the concept of technological change provides a firm anchor between the STEEP framework, Scenario Archetypes and Myths of the Future. Not only does it hold a similar connotation in the three frameworks, but also (as revealed by it emerging as a factor in the survey analysis) it provides enough variation between individuals to be informative and useful in a foresight exercise. Our analysis also reveals that attitudes towards technological development are not value-free. Both

We left the Techno-Optimism myth to the last because at first sight it may appear that beliefs in technological development originate solely from perceptions about the potential or limitation of technical or scientific development rather than from cognitive roots. However, the correlations with the other myths and with other cognitive constructs show how technological development may be perceived through different lenses. Table 5 (top, grey rows) shows the correlations between the Techno-Optimism myth and the other Myths of the Future. We notice a significant split in terms of optimism (in the positive correlation between Techno-Optimism and Social Transformation) vs pessimism (in the negative correlations with Social Crisis, Eco-Crisis and Power and Economic inequality). The Cultural Theory explains these relations: Table 5 (bottom, white rows) shows how optimism originates in associating Techno-Optimism with the beliefs that ecological crises can be avoided (negative correlation with Environment Ductile and positive correlation with Environment Elastic). Techno-Optimism is also associated with less concern for inequality (positive correlation with Social Dominance Orientation and preference for a Hierarchical approach to governance), possibly motivated by the belief that technology can improve the life of the less affluent even in a very unequal society. Techno-Optimism is positively associated with preference for economically, rather than environmentally or socially, motivated choices (Economic Trade-offs) and with an optimistic vision of Australia society in 2050. Of particular interest, and possibly counter-intuitive, is Techno-Optimism's focus in the present rather than in the future, as shown by the negative correlation with the Concern for Future consequences and the fact that Techno-Optimism reflects low Perceived Need for Change.

and Table 5 show that attitudes towards technological development are influenced by (and can reveal) beliefs regarding how society and the environment should be managed, and to what extent technology itself can be a positive or negative force in this management. Once again, revealing and discussing the cognitive roots of attitudes towards technological development can be particularly insightful within a future study workshop.

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