

SCENARIO DEVELOPMENT: A METHODOLOGY FOR ALIGNING CONTEMPORARY PRACTICES WITH THE POTENTIAL FUTURES OF UK CONSTRUCTION

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Visualising and preparing for the future is a central activity for firms, other institutions, governments and individuals, and future studies has become a significant area of interest and study. The methodological approach developed for a large project – ‘Sustained competitiveness in UK construction’ or ‘the Big Ideas’ for short – investigating the possible implications of different potential futures for the construction sector is outlined, and several key methodological principles discussed. These include a commitment to producing a diverse range of possible future scenarios, and maintaining a strong connection between these potential futures and the contemporary practices and abilities of construction firms and practitioners. An example scenario is presented and discussed, and the development of the approach on the project considered.

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INTRODUCTION

Thinking about and preparing for the future is an important strategic activity for firms, other institutions, governments and individuals. Everyday corporate activities such as decision making often involve the assessment of the future consequences of decisions and actions. Considering this, and the emphasis placed on strategy development in contemporary organisational rhetoric and organisational literature, it is no wonder that future studies has grown into a substantial field, in terms of both academic research and practitioner activities, and there are a number of thriving UK ‘future studies’ consultancies offering assistance in aligning current practices with likely future developments. ‘Sustained Competitiveness in the UK Construction Sector – A Fresh Perspective’ (or the ‘Big Ideas’² for short) is a collaborative research project involving the IMRC’s (Innovative Manufacturing Research Centres) of Loughborough, Reading and Salford Universities. The overall aim is to ‘engage industry in the development and implementation of an integrated strategy in support of sustained, innovation-based competitiveness’, and the work at Loughborough involves looking ahead to identify possible future developments both within and external to the construction sector over

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the next two decades. The potential implications of these developments for the sector can then be used as a basis to prepare today's construction firms for tomorrow's possible futures.

However, 'future studies' incorporates a large number of diverse approaches, aims and orientations. It also suffers somewhat from being perceived as an attempt to pre-empt or predict the future, an enterprise almost certainly doomed to failure. But prediction does not have to be the ultimate purpose of future studies - they can produce a range of likely or possible futures which can inform both potential future activities and contemporary practices. This is the focus of the Big Ideas work.

Given the diversity of future studies, before outlining the methodology being developed for the Big Ideas project, it is important to position the approach within the field of future studies more generally and to consider some of the methodological issues raised in existing studies of the future of construction. Following this, the methodology adopted is outlined, and some early results from the research discussed, before finally reflecting on the on-going nature of the research project and the further development of the approach.

FUTURE STUDIES METHODS

There is a variety of methodological approaches and conceptual perspectives which constitute the field of 'future studies' or 'futuresology'; a glance through collections such as the *Handbook of Futures Research* (Fowles 1978) or *Looking Forward: A Guide to Futures Research* (Helmer 1983) demonstrates the plethora of often highly sophisticated techniques which can be adopted, including the Delphi method (a device to achieve consensus among experts through evolving questionnaires, so called after the Oracle at Delphi) or cross impact analysis (a quantitative method which uses estimations of the probabilities of different events to deduce interconnectivities between them). They can utilise quantitative and / or qualitative data, be oriented to societal, industry or firm levels and produce a diverse range of outputs, including econometric models, future scenarios or descriptions of potential or likely futures, 'hard' predictions and timelines.

One of the key distinguishing features is their predictive capability. Prediction within these approaches is based on the extrapolation of current and previous trends, for instance economic growth or demographic change. This can be helpful in some situations, and play an important part in scenario production, but cannot account for novel, innovative change, or the variability of trends over time. For instance, in 1929 the U.S. Department of Labour's *New Year Forecast* proclaimed that '1930 will be a splendid employment year'. Similarly the significant impact of information technology across a broad spectrum of personal and corporate practices has defied expectation. A well used (although perhaps apocryphal) example is Thomas Watson's (the founder of IBM) assertion in 1958 that the global requirement for the number of computers in the future would total only five units.

Prediction, then, can be a dangerous business, and there is good reason for the ubiquity of incorrect attempts; our understanding of the future can only be grounded in the present, and there is no robust or rigorous way of anticipating what new developments may be on the temporal horizon (although some futures consultants do sell their ability to do this). But there are alternative ways to apply future studies' methods, and alternative expectations of what they can deliver. There are a number of advocates of alternative approaches, which address some of the problems of the

inaccuracy of prediction and advocate a more cautious perspective and the production of a range of scenarios which describe a number of possible futures (see e.g. Berkhout *et al* 2002; Godet 2000; Kok *et al* 2006; Rotmans *et al* 2000). Broadly speaking, these adhere to (some of) these key ideas: to explore multiple and uncertain futures; to take into account qualitative factors and the strategies of actors; to remember always that information and forecasts are not neutral; to opt for a plurality of approaches; to adopt a global and systemic approach (see Godet 1986). The idea that there are multiple possible futures is operationalised in practice by the production of a number of scenarios which offer alternative accounts of the future. Accounting for the potentially conflicting strategies of different actors, and the recognition that forecasts and scenarios are not neutral but represent specific and partial perspectives are also important methodological considerations. A positive scenario for one stakeholder may have negative implications for others; for instance a future transition from being just a construction contractor to the integration of construction and facility management (FM) might be seen as a positive step for facility managers, but bad for contractors with no interest in diversifying into FM. Utilising a plurality of methods, for instance using interviews along with questionnaires and document analysis, removes the problem of relying on a single method in the production of scenarios, and allows complementary and interrelated sets of quantitative and / or qualitative data to be built up and compared. Utilising a global and systematic approach allows consideration of a wide range of issues, and enables scrutiny of their interconnections. Arguably, there is little value in a scenario oriented around, say, the future of skills within construction which does not take into account wider demographic or economic changes to do with the availability and quality of workers, and expectations over pay and conditions.

Before moving on to look at some existing construction future reports, there is a final and arguably essential point to add to the list above which permeates through the above comments, but is not often specifically discussed. For scenarios to be useful and informative to practitioners, or to hope to give a plausible account of the future, regardless of how they have been produced, there must be a strong connection between the scenarios themselves and current conditions and practices. Without an appreciation of the events that have led to present situations or the influence that current actors can lever upon the contexts in which they work, the scenarios themselves cannot be connected to the adoption of particular strategies to respond to or pre-empt them. If this connection is not made, the utility of future studies can be fundamentally questioned.

FUTURE STUDIES IN PRACTICE: CONSTRUCTION REPORTS

There are a number of reports which implement future studies methods to generate pictures of the potential futures of the construction sector. A more detailed analysis of 13 of these reports in terms of their methodological approach and thematic content has been undertaken elsewhere (see Harty *et al* forthcoming) but it is worth a brief mention of some of the strengths and weaknesses of them, in light of the above discussion. The reports tend to fall into three main types; those based on the ideas of industry practitioners, usually collated through workshops (e.g. DTI 2002), others based on speculation by specific industry practitioners or academics (e.g. Hughes 2003) and those which provide a review of other reports (e.g. Edkins 2000). Each approach has its own strengths and weaknesses; workshops with industry do represent the opinions of construction practitioners, but tend to start each exercise with a blank sheet of paper, and so the sorts of scenarios produced reflect only their current

preoccupations and lack any connection with pre-existing futures reports. Speculative accounts can produce interesting and challenging scenarios, but they are, as one might expect, highly individual and can lack any grounding in the collection and collation of a broad base of opinions, or in connecting speculation to current configurations and practices of the sector. Review type reports can provide a useful synthesis of existing work, but tread little new ground and have no direct input from practitioners.

THE BIG IDEAS METHODOLOGICAL APPROACH

Analysing Past Reports on the Future of Construction

The aim in developing the particular approach taken for the Big Ideas project was to try and retain the positive aspects of previous reports, but also to try and shore up some of their weaknesses. One of the central concerns was to retain and build on existing work on the futures of construction, by identifying common (and uncommon) themes, issues and trends. With this intention, the content of 13 reports on the future of construction produced between 1998 and 2005 was reviewed and analysed (see Soetanto *et al* 2006). Content analysis, like future studies, can incorporate a wide variety of approaches and uses, but broadly refers to techniques of extracting the words, meanings, and ideas within a text (Neuman 1997). There are no strict methods for, or rules of, content analyses, and so can be largely driven by the aims of the particular research (Weber 1994). In this case, issues and ideas about the future were identified, and this produced a list of 337 (at last count) of different issues which do or might face the construction sector.

This initial phase presented a problem which many 'blank sheet' based future studies do not have to deal with; how to structure, classify and manage such a large number of issues. Initially, the list was grouped into an adapted PESTEL (Political, Economic, Social, Technological, Environmental, Legal) framework, incorporating 'People', 'Work', 'The Planet', 'the Built Environment' and 'Governance'. However, a more finely grained framework was required, so issues were clustered into a number of sub-themes. The process involved beginning with each issue on a separate Post-It-note and clustering them together into similar themes. This was undertaken collaboratively by the research team, and over subsequent iterations some clear clusters emerged. Where there was some uncertainty over precise meanings or possible location the original reports were re-consulted. It is important to note, however, that the aim of this exercise was not to deduce a universal schema or to irreversibly define issues as part of a specific cluster; although many of the issues logically fell into one, there were many others that could have been allocated to several different clusters. The main aim of the exercise was to provide a way of managing the list to produce something that could be taken forward and built upon by subsequent empirical research. Eventually, a 'high level' map with 39 clusters emerged (see fig. 1).

This produced a much more manageable map of the 337 issues, from which to build timelines and scenarios of the future of construction. However, 'digging down' into the high level map to the clusters within it revealed only a number of issues, loosely grouped together. An issue such as 'ageing population' may have a significant effect on construction's future, but in order to explore its effects and consequences as part of a future scenario or timeline some more information was required. This, coupled with the obvious wide-ranging scope of the issues, presented a significant challenge; how can the move from thinking about something rather vague such as an ageing

population be sharpened up to allow its potential effects to be incorporated into scenarios?

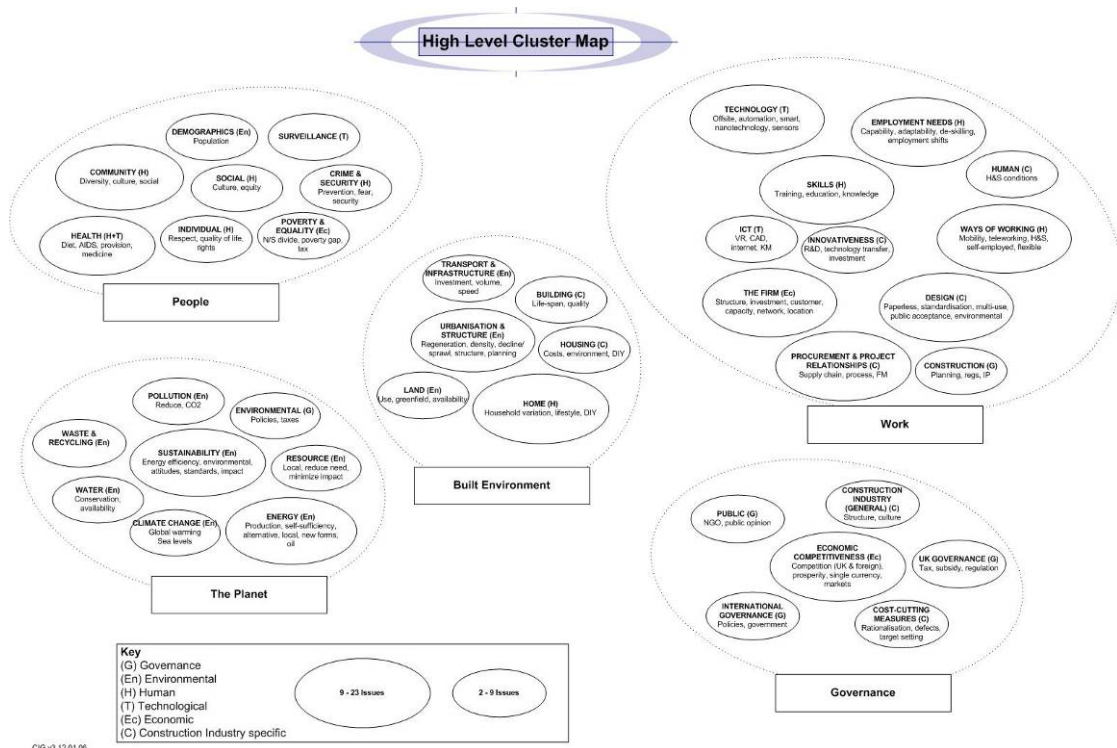


Figure 1: The high level clusters

Enriching the clusters

There were a couple of options for doing this, one of which – the consultation of ‘experts’ from areas such as climate change, demographics, policy and so on – would have required large amounts of resources, and so an alternative strategy was adopted. This involved reviewing and collating a sample of the wealth of futures reports and other data regarding future trends available from a variety of areas outside of construction including transport infrastructure, climate change, demographic change (including population growth estimations and telecommunications). These reports themselves represent the opinions and ideas about the future from many ‘experts’ in different fields. Key information was extracted, and then transferred onto the map of each cluster. For example, for the ‘Demographics’ cluster this included estimations of world population growth (which appears to be increasing, but with growth slowing), national and regional trends (including the population expansion of some developing countries and the declining rates of others such as Europe), and figures estimating the age distribution of UK society (see fig. 2).

The utilisation of such enriching information in relation to the original clusters fulfils two important purposes. Firstly, it incorporates the opinions of the numerous experts from outside of the field of construction that contributed to the original reports. Secondly, it sets some limits, boundaries and tolerances from which to construct scenarios. For instance, a scenario could be produced which uses an ageing population as one of its building blocks. Using the enriched map, an estimate of the likely change in age profile can be deduced; over the next two decades the proportion of pension-age individuals to workers will increase from about three in ten to seven in ten. This is a validated, rather than speculative, estimate taken from specific demographics studies, and although it is not assumed to be a precise prediction, it does indicate the

pace and scale of the ageing of the UK population. Another example can be taken from the climate change cluster; by analysing different reports the likely rises in sea levels which may occur in the next 20 years were estimated at between 0.04 and 0.2 metres. Scenarios involving the implications of rising sea levels can therefore take these as likely tolerances; although it might be useful to think about potential sea level changes outside of these estimates, to move too far away from them risks reducing the plausibility of the scenario. There is probably little value in considering what a five metre sea level rise might bring with it, if the higher end estimates are considerable less than this.

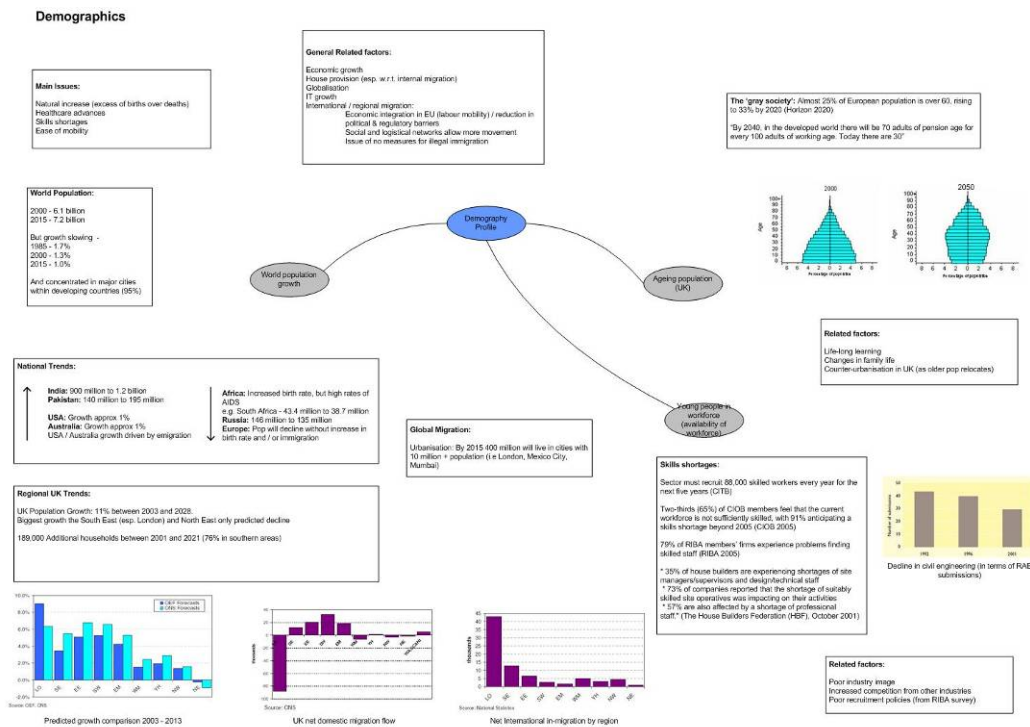


Figure 2: Enriched Demographics Cluster

Another important aspect of producing these enhanced clusters was to produce accessible and usable resources for scenario building. By arranging relevant information around each cluster, the maps can be consulted as scenarios are put together and discussed. The connection between each cluster and the high level map retains some sense of the relations between the whole gamut of issues within the original list of issues.

Producing Timelines and Scenarios

Armed with this resource, the next step of the approach is to take the maps into further empirical research with practitioners. In line with the assertion that there are multiple and uncertain futures ahead, this is intended to produce a diverse range of timelines and scenarios, but which are grounded in the comprehensive list of issues, and within or around the broad tolerances or boundaries suggested by the various future studies consulted. It is also worth restating that the core methodological issue is not the correctness or otherwise of the reports – remembering the tenet above that information is never neutral - but that it is building on existing information which is then being used only as a guiding framework and a stimulus to encourage informed debate about potential futures. This also avoids the potential trap of untempered relativism – the

idea that if information is not objective or neutral, it must be entirely subjective and hence anything goes – by suggesting some plausible tolerances of the sorts of building blocks used to produce scenarios.

There are a number of stages to the process of assembling scenarios. Firstly, some key issues around which to base the scenario need to be selected. This can be achieved in a variety of ways. One approach is for the research team to suggest a main theme for scenario construction, for instance around the implications of climate change on construction, or of skills shortages in the industry. From a practical point of view, this has the advantage of stimulating the specific interests of firms and individuals attracting those who are interested in, say, technological changes or the relationship between sector practices and policy. The idea is that as debate unfolds in the workshops, many more issues from other areas and clusters will be pulled into the scenario. For instance, it is difficult to think about the implications of climate change for construction without also considering the potential legislation and policy that might accompany a shift to a more ‘sustainable’ construction sector.

An alternative way is to begin a workshop session with a list of different issues, which can then be ranked by participants in terms of their importance and their potential impact. This can be a formal exercise which collects and collates probability and impact estimates from workshop members, allowing the collectively most important issues to be the focus of subsequent scenario development. The gathering of probability and impact data also presents the opportunity in the future to perform some of the more statistical future studies methods, such as cross impact analysis. Again the intention is that these issues are only the starting point, and that others will be selected and incorporated as scenarios are elucidated.

Once some key issues are selected, they can be combined with some of the estimations and tolerances suggested by the enriched clusters. This is a crucial step, as scenarios and timelines are based around events rather than issues. An issue, such as ‘oil shortages’ is an interesting and important theme on which to build a scenario, but needs to be converted into an event; it needs to have some temporal element or threshold added to it, such as ‘oil price rises to \$100 per barrel’. This is an event which can then be placed on a timeline, or further elaborated within a scenario. Again it is important to note that the accuracy of the predictions or estimates is not fundamentally important; oil may rise to \$100 per barrel next week, in 10 years, or never, but the scenario developed offers the opportunity to consider the implications of such an occurrence, and to discuss its potential effects on construction work.

Once some core focus issues have been selected and converted, the process of populating timelines can begin. There are two main ways of approaching this task; either working from an initial event and looking forward into the future, or by placing an event on the timeline and working backwards to consider what might have happened between now and that point to make the event occur. Practical experience tends to favour the latter approach; it seems to be an easier task to work backwards than to think forwards, but both can be used and neither offers any significant methodological advantage over the other.

The process of constructing timelines can also identify any potential barriers or problems that need to be overcome to bring about a particular future event or situation. These can then form the basis of turning points on the timeline. If a barrier is overcome, event X may happen, if not it will not, but something else will. Timelines constructed in this way form a useful basis for thinking about strategies for facing

possible futures. A particular barrier might stand in the way of a firm's desired future; this method helps to identify such problems.

An Example: Wireless Technologies

A brief discussion of an example will be helpful to demonstrate the utility of the approach. The following scenario, based around the growth of wireless communications, was developed from a meeting between one of the research team and two consultants with experience in both conducting future studies and with working with construction practitioners. The meeting was a dry run to test the approach and to see whether it could produce useful and interesting scenarios. Wireless communications were selected as the basis of the timeline as they were considered a key development which could provoke significant changes. To turn the issue of 'wireless communications' into a suitable event for a timeline, a threshold was added, making it 'wireless coverage matches that of GSM'. This provided an initial point at which to start thinking about the wider implications of this event. Starting from this, the following timeline emerged (fig. 3).

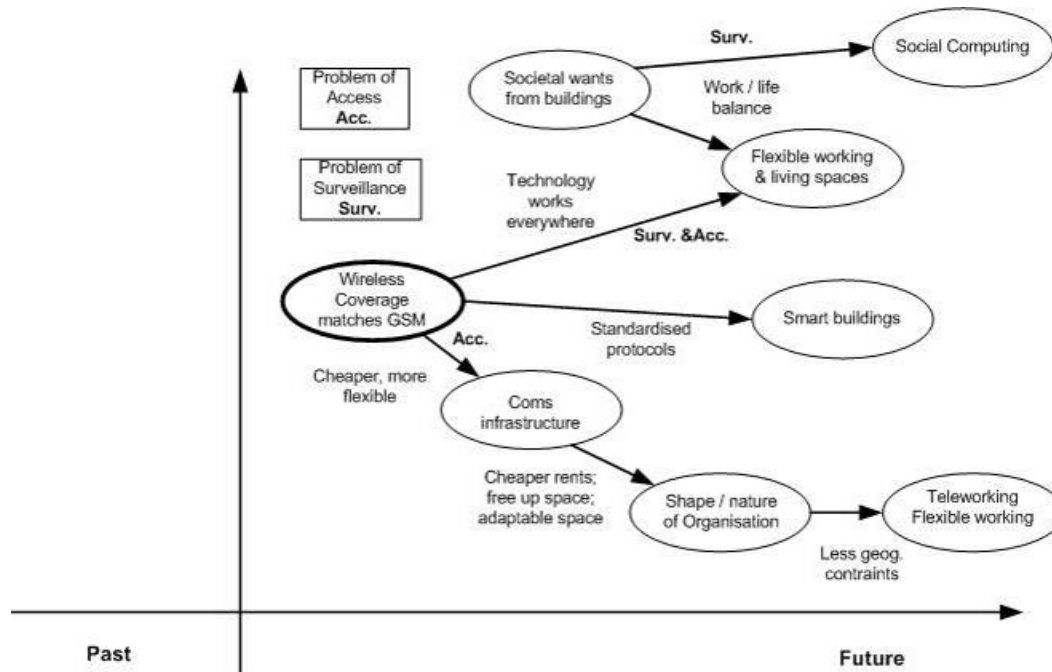


Figure 3: Wireless communications timeline

This was then developed into a written scenario; a storyline outlining possible future changes instigated by the spread of wireless communications:

“The shape and ways of using both domestic and commercial space has radically changed. The provision of universal high bandwidth wireless standards, coupled with developments in computer control of various appliances and the integration of building services and systems has meant that truly flexible and easily re-configurable spaces are the norm. No more light-switches or heating controls - everything, from the levels of light and heat and the programming of the washing machine to the organisation of work and scheduling of your multimedia interests is controlled from a single device. Using partitions, internal open-plan spaces can be quickly changed to suit individual needs and preferences. At work, meeting rooms, working areas, offices

and relaxation spaces are interchangeable and can transform to suit a firm's dynamic business needs. Existing building stock can be easily refurbished, as there are few physical requirements to meet, and this has made available a wealth of potential living and working areas and reduced refurbishing costs.

“In addition, the extent of flexible and home working has dramatically increased, utilising shared document management systems and virtual meeting technologies wirelessly to work in isolation or as a team anywhere. This has reduced the spatial requirements of many firms cutting costs further. It has also allowed smaller domestic spaces to fulfil more functions, allowing smaller, and therefore cheaper, homes.

“This provision of wireless access has brought about other changes. Managers can track and monitor the whereabouts of staff - times into work, movements around the office and so on, using transmitters in PDAs, as well as what documents they are accessing or filing. The same technology has provided some more congenial uses, by allowing friends and family to keep track of one another, and to alert them when an acquaintance is nearby.”

Analysing and Utilising the Timeline and Scenario

The example succinctly demonstrates a number of the main elements of the Big Ideas methodology and approach. It is not so much about the future itself, but about the path from the present to the future, thus connecting contemporary actions to future states. The interconnectivities between issues are shown, such as between ‘societal wants from buildings’ (part of the *community* cluster), ‘smart buildings’ (from the *technology* cluster) and ‘teleworking’ (*ways of working*). In addition, each connection arrow has a specific description, which means that practitioners must carefully consider the nature of the connections that they are proposing. The timeline exposes some crucial barriers within and outside of the construction sector that need to be overcome – namely the problems of controlling access to wireless communications, of the negative associations of increasing electronic surveillance and of the need to harmonise diverse building and consumer electronics standards to allow the fully networked ‘smart building’ to become a future reality.

CONCLUDING THOUGHTS

Considering the future through the method outlined here provides an appreciation of the scope and scale of changes that might be required to bring a future scenario about and / or of the implications of what it might subsequently bring about. This can be connected to an appreciation of construction firms' and practitioners' capacity for influencing or participating in the process of change; it can suggest areas where firms can make significant inroads into bringing about or avoiding potential futures, or where other methods, such as government policy, are required to help guide industry activity along a potentially beneficial path. By basing the scenarios on the original issues extracted from the futures reports, the interconnections suggested in multiple scenarios can be overlaid back onto the high level and cluster maps, hence providing a way of representing the interdependencies between issues at an aggregated level. For example, this would show if the same interconnections are proposed in a number of different scenarios; if so this would suggest that they are if not likely, they are at least important preoccupations of construction practitioners.

The Big Ideas project is now about to begin the scenario workshops in earnest. The methodology outlined here will produce a range of scenarios which can form the basis of strategy development within construction firms, and the approach will also be

adapted into a tool for firms themselves to use when planning for their future. It is intended to maintain consistency with the key points made at the beginning of this paper: it recognises a range of uncertain futures; it maintains a strong link between scenario development and the actions and decision making abilities of firms; it is inclusive in its orientation rather than tending towards a narrow focus and (over)simplification; and it uses a plurality of methods, including workshops, interviews and documentary analysis, aligning qualitative scenarios alongside 'harder' extrapolation of trends. It is not about prediction or even about finding a small number of 'best fit' futures, but instead defines a range of 'possibility spaces' (Berkhout and Hertin 2002) that firms can explore and develop strategies for and responses to.

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