

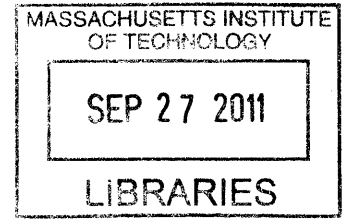
**Large Scale Participatory Futures Systems:  
A Comparative Study of Online Scenario Planning Approaches**

By

Noah Raford

M.Sc. Advanced Architectural Analysis  
University College London, 2004

B.A. Sociospatial Analysis and Design  
Brown University, 2000



**ARCHIVES**

Submitted to the Department of Urban Studies and Planning  
in partial fulfillment of the requirements for the degree of

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Author \_\_\_\_\_

A handwritten signature in black ink, appearing to be "Noah Raford", written over a horizontal line.

Noah Raford  
Department of Urban Studies and Planning  
August 30, 2011

Certified by \_\_\_\_\_

Professor Michael Flaxman  
Department of Urban Studies and Planning  
Dissertation Supervisor

Accepted by \_\_\_\_\_

Professor Karen R. Polenske  
Chair, PhD Committee  
Department of Urban Studies and Planning

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**ABSTRACT**

This dissertation explores the role that participatory online collective intelligence systems might play in urban planning research. Specifically, it examines methodological and practical issues raised by the design and use of such systems in long-term policy formulation, with a focus on their potential as data collection instruments and analytical platforms for qualitative scenario planning.

The research questions addressed herein examine how the use of collective intelligence platforms informs the process of scenario planning in urban public policy. Specifically, how (if at all) does the design and deployment of such platforms influence the number and type of participants involved, people's reasons for participation, the kinds of activities they perform, and the speed and timeline of the scenario creation process? Finally, what methodological considerations does the use of such instruments raise for urban planning research in the future?

In-depth interviews with experts in the fields of urban planning, public participation, crowdsourcing, and scenarios were conducted, combined with secondary analysis of comparable approaches in related fields. The results were used to create an analytical framework for comparing systems across a common set of measurement constructs. Findings were then used to develop a series of prototypical online platforms that generated data for two related urban planning cases. These were then analyzed relative to a base case, using the framework described above. The dissertation closes with a reflection on how the use of such online approaches might impact the role and process of qualitative scenario research in public policy formulation in the future, and what this suggests for subsequent scholarly inquiry.

Thesis Supervisor: Michael Flaxman  
Title: Assistant Professor, Urban Studies and Planning

Readers: Joseph Fierrea, Professor, Department of Urban Studies and Planning, Massachusetts Institute of Technology

Andres Svetsuk, Assistant Professor, Department of Urban Studies and Planning, Massachusetts Institute of Technology

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Title: Assistant Professor, Urban Studies and Planning

Readers: Joseph Ferreira, Professor, Department of Urban Studies and Planning, Massachusetts Institute of Technology

Andres Sevtsuk, Lecturer, Department of Urban Studies and Planning, Massachusetts Institute of Technology

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## **Chapter 1 Introduction**

### **1.1 Chapter Introduction**

This dissertation explores the possibilities presented by online platforms for scenario planning in urban public policy. Specifically, it examines various methodological and practical issues raised by the design and use of such systems in long term policy formulation, with a focus on their potential as data collection instruments and analysis platforms in qualitative scenario planning.

This chapter provides an overview of the research and articulates the questions that inspired and guided the research process. I set this inquiry in the context of three distinct bodies of professional literature, including public participation in urban planning research, qualitative scenario research for urban planning, and participatory collective intelligence systems as data generation and analysis instruments. I then describe the dissertation's method and core case studies, and conclude with a discussion of the contribution this research might make to the field.

### **1.2 Problem Statement**

Urban planning research has a long-standing interest in the future. Davidoff and Reiner (1973, p. 11) write that, "we define planning as a process for determining appropriate future action through a sequence of choices". Myers and Kitsuse (2000, p. 225) observe that, "the future orientation of planning is unique to the field's identity... The very substance of urban planning is founded in time." Yet in equal measures, planning has turned away from its futures orientation and towards more present-focused, deliberative processes.

Certain scholars (van der Heijden, 1996; Schwartz, 1996) advance qualitative scenario planning as one methodology for delivering higher-quality planning and research that are together

able to account for the uncertainty, volatility and complexity in public policy. This approach is thought to enable researchers to integrate the participation of a wide variety of stakeholders with diverse perspectives into the planning process (Chermack and van der Merwe, 2007). To date, the influence of qualitative scenario research on urban planning as a field has been limited. This may be because methodological, logistical and financial constraints limit its applicability for use in many multi-stakeholder engagements. Time and resource constraints have meant that scenario exercises have been limited to small groups of largely senior decision-makers. The number of in-depth interviews researchers can conduct and analyze has typically constrained the breadth and diversity of participants involved, particularly when the research question is such that researchers might benefit from a large sample including a broad and diverse group of respondents. Finally, the constraints placed on researchers to set up, coordinate, conduct, and analyze interviews can significantly limit the amount and type of data researchers set out to generate.

At the same time, developments in online approaches, characterized broadly as “Web 2.0”, offer the potential to address both the need for increased participation in complex, future-oriented planning settings, as well as the constraints of traditional qualitative scenario planning. Recent developments in large-scale collective intelligence systems have the potential to enable researchers to generate data from a diverse set of stakeholders (Malone, 2010). These systems are also capable of rapid data analysis and computation. This suggests that they may be useful in helping participants understand the interaction between scenario variables and produce more complex, rich narratives of the future. The potential of large-scale collective intelligence systems, if realized, suggests that it may be possible to incorporate larger, more diverse perspectives, with more in-depth and rigorous analysis, in a way that is also rapid and more cost-effective.

But how well do such large-scale collective intelligence systems live up to this potential? Where do they succeed, in what ways, and where might they still fall short? This dissertation

explores the role that such systems might play in the qualitative scenario planning process in urban planning, with a focus on their ability to help generate diverse data, facilitate larger and more robust participation, and add analytical or synthetic value. It focuses on some of the methodological and practical concerns raised by the design and use of such systems in long-term policy formulation, with an emphasis on their impact on stakeholder participation in different phases of the scenario planning process. It also examines the possible evolution of these systems in the future, with special consideration of their methodological implication for scholarly research.

### 1.3 Research Questions

This dissertation explores online participatory futures systems as a novel approach to qualitative scenario planning research. It asks two broad questions:

- Do web-based participatory approaches add value to the traditional scenario planning process, and if so, where and in what ways?
- If not, where do they fall short, in what ways, and why?

More specifically, what impact do the web-based approaches explored in this dissertation have on:

- The *number* and *type* of participants involved in the process and at what phase?
- The *geographic scope* of participation enabled?
- The *range of expert professional disciplines* consulted?
- The *number of variables* and *opinions* incorporated?
- The mechanism of *analysis, ranking and clustering*?
- The *time spent* on data collection and analysis?
- The amount of *user debate and reflection*?

In light of evidence raised by these research questions, the following discussion points will also be explored:

- Is more participation necessarily better?
- What impact might such approaches have on the *pedagogical* impact of scenario planning engagements?
- What potential do such tools have to incorporate the “wisdom of the crowds” for more in-depth analysis and large-scale engagements?
- What impact might such approaches have on the facilitation of *consensus-building and debate*?
- How might different levels of *interface structure* influence user participation?
- What role does *participant recruitment* play in the process of user engagement and analysis?
- How might such systems help *preserve dissenting ideas* and challenging debate?
- What potential do such tools have to help minimize *facilitator bias*?
- What methodological considerations do the use of such tools as data generation instruments raise for urban planning research more broadly?
- What does this research suggest for a more rigorous evaluative approach in the future?

## **1.4 Overview of the Literature Review**

Chapter Two of this dissertation locates this work within the broader literature on public participation in urban planning research, qualitative scenario planning research for urban planning, and participatory collective intelligence systems as data generation instruments. Brief summaries of each are provided below to add context to the summary of the research design that follows.

### **1.4.1 Public Participation in Urban Planning Research**

Continued pressures for democratic participation and stake-holder engagement has further emphasized the importance of public participation as a research topic. In the last 15 years, planning researchers have begun to examine the potential of information and telecommunications technology as a means to facilitate stakeholder participation in planning, as well as to generate data for related

topics. In recent years, the context of e-government has mainstreamed the use of information technology to engage citizens in municipal government operations and planning.

As an applied research discipline, urban planning is both responsive to this legal context and motivated to engage the public in research at least in part to help mobilize understanding of and support for the resultant plans. Public participation as a context for planning research is both a historical reality and the topic of intense methodological and practice-oriented debate within the professional literature of the field. The evolving and contested definitions of and rationales for public participation in urban planning research provide a context for this dissertation's exploration of collective intelligence systems as a mechanism for stakeholder participation. This dissertation explores the lack of suitable technical tools to engage stakeholders in a manner that facilitates research, and examines the urban planning literature regarding the unique technological needs of the field. Online participatory systems that engage stakeholders in the planning process are new, but the practice of engaging the public in urban development is established.

#### **1.4.2 Qualitative Scenario Research Within Urban Planning**

Scenario planning is a research tradition within urban planning that explores uncertain futures based on external trends and complex forces at play over time. Qualitative scenario planning research typically follows a structured approach to explore the long-term policy impacts of uncertainty and change in order to enhance traditional planning research techniques. As such, it is both an approach and a technique for urban planning research. It uses qualitative data generated from stakeholders and experts to explicitly account for the forces driving uncertainty in planning research.

Porter (1985) defines scenarios as “an internally consistent view of what the future might turn out to be - not a forecast, but one possible future outcome.” Schwartz (1991) defines scenarios as “a tool for ordering one's perceptions about alternative future environments in which one's

decisions might be played out.” Ringland (1998) defines scenario planning as “that part of strategic planning which relates to the tools and technologies for managing the uncertainties of the future.” Operational researcher Shoemaker (1995) suggests that scenario planning is “a disciplined methodology for imaging possible futures in which organizational decisions may be played out.” The term comprises several related schools of approach, most of which involve facilitated stakeholder workshops that focus on external, environmental uncertainties and stakeholder reactions to create multiple “plausible futures” for a situation. Scenario planners theorize (Chermack, 2003) that the exploration of uncertainty in its social context produces shared understanding, enhanced learning, and more robust long-term policies.

Traditional qualitative scenario planning research thus entails a structured process of generating data in order to create multiple potential future scenarios that reflect cyclical uncertainties and stretch researcher and stakeholder awareness about the context within which specific policies will unfold. Indeed, scenario planning researchers suggest that the integration of more robust data with regard to structural uncertainties can help research and policy move beyond one-dimensional extrapolations of the past towards more sophisticated, complex modelling of the influence of uncertainty on planning.

### **1.4.3 Participatory Collective Intelligence Systems as Data Generation Instruments**

In non-urban planning fields, participatory collective intelligence systems are beginning to enable researchers to generate data from a broad and diverse sample of participants. In urban planning, traditional qualitative scenario research most often involves interviewing a handful of subject matter experts and convening 15-25 senior decision-makers in person. Large-scale collective intelligence systems, in contrast, have the possibility of engaging entire stakeholder groups, interest networks, and geographies.



Malone et. al at the MIT Center for Collective Intelligence define “collective intelligence” as, “groups of individuals doing things collectively that seem intelligent” (2010). Pierre Levy (1994) argues “...that because the Internet facilitates a rapid, open and global exchange of data and ideas”, that the network should “mobilize and coordinate the intelligence, experience, skills, wisdom, and imagination of humanity” in novel ways.

O’Rielly (2005) writes that Web 2.0 is a way of “harnessing collective intelligence” by providing “architectures of participation” that embrace experimental “perpetual beta” applications, and eases experimentation and collaboration between diverse communities. This is often achieved through an approach termed “crowdsourcing”: the act of accomplishing tasks by mobilizing and capturing the distributed efforts of a large network of diverse, web-based participants. Brabham (2008) defines “crowdsourcing” as “a new Web-based business model that harnesses the creative solutions of a distributed network of individuals through what amounts to an open call for proposals.” He goes on to argue that crowdsourced approaches constitute “a legitimate complex problem-solving model... capable of aggregating talent, leveraging ingenuity while reducing costs and time formerly needed to solve problems” (Brabham, 2008).

This literature on the architecture for collective intelligence projects provides a useful context for envisioning the components of an online scenario planning system. Combining this with the components of scenario planning process outlined previously allows researchers to provide more detail as to how such a system would ideally operate in order to generate data.

## **1.5 Overview of Methodology and Constraints**

Chapter Three discusses the methodological approach employed in this dissertation, with particular focus on the case study strategy. I outline my approach to sampling and case selection, and provide background on the base case, the three comparative examples, and two original case studies, each of

which explores different aspects of online futures research in urban planning. The approach to data generation, collection, and analysis is discussed and the limitations of the method are also outlined. Each of these is reviewed briefly below.

This study employed a qualitative, mixed-method approach to investigate the research questions. Specifically, two novel online platforms were developed and deployed as case studies in order to generate data for the research questions. Results were then compared pair-wise to a base case example; which represents a typical face-to-face scenario planning exercise for urban planning and public policy settings. These in-depth case studies were then augmented with a comparative analysis of three additional examples of online participation platforms in disciplines other than urban planning. Finally, in-depth qualitative interviews were used to help add context and interpret the results of both.

Such a mixed method approach departs from traditional experimental design. An ideal experiment would allow for the isolation of key outcome variables in advance, manipulation of specific independent variables through a controlled set of randomized or semi-random tests and then measurement of their impact on the dependent variables of interest through standardized measurement techniques and instruments. This would include adequate control for error, variance and exogenous factors, thereby providing evidence if such approaches are “better” or “worse” than traditional scenario planning approaches.

A purely experimental approach was infeasible for three reasons: 1) the relevant categories and variables for measurement were unknown in advance; 2) there was little empirical evidence for, or agreement on, the key outcome variables of scenario planning and; 3) there was no standard measurement instruments or protocols that could be applied in their testing. As a result, both the dependent and independent variables were unknown and no standard method for comparison could be established. An alternative research strategy was therefore required.

The approach taken involved two stages: first, platform design, and second, application and comparison to a base case. Because no online participatory futures systems for urban planning existed at the time of this research, it was first necessary to design and produce a series of prototypical system designs that could generate data for these research questions. Before their development, various concepts and designs were tested with expert interviews and groups of participants to determine potentially relevant design features. These were then used to create measurement constructs that could be used to evaluate them.

For each case study, I generated a significant amount of detailed data from a number of sources, including interviews, focus groups, rapid prototype workshops, online participatory futures system instruments and primary document review (Gomm et al. 2000, p. 2). Each of the cases was designed to illuminate different aspects of how these novel methodological approaches could be of use for urban planning research in general, and qualitative scenario planning in particular. This approach enabled rich descriptions, concept development, and understanding through the analysis of both the structured and unstructured data as it emerged.

The cases were designed, developed and tested in sequence. Data from the first case was compared internally as well as pair-wise against the base case. Next, the lessons from this case were incorporated into the design and deployment of the second case. The second case was explicitly different from the first, taking an intentionally different approach to data collection, measurement and evaluation. This was done in order to help explore gaps in the research questions that the first case was unable to answer, as well as to test new ideas raised by the first. As a result, cross-case comparison of data was not conducted between the two online cases, but was used in a pair-wise comparison with different aspects of the base case.

Due to the limitations of the core cases, however, they were supplemented with a detailed review of three comparative examples of online participation platforms in other disciplines. Each

comparative example was chosen specifically to address key weaknesses or data gaps from the case studies, thereby providing a richer, more robust source of evidence for review. The results of both the cases and comparative examples were further supplemented by a series of in-depth, semi-structured interviews with experts in the field of scenario planning, online participation, or public policy. These interviews helped provide depth and context to the earlier findings, aiding in concept definition, interpretation, and evaluation— completing my multi-method approach. Finally, the case and comparative examples were interpreted in light of the research findings and used to analyze emergent themes and issues relative to the research questions.

## **1.6 Overview of Cases and Comparative Examples**

The online participatory futures systems analyzed in the two case studies are suggestive of an approach to these questions that may contribute to future urban planning research needs. This section introduces the base case, the two online cases and the three comparative examples.

### **1.6.1 Base Case: Regional Scenarios for the Future of a Northern Spanish Region**

This case study was selected as a representative example of a typical qualitative scenario creation process for urban and regional planning. The exercise, conducted under the employment of a notable scenario planning company, on behalf of a regional government in the north of Spain. For confidentiality reasons, the names of both the consultancy and client have been anonymized.

The client for this cases acts as a public-private interface and helps to coordinate stakeholders around strategic projects and future urban plans. The project that served as the base case was intended to look forward 20 years to the year 2030 and create multiple qualitative scenarios based on different development pathways of Europe and the region. These scenarios were then used to

evaluate current investment policies and develop a more robust long-term vision , helping the city to remain competitive and vibrant in the face of uncertainty and change.

This case focuses on the process of drivers and uncertainty generation, presentation, ranking, clustering, and distillation into draft scenario frameworks. It also considers the method and output of draft scenario detailing activities but does not explicitly consider the use of this material to create the final narrative scenarios and policy documents.

### **1.6.2 Case 1: Futurescaper**

The prototypical collective intelligence system developed to generate data for this research was called “Futurescaper” (after the term “futurescaping”, coined by designer Anab Jain). For this case, I designed and developed a data generation and analysis platform for exploring various aspects of the qualitative scenario planning process online. Data generation for this case was completed using data from the International Futures Forum (IFF) as part of a project run by Tony Hodgson on the implications of climate change impacts for the UK Government. The purpose of this project was to identify the systemic linkages between climate change impacts in other parts of the world and the secondary and tertiary impacts on critical supply chains and governance functions within the UK. Futurescaper used a structured, form-based approach to the collection of trends and drivers that could affect the future of the research topic. It stored these trends in an online database and provided basic tools to aid in their analysis.

### **1.6.3 Case 2: SenseMaker Scenarios**

The second in depth online case was called “SenseMaker Scenarios”. For this case, I adapted an existing commercial software platform to address several themes raised by the first case—specifically, a desire to involve a greater number of participants, to explore new formats of data

collection, and to improve the user interface to facilitate collective analysis. The approach was developed in conjunction with two colleagues, Dave Snowden and Wendy Schultz, who were instrumental in the design and execution of this case. Data was generated for this case in an online engagement lasting approximately one week, as part of the 2010 International Risk Assessment and Horizon Scanning Conference for the Government of Singapore. Participants were asked to explore the future of urban public services under financial uncertainty.

SenseMaker Suite is a platform designed to solicit stories about a particular topic or theme from distributed contributors. Respondents were asked to relate a story about the subject that may shed some light on the topic under consideration. Users then coded their story against key themes and concepts, either with sliders or through locating their story along a spectrum of values. The goal was to blend qualitative research in the form of stories, anecdotes and narratives (that convey rich social meaning and are easily transmitted), with quantitative data that can be coded, index, classified and sorted. The system therefore asks users to code the significance of their story on qualitative axes, thereby generating quantitative data for subsequent comparison and analysis.

#### **1.6.4 Comparative Example 1: The Institute for the Future's Foresight Engine**

The Foresight Engine is an interactive gaming platform developed by the Palo Alto-based technology forecasting non-profit, The Institute for the Future (ITF). Foresight Engine uses a card-game like interface in which thousands of players submit ideas to explore the future of a subject during a curated engagement period. The example chosen for the dissertation comparison was an engagement exploring the future of the United States utility network, entitled "Smart Grid 2025". The event, sponsored by the Institute of Electrical and Electronics Engineers (IEEE), engaged almost 700 participants from 81 different countries over a 24-hour period, creating nearly 5,000 submissions and interactions. Aside from the participants, over 26,000 people viewed the project

website and associated content. Participants included subject matter experts, academics and students, IFTF staff, and members of the general public. This project was selected as the first comparison example because its game-like interface and open-ended participation is an excellent example of leveraging stakeholder participation online.

### **1.6.5 The WikiStrat Grand Strategy Competition**

*WikiStrat* is an online geo-strategy platform. The platform operates as a for-profit strategy consultancy, using a distributed network of analysts and subject matter experts who contribute piecework or competition-based analysis in a crowd-sourced format. Compared to the Foresight Engine, WikiStrat uses a fairly simple Content Management System (CMS) / wiki platform. In contrast, however, it supports a more complex community of experts, who participate over time for both recognition and financial reward. Paying clients pose topics or questions to the community, via moderation by WikiStrat staff, who then contribute essays, analysis, trends and drivers into the WikiStrat system via web forms and surveys. Participants are asked to select and evaluate different trends and factors, suggest implications, and draft narrative comments via questionnaires, which are then scored by a combination of algorithm and staff to select “winners” for each engagement. Winners are then paid a portion of the proceeds generated by WikiStrat client engagements. Past topics included the outcome of the Arab Spring, the future of China, and other geopolitical and security topics.

### **1.6.4 Comparative Example 3: OpenForesight’s Future of Facebook Project**

The last comparative example selected explored the future of the social media platform, Facebook through an “open foresight” process. This project used entirely free services such as Facebook, Twitter, YouTube Quora and Kickstarter to conduct an “open source” scenario planning exercise.

The process began with a video on Kickstarter project (the crowdfunding platform) to generate interest and funds to execute the project. This announcement was promoted via Facebook, Twitter, blogs and emails and received significant social media coverage. The second phase engaged approximately 25 thinkers in the field in in-depth video interviews over Skype. These were then edited into short clips and posted on a public YouTube channel for distribution and review. The administrators also created a Quora an interactive, user-driven question and answer site, with which users posed and responded to various questions raised by the interviews. Finally, traditional desktop research was conducted offline. The results were represented back to the open community of users in the form of several blog posts and videos, resulting in a series of scenarios describing several possible futures for the Facebook platform. In addition to the 25 experts interviewed via video (which received over 17,000 views on YouTube), the project received 109 responses from over 220 subscribers to the Quora and extensive interaction on Facebook from over 50 users.

## **1.7 Structure of the Dissertation**

This section presents a detailed discussion of the purpose of the research and the structure of the dissertation. In Chapter Two, I review the relevant background literatures from urban planning, public participation, scenario planning, and online collective intelligence systems. Chapter Three presents the core research questions and my methodological approach. These chapters comprise the background research to this work.

Chapters Four, Five, Six and Seven present the findings of this research. This includes a detailed discussion of the Base Case (Chapter Four), the Comparative Examples (Chapter Five), and Cases 1 and 2 (Chapters Six and Seven, respectively). Each findings chapter focuses on a qualitative exploration of the subject, analysing who participated, how they contributed and interacted, how this material was used, and what outcomes were produced.



Chapter Eight, Discussion, integrates these findings into a discussion framework. Specifically, it compares and contrasts the results of each case and example and highlights themes and issues relevant to the research questions. This takes two forms: first, a discussion on a set of themes for which robust data from the Findings exists and; second, a more speculative discussion about aspects which the data did not support or cover, but which are still interesting and relevant to the research questions.

Finally, Chapter Nine, concludes the dissertation by reflecting on the discussion findings in the context of an emerging typology of online approaches to futures research and scenario planning, suggesting future improvements and research opportunities. I discuss the limitations of this study, make recommendations for future research, and various ways of generating better understanding of these systems within the context of planning research.

## **1.9 Overview of Contribution to the Field**

This thesis aims to make several contributions to the field of urban planning research. First, it explores methodologies that highlight the benefits and drawbacks that collective intelligence platforms for scenario planning can offer urban planning and design. It examines whether rigorous social research focused on planning in contexts of complexity might be achieved through a greater emphasis on large-scale online participatory methods, and discusses how they might complement more established streams of scenario and urban planning research.

Second, this thesis speaks to the relevance of online tools to enable stakeholder participation in planning, while addressing their limitations. Online approaches appear to have significant promise. They allow distributed stakeholders to participate in the process over greater distance and time, not bound by workshop facilitation style or space constraints. They increase the scale of participation possible, as well as the data sources and analytical viewpoints that can be considered.

They have the potential to speed up the process by utilizing distributed resources and crowdsourcing approaches to conduct work and analysis in parallel. Finally, online approaches allow for larger sample size collection, increased transparency and further empirical validation of scenario planning's claims.

Third, this thesis seeks to suggest refined measurement instruments that may be better capable of integrating a broad and diverse set of stakeholder perspectives into the research process. It is hoped that a better understanding of the key concepts of measurement and mechanisms of evaluation for such systems can help researchers better understand related questions in the future.

## **1.10 Chapter Conclusion**

This introductory chapter described my doctoral research, framed the urban planning research problem statement, and articulated the research questions and exploratory hypothesis. I located my inquiry within three distinct bodies of professional literature, including public participation in urban planning research, qualitative research within urban planning, and participatory collective intelligence systems as data generation instruments. I then described the dissertation's method and core case studies, and previewed the contributions the research has the potential to make to the field.

## **2.0 Literature Review**

### **2.1 Chapter Introduction**

This chapter introduces the research topic in the context of urban planning research and theory. It explores how the field of urban planning has historically positioned itself relative to the concept of the future, arguing that producing knowledge for, and attempting to influence the future has always been an integral part of the field's purpose. It reviews how this relationship has evolved over time through the lens of four different philosophical and theoretical traditions, then explores the role that public participation has come to play in this context.

Next, it situates the field's use of prediction, modelling and forecasting in relation to public participation, vis-a-vis an exploration of several socio-technical engagement approaches. These include the literatures around Planning Support Systems (PSS), Public Participation (PPGIS) and Alternative Futures Analysis (AFA). In parallel, it explores how the literatures on Web 2.0, online participation and collective intelligence systems have developed in relation to these issues. Finally, it introduces the history and theory of qualitative scenario planning, reviews the literature on how it is most frequently practiced, and how its strengths and limitations are discussed. This chapter concludes with a discussion of how the research in this dissertation fits within the overall landscape of this literature.

### **2.2 The Role of the Future in Urban Planning**

Urban planning research has a long-standing relationship to the future. Myers and Kitsuse (2000) observe that, "the future orientation of planning is unique to the field's identity... The very substance of urban planning is founded in time" (p. 225). Davidoff and Reiner (1973) write that, "we define

planning as a process for determining appropriate future action through a sequence of choices" (p. 11). Hopkins and Zapata (2007) write, "Planning takes place in the present and engages the future" (p. 2). More specifically, Myers (in Hopkins, 2007) suggests that, "the essential task of planning, its heroic challenge, is to build a bridge from present individualism to the community future" (p. 60).

This appreciation for, and desire to influence the future, is deeply rooted in both planning and public policy. In his review of two centuries of planning history, Friedman (1987) argues that at least three of the four main strands of planning thought are related efforts to "guide history" towards more desirable outcomes. These traditions include *social reform*, *policy analysis*, and the *social learning* traditions, which Friedman differentiates from the more recent and adversarial, *social mobilization* tradition. Each is discussed in more detail below, with reference to their scholarly relationship to the concept of the future.

### **2.2.1 The Social Reform Tradition**

The first of these is the *social reform* tradition, which Friedman (1987) writes "focuses on the role of the state in societal guidance," and is "chiefly concerned with finding ways to institutionalize planning practice and make action by the state more effective" (p. 76). This tradition was a reaction to the consequences of rapid industrialization in Europe and the United States. Cities such as Manchester, England were becoming notorious examples of sprawling, disorderly industrial cities, replete with slums, congestion, sickness, crime and social upheaval (Sutcliffe, 1977). This rapid change led to concern about the effects of such environments on the health of both individuals and society. The influential photo-journal *How the Other Half Lives* (Riss, 1896), observed of New York City that "three-fourths of its people live in the tenements, and the nineteenth-century drift of the population to the cities is sending ever-increasing multitudes to crowd them...We know now that there is no way out; that the 'system' that was the evil offspring of public neglect and private greed

has come to stay, a storm-centre forever of our civilization" (p. 12). H.G. Wells fearfully warned that unless its growth was somehow checked, the "whirlpool city" threatened to suck the whole life of the society into its dense vortex (cited in Fishman, 1998).

Rothman (1971) suggests that the debates behind the *social reform* movement were underscored by a "vigorous attempt to promote the stability of the society at a moment when traditional ideas and practices appeared outmoded, constricted, and ineffective" (Rothman, 1971). The almshouse, the penitentiary, the reformatory, the asylum and the orphanage were all efforts to reengineer a new form of stability in the midst of bewildering change and complexity. "It is no wonder then, that [the supporters of the moral role of planning] held their positions so staunchly, eager to defend every detail. With the stakes so high and the results almost entirely dependent upon physical design, every element in penitentiary organization assumed overwhelming importance" (Rothman, 1971).

The profusion of well-wishing reformers at the end of the nineteenth century, coupled with an explicit focus on the connection between physical form and social effects, left a powerful mark on the minds of architects, planners, policy makers and students of urban sociology. Works such as Howard's *Garden Cities of To-Morrow* (1902), which Ward (1998) called "the richest single source of planning ideas over the last century" and those of Frederick Law Olmsted and the City Beautiful Movement, "gave the public faith [in] technologically expert engineers" (Chudacoff & Smith, 1994; Stilgoe, 1983). These thinkers laid the philosophical groundwork for the large-scale urban planning efforts of the twentieth century and were critical in the foundation of the Modern Movement in architecture. In the words of Dutch sociologist and future studies pioneer, Fred Polak (1974), the social reform approach to planning was *essence-pessimist, influence-optimist*; society was at its essence flawed, but could be "brought towards light" through positive, rational action.

### 2.2.2 The Policy Analysis Tradition

The *policy analysis* tradition was similar, but recognized the pragmatic difficulties in defining, not to mention achieving, an “optimal” public good. Simon’s seminal work, *Administrative Behavior*, (1945) is representative of this tradition, which sought to understand how organizations made “satisficing” decisions in the face of incomplete data using bounded rationality. Simon’s contribution was part of a genre that would influence decades of planning researchers, including early systems thinkers such as Stafford Beer (1959), Jay Forrester (1968, 1969) and Thomas Schelling (1978).

In general, the *policy analysis* approach turned away from the explicit, normalizing rhetoric of the social reform school. But it did not abandon the quest for rational, scientific, empirical influence over the future. Instead of asserting normative values, members of this tradition focused on the instrumentalization of rationality as a tool for helping decision-makers. Lindblom (1979) called this the “rational-comprehensive” approach, whereby values and objectives were clarified independently before analysis begins, the desired ends are isolated, the means to achieve them are deduced and a comprehensive analysis is conducted. Finally, policy is chosen based on whatever means meet the ends best.

Friedman elaborates further by presenting a version of Stokey and Zeckhauser’s (1978) process from their influential, *Primer on Policy Analysis*. These steps include: (a) formulation of goals and objectives; (b) identification and design of major alternatives for reaching the goals identified within the given decision-making situation; (c) prediction of major sets of consequences expected to follow upon adoption of each alternative; (d) evaluation of consequences in relation to desired objectives and other important values; (e) Decision based on information provided in the preceding; (f) implementation of this decision through appropriate institutions; and (g) feedback of actual program results and their assessment in light of the new decision situation.

This tradition has had a powerful influence on urban planning, vis-a-vis operations research, urban modelling, and simulation. In his 1994 review of Anglo-American urban modelling, Batty writes, “Computer models of land use and transportation were first developed in a milieu dominated by the sense that the early and mid-twentieth century successes in science could extend to the entire realm of human affairs.” These were developed in the context of an increasing emphasis on positivism and scientific rationality which “together with the concern for systematic decision-making in such fields as management, politics, psychology and economics, led to a rational model of decision which came to underpin physical planning” (Batty, 1994; Faludi, 1971).

The role that forecasts played in these approaches makes them particularly relevant for this review. Although each modelling system had its own specifics, producing forecasts of spatial interaction and socio-economic outcomes was almost always part of their goal. These forecasts were used to make policy-making choices; a process demonstrable by faith in both the theoretical underpinnings and operational mechanisms of such models.

By the early 1970’s, however, the limits of the rational positivist approach in the complex dynamics of urban environments were becoming clear. In 1973, Lee published his seminal article on the dysfunction of large-scale urban models. Lee identified seven major “sins” of large-scale models: (1) “hypercomprehensivity”, models which tried to replicate too many aspects of the real world; (2) “grossness”, producing outputs at too high a level of aggregation or abstraction to be useful for decision-making; (3) “hungriness”, they had a tremendous need for data to produce results; (4) “wrongheadedness”, they often made assumptions about system behavior based on scanty or incomplete evidence; (5) “complicatedness”, their output lacked validity and rigour and was presented in an overly complicated form; (6) “mechanicalness”, they often propagated errors and compounded uncertainties in mechanistic, deterministic ways; and finally 7) “expensiveness”:

these models were also exorbitantly expensive. Lee concluded his requiem by emphasizing that at the time no model had produced any kind of relevant theory or decision-ready information.

That same year, Brewer (1973) published an insightful analysis of the political and organizational limits of forecasts in planning. Brewer's account focused on the social and political contexts within which such models were applied. He argued that the organizational investment required in them created maladaptive outputs and political misuse. Even if the models had been perfect, he suggested, the pressure to produce results resulted in botched analysis, fudged assumptions, manufactured data, and overinflated promises that ultimately doomed the entire enterprise.

Larger social and political forces were also sweeping society that would draw urban planning even further away from a techno-positivist relationship on the future. Banerjee (1993) describes this larger transformation when he writes:

*Planning lost its innocence in the 1960's when physical and project focus was much discredited by the social scientists who joined planning and urban studies programs or became advisors to government bureaucracies. Planning became an advocacy for the poor, for the minorities, for the disenfranchised, and for those who suffered from decades of social injustices and inequities. Planners were no longer dealing with discrete physical projects but were very much engaged in a wider range of social and environmental policy matters involving redistribution of income and encumbrance of property rights in a profound way (p 523).*

Returning to Freidman, this transformation would split planning research into two broadly distinct but related camps, the *social learning* and the *social mobilization* camps. These are discussed below.

### **2.2.3 The Social Learning Tradition**

The *social learning* tradition developed as a refinement of the policy analysis approach. It recognized fundamental limits to what planning could and could not claim, yet still shared many goals of policy



analysis tradition. Lindblom (1979) characterized this shift as one from “root to branch”, i.e., rational comprehensive planning and policy-making to “incremental acts of mutual adjustment” or less glamorously, “muddling through” (p. 80). But why “learning”, and how is this relevant to the future?

While authors such as Lindblom and others did not reject rationality or the use of science, their approach was fundamentally post-positivist. They believed that the world was subject to multiple possible meanings without a single “solution.” Problems were often “wicked”, unbound, and undefinable (Rittel & Weber, 1973). Stakeholders had conflicting goals and agendas, not all of which were rational (Majone, 1989). They also argued that the rational comprehensive approach not only fell short of handling real-world complexity in socially meaningful ways (Scott, 1998), but also privileged certain groups and perspectives at the expense of others (Faludi, 1986).

Authors such as Davidoff (1965), Forester (1989), Schon (1983) and others pioneered a turn away from rational policy analysis in response. Their approach emphasized the social and psychological dynamics of multi-stakeholder interaction as an “exercise in discovery” (Healey, 1997), based largely on ideas of communicative rationality pioneered by Habermas (1981).

Instead of a technocratic expert with confident forecasts of the future, the planner was meant to become an active participant in the “social learning processes” (Schon and Rein, 1994), thereby helping to build shared understanding and consensus around policy. Thus, the *social learning* approach to the future was among the first to acknowledge that parts of the planning process are fundamentally uncertain, cannot be predicted, and require the co-creation of meaning through interactions with different stakeholders.

## 2.2.4 The Social Mobilization Tradition

The last tradition necessary to explore here in relation to planning's approach to the future is what Friedman (1987) classified as the *social mobilization* tradition. This approach was related to the social learning school described above, but drew more explicitly political conclusions from its analysis. Forester (1989) summarized this approach when he observed that, "all human interaction and exchange was embedded in a system of power, domination, and normative roles" (p. 152). Like social learning, key aspects of this critique assert that: (a) formal optimization strategies are inadequate in the face of complex social problems; (b) it is impossible to gather the necessary information to make fully rational decisions; and (c) attempts to do so privilege certain groups at the expense of others, reinforce existing power relationships and further marginalize under-represented groups. Castells (1977) even goes so far as to define urban design entirely on these terms:

*We call urban social change the redefinition of urban meaning. We call urban planning the negotiated adaptation of urban functions to a shared urban meaning. We call urban design the symbolic attempt to express an accepted urban meaning in certain urban forms (p. 303–304)*

This approach drew heavily from materialist Marxist theory, which positioned planning in a matrix of class struggle and social domination. Lefebvre (1991), for example, extended the traditional Marxist analysis to the urban spatial environment, equating the social production of space with the production of any other commodity. This process, he claimed, was inherently laden with class and power relationships (Lefebvre, 1991, p. 33).

Aside from re-theorizing the role of planning in society, one of the most important impacts of the social mobilization approach is its enduring impact on the role of *participation* in urban planning. Davidoff (1965) was among the first to argue strongly for the participation of different actors in the planning process. In *Advocacy and Pluralism in Planning*, he argued that it was impossible for the planner to be entirely value-free as regards to ends, since planners as people had values as well. He therefore sought a method of planning that was open to a greater diversity of values

“among the plurality of interests within a political community” (p. 25). In this context, he argued, planners should not stay value-neutral. They should become “value-conscious,” thereby declaring their values and making themselves available to clients who wished to pursue such values.

This led directly to the “communicative approach” of Forester (1989, 1999), Healey (1992, 1993, 1996), Innes (1996, 1998), and others such as Schon (1983), whose attempts to make planners aware of the value of discussion, debate and information sharing were part of a larger effort to shift planning culture towards greater community collaboration, consensus building, debate and discussion. Their goal was to remake planning to focus on issues of social justice, equity, and the redistribution of power and resources. They saw discursive practices such as community workshops, public outreach, debate and consensus building as a means by which people could learn about each other, debate their differences, and become more reflective of their own role in society. “In this way, a store of mutual understanding is built up, a sort of ‘social and intellectual capital’ which can be drawn upon when dealing with subsequent issues” (Healy, 1997; p. 25). They also argued that this would create a more level political playing field on which to debate power relationships. Deliberate social change was thus perceived to be an activity that arose from below. Thus began the era in which advocacy and pluralism became the bywords of planning pedagogy.

### **2.2.5 Summarizing the Evolving Role of the Future in Urban Planning**

In all of these traditions, the future played a central role in the mandate and mechanisms of urban planning. But the role of the future, and faith in the planner’s ability to gain knowledge and influence over it, has declined over time. This is partially the result of a more mature relationship to complexity and uncertainty, and partially the result of the political and social reaction against technical rationalism in favor of political participation and debate.

In its strongest form, some argue that the field has become overly interested in near-term amelioration of political disputes, driven by both philosophical and practical political concerns for expediency. Coucelis (2005) argues, for example, that, “urban planning has retreated from strategic, future-oriented topics to become absorbed in operational and managerial activities characterized by short time horizons and value choices likely to be equally short-sighted and ad hoc” (p. 1356). While this interpretation may be overly stark, it should nonetheless be familiar to scholars and practitioners involved in futures-oriented planning in the public realm. Although mainstream urban planning may have retreated from futures-oriented technical analysis for the reasons explained above, other sub-disciplines within it have continued to pioneer formal rational approaches with reasonable degrees of success. Disciplines such as transportation modelling have made progress with computational models of traffic volumes and the like, although the success of such rational approaches is still limited to domains which have fewer variables to compute and do not suffer from conflicting optimization goals and objectives. Thus while several sub-disciplines have made progress, the broader political nature of multi-stakeholder urban governance has restricted the wider impact of these technical improvements.

The following section explores the means and mechanisms of participation in planning in more detail. It then relates this participation to the literature on scenario planning and uncertainty in the sections thereafter.

### **2.3 Participation in the Planning Process**

In 1969, a former official at the U.S. Department of Housing and Urban Development (HUD) Sherry Arnstein published an influential paper on public participation. She defined eight levels of citizen participation in the planning process, organized through a “ladder” metaphor. The “rungs” of the ladder were sorted into three levels, including nonparticipation (manipulation), tokenism

(informing, consultation, placation), and citizen power (partnership, delegated power, citizen control). Although later authors and practitioners would move beyond these categorizations into more sophisticated approaches, her paper marked the beginning of a significant research effort into more effective ways of engaging citizens in the planning process. Hulchanski's (1977) bibliography of participation approaches documents the rapid expansion of techniques and perspectives that resulted, in part, from Arnstein's seminal paper.

By the 1990's, consultation and public participation was a thriving industry of sub-consultants, academics and researchers. The APA's 1990 manual, *Neighborhood Planning: A Guide for Citizens and Planners*, presents a variety of methods used for outreach, data-gathering and public involvement. It argues that public participation is not only "ethical" (thereby echoing the influence of the *social learning* and *social mobilization* theorists of the 1960's and 1970's), but necessary to create better plans that are more likely to succeed. "Doing things democratically takes more effort and more time, but it is worth it for the quality of product that emerges and the sense of commitment that people will have toward it" (p. 12). Like other works in a similar vein, participation was espoused as an effective means to produce "deprofessionalization, decentralization, demystification, and democratization."

Brody et al. (2003) suggested five approaches to consider when engaging citizens in the planning process. The objectives of the process should be to "listen" and "empower citizens", thereby providing them with a chance to influence planning decisions. This should be done publicly, early and continuously throughout the process, aiming to solicit input from as broad a range of stakeholders as possible. Different techniques for outreach and engagement should be used to enhance uptake in a wide variety of communities, and information should be presented in as clear and value-free way as possible.

Others are more explicit in their assessment of the benefits of public participation.

Creighton (2005) argues that participation produces: (a) higher quality decisions; (b) lower costs and less delays; (c) increased consensus and agreement; (d) easier implementation; (e) enhanced credibility and legitimacy; (f) a means to avoid ‘worst case confrontations’; (g) a way to anticipate and respond to public concerns; and (h) more social capital and a stronger sense of ‘civil society’.

While the moral value and supposed benefits of participation are clear, not everyone agrees that its operational impact is as positive as its proponents claim. Day (1997) argued that citizen participation is an “essentially contested” concept for urban planning and public policy. If participation is meant to enhance “citizen power”, as Arnstein originally defined it, Day observes that this is rarely actually ever practiced. The final authority, she argued, is reserved for elected political officials and their professional staff.

Innes and Booher (2004) are even more direct in their criticisms. They first define five purposes for participation: 1) to discover people’s preferences, 2) to incorporate local knowledge, 3) to advance the principles of fairness and justice, 4) to legitimize governance decisions, and 5) to fulfill legal requirements. They then observe that these ends are most often met through the use of public hearings, surveys and focus groups, written public comments, citizen-based commissions, or citizen appointments to boards of directors, advisory committees and task forces.

While such approaches might fulfill the purposes of planning in letter, they argue that they fail to produce the kind of transformative empowerment sought by citizens. Indeed, most participation is a “complicated, convoluted, time-consuming, and intimidating” process that in most cases “helped to maintain the hegemony of the affluent and the non-minority population” (p. 419). Such methods “do not achieve genuine participation in planning or other decisions, do not satisfy members of the public that they are being heard, seldom can be said to improve the decisions that agencies and public officials make, and do not incorporate a broad spectrum of the public” (p. 419).

Worse yet, they argue that such approaches antagonize the public, pit citizens against each other, polarize views, discourage additional participation and make it expensive and difficult for planners to make good planning decisions. In short, Innes and Booher (2004) argue that traditional methods of public participation fail to achieve their goals “by any measure used” (p. 418).

In its place they propose a more direct, face-to-face form of multiparty problem solving dubbed “collaborative participation.” This approach is distinguished from traditional public participation in that it allows different individuals and interest groups to interact directly with planners and decision-makers, in round table-like conversational formats. It often uses neutral facilitation and/or creative and informal techniques such as role-playing and open-ended conversation, to facilitate consensus through “the transformative power of dialogue” (Roberts, 1997). Innes and Booher (1999) claim that this approach facilitates shared learning, mutual trust, increased communication, social capital and in some cases, consensus amongst difficult issues and long-lasting collaborative networks.

#### **2.4 Planning Support Systems, the Web and Emerging Collective Intelligence Platforms**

A variety of interactive approaches have been developed to address the perceived limitations of both rational policy planning and the shortcomings of public participation as often practiced. These include digitally-enabled planning tools, loosely defined as Planning Support Systems (PSS), various Web 2.0 approaches, and an emerging genre of mass collaboration platforms known as collective intelligence systems.

The following section reviews the literature on these subjects, first by reviewing PSS and related approaches such as Alternative Futures modelling and participatory agent based modelling, and then reviewing the literature on Web 2.0, crowdsourcing, and collective intelligence platforms.

### **2.4.1 Planning Support Systems, PPGIS and Participatory Agent Based Models**

Planning Support Systems (PSS) (Brail and Klosterman, 2001) embrace the use of computers to aid planning efforts in a way which go “beyond geographical information systems”, as originally described in an article by the same title by Britton Harris (1989).

Batty (2003) distinguishes PSS approaches from more formal modeling and optimization approaches that characterized simulation efforts in the 1970’s and 1980’s. He notes that most PSS efforts are “loosely coupled assemblages of computer-based techniques”, forming a kind of toolbox of techniques to help decision-makers in their daily tasks. “In a sense,” he writes, “[PSS] reflect the times in which we live and the dominant way we currently conceive of planning and management, government and control” (p. 12).

Within this rubric, there are a range of different PSS types, three of which will be discussed below. These include Public Participation GIS efforts (PPGIS), alternative futures analysis (AFA), and participatory agent-based modelling exercises.

#### *Public Participation GIS*

GIS has been recognized as a valuable tool for planning and urban design since the late 1980’s, achieving widespread use in the mid-1990’s (Warnecke, Beatie, & Lyday, 1998). One of the early challenges of GIS was differential access to official data. Heavy investment in the 1990’s in data collection and sharing has largely solved this problem, leading to an age of what some have called “ubiquitous data” (most recently Drummond and French, 2008). However, access to local knowledge and non-cadastral data remains an obstacle (Talen, 2000). The nature of the GIS interface and databases make it difficult to record fuzzy, subjective data that can be very important in the planning and decision-making process. How does one record a “scary area” for example?



Differential access to the tools of analysis themselves has also been a problem. Groups or individuals that had access to GIS and the knowledge of how to use it have been found to have an inherent advantage in policy debates over those that did not (Craig and Elwood, 1998). Leitner et al. (2004) documents six models that enhanced the availability of GIS to the public, ranging from university – community partnerships to Internet map servers. The internet is changing this as well, allowing more people more access to data layers, thematic maps, and even online spatial query capability. Dragicevic (2004) suggests that the web has enhanced the use of GIS in three primary ways: through increased spatial data access and dissemination, by allowing online spatial data exploration and geovisualization, and through online spatial data processing, analysis and modeling. Published examples include Evans et al.'s (2005) example of using Web-based GIS to enhance democratic input in the siting of nuclear waste (Geertman and Stillwell, 2003).

Public Participation GIS (PPGIS) has been proposed as a way to address some of these shortcomings and involve the public in more effective decision-evaluation. Returning to Innes and Booher's (2004) five purposes for participation, we can see how PPGIS technologies may help facilitate some but not all of these goals. Such technologies appear most relevant to the first and second goals of participation (soliciting opinion and incorporating local knowledge) and indirectly to the fourth (providing increased legitimacy).

Regarding the first purpose, the use of online surveys, user forums, web-polling technologies and the posting of public documents online for comments may allow for enhanced solicitation of people's preferences. These have the potential to engage larger audiences, although admittedly only those with access to and interest in the Web. Experiments by the City of New York used virtual models of a proposed park in New York City, for example, hosted within SecondLife, to publicize the process and encourage commentary. City staff "manned" the virtual model during business hours, talking directly to citizens and recording public comments. Online services such as IdeaScale

and InnoCentive are both popular tools for harvesting and publicizing group opinions based on collective voting and emergent crowd behavior. It is now common to be able to sort content by the most popular, the most recommended, the most emailed, and many other emergent community-preference ranking schemes. Approaches such as these can perhaps be effective at soliciting the importance of different issues and opinions from different groups. The online resource *ParticipateDB* maintains a list of over 250 such online tools related to public participation in urban planning and policy-making.

Regarding the second area of contribution, tools such as web-GIS servers, GoogleMaps and GoogleEarth allow for better incorporation of local knowledge. Services such as “FixMyStreet.com” provide an online submission platform for UK residents to submit complaints about potholes, broken streetlights, dangerous crossings, abandoned cars, etc. all using an online map service. GoogleMaps or Bing-like services, which integrate Flickr or Picassa photos in a geospatial framework, allow for a rich experience of visual evidence in a study area. Other, more GIS intensive efforts such as “MIT@Lawrence” actually train and empower community members to collect and map data on topics of interest to them such as foreclosed properties. The Boston Metropolitan Area Planning Council’s (MAPC) “MetroFuture” project is an example where a planning agency used PPGIS and the web to solicit input from meetings that was then used to weight different issues and alternatives as part of their growth-modeling efforts.

### *Alternative Futures Analysis*

Karl Steinitz’s (2003) *alternative futures analysis* (AFA) is one of the more structured ways of engaging the public through PPGIS efforts (Theobald & Hobbs, 2002). This approach uses GIS infrastructure to design a small number of alternative plans for landscape and land use change, then assess them against biophysical and community standards. It often makes heavy use of visualization

and community assessment of alternatives to balance political and natural science constraints. Software approaches such as CommunityViz, WhatIf? (Klosterman, 2003) and other custom implementations are often used to create a range of multi-attribute quantitative scenarios for achieving these goals (Hopkins & Zapata, 2007).

An EPA summary (Environmental Protection Agency, 2002) of a study conducted of the Willamette River Basin in Oregon characterizes alternative futures analysis as follows:

*Alternative futures analysis is an environmental assessment approach for helping communities make decisions about land and water use. The process helps community members articulate and understand their different viewpoints and priorities. The product is a suite of alternative visions for the future that reflects the likely outcomes of the options being advocated. The visions are expressed as maps of land use and land cover. Potential effects of these alternative futures are then evaluated for a wide range of ecological and socio-economic endpoints (i.e., things people care about).*

Lagigno and Reed (2003) provide an overview of a range of case studies using this approach, ranging from watershed conservation issues in the Chesapeake Bay to urban growth evaluation in Monroe County, Pennsylvania. Other examples include Kepner et al.'s (2004) study of the San Pedro River, Santelmann et al.'s (2004) study of agricultural landscapes in Iowa, Carr's (2005) study of land use conflicts in North Florida, Hunter et al.'s (2004) study of habitat protection in the Mojave, and MIT's own research in Cabo San Lucas, Mexico, Albacete, Spain, and Southern Florida.

Although often quite rich in modelling detail, many AFA exercises are essentially static model runs with varying parameters. A related approach, participatory agent-based modelling (ABM), endeavours to add more dynamism and uncertainty in the process through the use of bottom-up stochastic agents and social simulation. These efforts often use role-playing games, social simulation, and PPGIS to achieve similar ends. Like AFA, participatory ABM approaches have been successfully used as educational and empowerment tools, as well as for policy impact assessments (Barnaud et al., 2007; Castella et al, 2005; Bousquet and Le P. , 2004).

### *Use in Public Participation*

While a full comparison between PSS, PPGIS, AFA and ABM approaches is beyond the scope of this review, these examples show different ways of soliciting local knowledge using a hybrid modelling and participation approach. Guhathakurta (1993) argues that the use of such approaches facilitates “modelling as negotiation” (p. 286). “By anticipating and reacting to a diverse array of interests,” he writes, “urban modelers are constantly involved in the process of negotiating and resolving conflicts over a variety of actors ranging from techniques involved in the process to the criteria for evaluating policy choices” (p. 286).

In evaluating the effect of such tools, Guhathakurta (1993) goes on to cite a range of literature which suggest that, properly constituted, such “Group Decision Support Systems” can be especially effective in large group settings, where traditional facilitation techniques tend to fail (Gallupeetal, 1992; Aiken, Krops, Shirani, and Martin, 1994). “Larger groups typically generate more unique, high-quality ideas and express higher rates of satisfaction with the process,” he writes (p. 288). These approaches seem to offset the limitations of traditional face-to-face large group meetings, whereby a few individuals tend to dominate the flow of conversation. Guhathakurta (1993) cites four advantages to such approaches in planning contexts: (a) anonymity; (b) parallel communication; (c) extensive information support; and (d) automated recording.

Although such approaches miss many of the more subtle cues of physical meetings, research suggests that they do offer unique benefits. Such efforts appear to both extend access to participation and increase the quality of the process through more structured impact assessment and visualization tools. Development of these later points in particular may help to address some of the criticism that collaborative planning may be naïve and can only produce low-quality decisions (Brand and Gaffkin, 2007; Harris, 2002), without sacrificing the more inclusive aspirations of public participation.

## 2.4.2 Web 2.0, Crowdsourcing, and Collective Intelligence

Parallel to these developments in the planning world, developments in ICT have produced a range of alternatives known loosely as “Web 2.0” approaches. These are discussed here as an extension of the modelling and participation literatures presented above, then linked to qualitative scenario planning in the following section.

### *Web 2.0 and User Generated Content*

Web 2.0 was defined by O’Rielly (2005) as a way of “harnessing collective intelligence” by providing “architectures of participation” that embrace experimental “perpetual beta” applications in a way that provides for easy experimentation and collaboration between diverse communities. Put more simply, the Web 2.0 model allows skilled experts to create easily accessible frameworks for collaboration that the general public can populate with their own content. This approach is typified by services such as Facebook and user-generated “mash-ups”, which combine data from different sources to provide unique services of interest to specific communities. Other developments on the web such as groupware, wiki-style collaborative environments, and middleware applications further enhance possibilities for collaboration. Anderson (2007) later expanded upon definition, adding that Web 2.0 approaches must include:

- Individual production of user-generated content, including amateur contributions
- “Folksonomic” tagging , i.e., user-signification of data, shared with the community (Vander Wal, 2005)
- Data aggregation and social filtering
- Participation and openness in terms of data, API’s and intellectual property

Within the Web 2.0 umbrella, a range of different approaches have emerged. These include *crowdsourcing, social computing, human computation* and *collective intelligence*. In a survey of these related terms, Quinn and Bederson (2011) offer a taxonomy of definitions for this growing field summarized below.

Crowdsourcing is often defined as a subset of activities and systems within the broader ecosystem of Web 2.0 services. Jeff Howe, the originator of the term crowdsourcing, is explicit about his definition. Howe (2006) writes,

*Crowdsourcing is] the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of an open call...The crucial prerequisite is the use of the open call format and the large network of potential laborers. (Howe, 2006)*

The emphasis is clearly on the distribution of discrete elements of labor to a large group of people outside a traditional organization (thus the etymological connection to the phrase, “outsourcing”). The term “collective intelligence” originated earlier from the philosopher Pierre Levy, who in 1994 was among the first to attempt to describe the impact of Internet technologies on the cultural production and consumption of knowledge. Por (2008) summarizes his definition of collective intelligence in the following way:

*The creation, aggregation and interpretation of strategically relevant information for decision-making through distributed means. (p. 7)*

Malone et al, at the MIT Center for Collective Intelligence later offer a more general definition of collective intelligence, which they suggest involves, “groups of individuals doing things collectively that seem intelligent” (2010). They suggest that the main elements of collective intelligence include: (a) goals relating to the desired outcome; (b) incentives which motivate collective involvement; (c) a clear structure or process for accomplishing these goals and; (d) core staffing to maintain and facilitate the process.

The MIT definition is widely cited, but in recent years scholars have attempted more rigorous definitions. Quinn and Bederson (2010) provide a more precise description of the differences between Web 2.0 and collective intelligence approaches in their taxonomy of collective intelligence, crowdsourcing and social computing. They differentiate along dimensions of Motivation, Human Skill, Aggregation, Quality Control, Process Order, and Task-request

Cardinality, corresponding broadly with Malone et al.'s dimensions of How, Who, What and Why.

Sakamoto et al., (2010) expand upon this taxonomy by adding additional specific dimensions in

**Table 2.1.** Their delineation draws a line between crowdsourcing as an input solicitation mechanism (and possibly filtering) mechanism, and collective intelligence, which includes the added dimension of distributed analysis and collective reasoning around complex tasks.

Despite these efforts, the term “crowdsourcing” is still often used as shorthand to describe an entire family of approaches. Regardless of definition, the family of crowdsourcing approaches is praised for accomplishing that which face-to-face group work cannot. In the context of urban planning and public participation, Brabham (2008) suggests that enhanced, “speed, reach, asynchrony, anonymity, interactivity and the ability to carry every other form of mediated content” enables planners to engage people in ways never before possible. Schenk and Guittard (2011) add that such approaches also have the potential to produce better analytical outcomes, leveraging positive network externalities, enhanced participation and greater stakeholder buy-in.

**Table 2.1: Differentiating Dimensions of Collective Intelligence Platforms**  
(Sakamoto et al., 2010)

Broad Dimension	Specific Dimension	Example Attribute
Who	Demographics	Age, country
	Level of Expertise	Years of experience in domain
What	Task Domain	Protein folding, image labelling
	Nature of the Task	Recognition, generation
	Output	Sequence of folded proteins
How	Incentives	Contest or prize
	Aggregation method	Collection, combination
	Evaluation method	Vote, expert opinion
	Visibility of outputs	Opaque, transparent
	Communication	Mediated through tasks, unstructured
	Levels of Hierarchy	None, few, many
	Workflow Sequence	Evaluation following collection
Why	Requester's motivation	Profit, knowledge
	Worker's motivation	Money, fun, influence

*Applications to Urban Planning and Implications for Participation*

Development of Web 2.0 frameworks have made an important contribution to public participation in urban planning, opening new doors for participation. Innes and Booher (2004) emphasize that successful participatory approaches must be self-organizing in nature, responding to specific topics of concern for diverse interest groups. Web 2.0 & distributed crowdsourcing approaches are ideally sufficiently low that we will see an increasingly rapid adoption of their use for even the most trivial issues.

Innes and Booher (2004) argue that “one of the biggest issues in participation is information, who controls it and whether it is trustworthy.” Web 2.0 platforms can address this concern in two ways: first, by providing a framework for joint fact finding when data is unavailable, and second, through providing tools for citizens to review, comment upon and in the case of wiki-style



collaboration projects, directly modify data and content. These approaches are not without their problems, however. Innes and Booher (2004) themselves express doubt regarding the efficacy of the Internet, suggesting that for such processes to be successful they must be face-to-face. More importantly, Carver (2001) notes that “academics tend to credit the public with more knowledge, greater rationality and enthusiasm for participation in decision-making than we perhaps ought.” Services such as Twitter and blogging are very popular, yet the value and substance of their constant stream of information is still evolving. Wiki-style systems like Wikipedia allow anyone to edit anything, but require constant monitoring to avoid spam, graffiti, defamation, and misinformation.

In summary, the web and crowdsourcing approaches summarized here appear to offer the potential to address a number of the shortcomings of traditional public participation in the urban planning process. It should be noted that such approaches are still under development in many cases. Many of these technologies were not in widespread deployment even as recently as 5 years ago, thereby suggesting that new opportunities for urban planning will continue to emerge as technologies develop in the future.

The following section introduces qualitative scenario planning in light of both the state of the planning literature described and the potential offered by these tools.

## **2.5 Qualitative Scenario Planning as a Response to Uncertainty**

While urban planning wrestled with the limitations of rational policy analysis and predictions in a public service, corporations and militaries were wrestling with similar issues in the world of business and warfare. The following section introduces the literature on qualitative scenario planning, differentiates it from the approaches to modelling described above, and describes its history and some of its current uses. It then explores some of the limitations of the practice and reflects on how developments in web technologies explored above may impact the field. Finally, it discusses the

differences between the “zero sum” conditions of business and warfare and those of public policy and urban planning.

### **2.5.1 The Origins and Contemporary Uses of Scenario Planning**

Studies of group and individual decision-making reveal important shortcomings when faced with conditions of dynamic uncertainty (Dorner, 1997). These include the “availability bias”, whereby people estimate the future probability of events based on easily remembered experiences from their past (Tversky & Kahneman, 1974), the “experimenter bias”, whereby people look for and select data that confirms pre-existing expectations (Rosenthal, 1966), the “ambiguity effect”, whereby subjects are ignored or discounted for which we have only partial or incomplete information (Frisch & Baron, 1988), and groupthink biases, whereby groups seek to minimize conflict and reach consensus without critically testing, analyzing, or evaluating ideas (Janis, 1972).

In addition to these behavioural limitations, fundamental limits to formal analytic approaches to planning under uncertainty exist as well. Although game-theoretical approaches and decision-sciences may help individuals optimize their personal choices in the face of uncertainty, these mechanisms are dependent on a clear articulation of individual goals and objectives. Arrow’s Impossibility Theorem (1951) demonstrated that it is impossible to optimize for the objective public good under conditions of social choice involving multiple actors, whereby each actor has different goals and objectives that cannot be reconciled into a community-wide ranking of values. This means that, although game-theoretical approaches may work in zero-sum competitive conditions where goals and objectives are clear, they cannot be equally useful in multi-stakeholder situations with conflicting goals and objectives.

Scenario planning originated as a facilitated process for overcoming these limitations and has subsequently evolved into a range of diverse approaches for helping managers and policy-makers

understand dynamic uncertainty in their respective fields (Wack, 1985; Van der Heijden, 1997). Unlike forecasting or quantitative trend analysis, which attempt to reduce uncertainty and project estimates of future outcomes, scenario planning attempts to uncover and exploit uncertainties within the strategic environment as a learning and awareness-building tool. Its goal is to expand the range of considerations and parameters taken into account by decision-makers, thereby helping participants better understand their assumptions about the future and test these against a range of possible outcomes.

This section explores the origins of scenario planning in the United States and abroad, how it differs from similar approaches such as forecasting and simulation, and then discusses some of its most common current applications.

### *Origins of Scenario Planning*

Scenario planning is believed to have originated at the RAND Corporation in the late 1950's as a methodology for "thinking the unthinkable" in long-term military planning. What is commonly referred to as "scenario planning" today, however, is the product of many diverse intellectual origins. These include roots in various US think tanks and institutions such as the Stanford Research Institute (SRI), multi-national corporations such as Shell, and various international centers such as Berger's *La Prospective* in France.

In the United States, Herman Kahn at RAND is considered to be one of the founding fathers of the qualitative scenario planning method. Chermack (2003) notes that Kahn gained notoriety in both military and civilian circles for suggesting that the best way to prevent nuclear war was to imagine its worst case scenario and then widely publish the results (Kahn & Weiner, 1967). After

producing a range of scenarios about the future of the Soviet Union for the US Air Force, Kahn went on to found the Hudson Institute in the 1960's.

The Hudson Institute became famous for producing “future-now” reports for a range of clients, reports which combined detailed analysis with creative imagination, and written from the perspective of the future. The Institute was also responsible for introducing many corporate clients to this approach, including Shell, IBM and General Motors. Mietzner and Reger (2005) write that, “the great value of [Kahn’s scenarios approach] was being able to take complex elements and weave them into a story, which is coherent, systematic, comprehensive, and plausible.” Kahn’s 1967 co-authored book, *The Year 2000: A Framework for Speculation on the Next Thirty-Three Years* (1967), is an excellent example of this approach and is widely regarded as the book which introduced the public to the notion of future scenarios thinking. Raubitschek (1988) suggests that *The Year 2000* was so influential because:

- It provided one of the earliest definitions of ‘scenarios’ and introduced the word into the planning literature
- It demonstrated the use of scenarios as a methodological tool for policy planning and decision making in complex and uncertain environments
- It strongly influenced the subsequent development and diffusion of scenario techniques as planning tools in the US, by providing a methodological foundation for other similar future studies
- It generated significant public controversy which led to a variety of popular follow-up studies, including the Club of Rome Reports and perhaps most famously, *Limits to Growth* (Meadows, et al., 1972).

Parallel to Kahn’s efforts, the Stanford Research Institute (SRI) began providing long-range planning services for corporate and government clients using scenario-based approaches. SRI’s approach intended to help forecast and prepare for massive social change such as that experienced in the late 1960’s and 1970’s (Ringland, 1998). Although the Institute still provides long-range

planning services to client to this day, it is best known in the history of scenario planning for producing several widely read reports for various departments in the US Government, including the Environmental Protection Agency (EPA) and the US Department of Education. Many of the key personnel responsible for the Futures Group at SRI would later go on to become important figures in the scenario planning world, including Peter Schwartz— first of Shell and then co-founder of GBN.

The combination of the Hudson Institute and SRI's influence gradually led to the adoption of a scenarios approach in corporate planning circles. Royal Dutch Shell stands as the most notable example, although IBM, GM and many others experimented with scenarios during the 1960's and 1970's. Shell's scenarios team was lead by Pierre Wack, head of Shell's Group Planning unit. Wack's approach gained notoriety in after the 1973 oil price shock. Before the OPEC crisis, Wack began systematically exploring events that could affect the price of oil. Observing that the US demand for oil was rising rapidly but that it was also rapidly exhausting its strategic oil reserves, and that OPEC Arab states were growing increasingly confident and resentful of US support for Israel after the Six Days War, he suggested that it was possible if not logical that OPEC would demand much higher prices for their oil should another conflict occur. The effect would be to create an artificial supply shortage and a significant increase in price. Shell's consideration of this possibility, and what it would do if such an event occurred, prepared it to react rapidly when such an event did unfold. Mietzner and Reger (2005) write that, "Shell's management responded quickly and in the following years, Shell moved from one of the smallest of the seven large oil companies to the second in size and the number one in profitability."

Shell's success in dealing with this rapid, unexpected change pushed scenario planning into the corporate mainstream. In their review of scenario planning approaches, Bradfield et al. (2005) note that, "Shell has become the most celebrated corporate exponent of scenarios...Its definition of

scenarios and process methods have become the de facto ‘gold standard of corporate scenario generation’”. Students of Wack and other leading scenario planners at Shell (such as Napier Collyns, Keis van der Heijden and others) moved on to create a cottage industry of scenario planning and long-range strategy consultancies. The most famous of these is Napier Collyns’ (of Shell), Peter Schwartz’s (of Shell and SRI), Jay Ogilvy’s, and Stewart Brand’s Global Business Network (GBN). Others included Michael Porter’s Monitor Group (now owners of GBN), Batelle, Boston Consulting, Reos Partners and SAMI, all of whom continue to provide high-level scenario consulting for governments and private clients around the world. Linneman and Klein (1979, 1983) found that there were few business users of scenario planning techniques prior to 1974 but in the two-year period after the first oil crisis, the number of adopters doubled, and then more than doubled again in the period between 1977 and 1981. They estimate that in the early 1980s, almost half of US Fortune 1000 industrial firms, US Fortune 300 non-industrial firms and Fortune Foreign 500 industrial firms were actively using scenario techniques in their planning process. A recent McKinsey report estimates that approximately 65% of today’s Fortune 500 companies employ some form of scenario thinking processes as part of their strategic planning efforts.

### *Definitions of scenario planning*

The term “scenario planning” has been defined in a variety of ways. Porter (1985) defines scenarios as “an internally consistent view of what the future might turn out to be - not a forecast, but one possible future outcome.” Schwartz (1991) defined scenarios as “a tool for ordering one’s perceptions about alternative future environments in which one’s decisions might be played out.” Ringland (1998) defined scenario planning as “that part of strategic planning which relates to the tools and technologies for managing the uncertainties of the future.” Shoemaker (1995) suggests

that scenario planning is “a disciplined methodology for imaging possible futures in which organizational decisions may be played out.”

In his review of the literature, Chermack (2003) produced the following table of definitions for scenario planning and linked them to their dependent variables. What is clear is that scenario planning is considered to be a qualitative process of creative synthesis for a wide range of diverse, highly uncertain outcomes for which probability estimates or numerical models cannot be made. The goals of scenario planning are also diverse, but all relate to helping participants better understand key uncertainties in their strategic environment, make use of creative and narrative approaches to help them synthesize and learn from these uncertainties, and produce plausible stories about possible futures to aid in learning and decision-making.

#### *Differences from forecasting and simulation*

RAND was also an early center for a parallel school of quantitative scenario development more explicitly oriented towards forecasting. Bradfield et al. (2005) and Huss & Honton (1989) identify two major approaches to quantitative scenario generation, trend-impact analysis (TIA) and cross-impact analysis (CIA).

These two broad approaches describe more quantitative approaches to scenario development, whereby quantitative trend data about a range of issues are manipulated through expert opinion to reflect a range of possible outcomes. This process often involves curve-fitting historical projects to estimate a “business as usual” scenario, then modifying these projections through expert and stakeholder surveys or workshops to establish high, medium, and low variations, as well as possible tipping points and discontinuities. Interactions between variables and scenarios can then be tested through “cross-impact” analysis, whereby probability distributions are estimated for pairs or groups of trends and variables, providing a more integrated numerical estimation of

possible futures. Notable users of these approaches include the consultancies The Futures Group, Batelle, Michele Godet's *La Prospective* group in France, and RAND Corporation's Center for Long Range Planning.

Bradfield et al. (2005) group both TIA and CIA into the general category of "Probabilistic Modified Trends" approaches. This basic forecasting approach shares similarities to other forms of forecasting and modeling exercises used in urban planning, such as Steinitz's Alternative Futures Analysis (AFA) described previously. While the specific mechanism varies greatly between these systems, the underlying approach of using modified trend analyses to generate a range of possible outcomes is similar across most model types.

While similar in philosophy, these approaches differ from the kind of "qualitative social simulation" typified by the Shell style approach. Quantitative forecasting aims to provide probability estimates of future outcomes with the goal of reducing uncertainty. Even if probabilities are not part of the explicit outcome of these approaches, they are often implied through the choice of "high", "medium" and "low" inputs or through "most likely" parameter estimates derived from expert and stakeholder consultation. This approach makes sense in the context of certain deterministic, natural systems or those with few variables and simple interactions. However, it may be less appropriate for conditions of dynamic or structural uncertainty, where assigning probabilistic estimates (explicit or otherwise) to complex systems risks masking assumptions or agendas and hiding critical uncertainties (Smith, 2007). More to the point, qualitative scenario planning offers the ability to incorporate factors which cannot be modeled by their very nature, such as so called "wild cards" and "black swans" (Taleb, 2007).

Knight's early work on risk and uncertainty (1921), and March & Simon's later application to planning and management (1958) bear mention. March & Simon argued that risk represents the "probability distribution of the consequences of each alternative." Knight argued that probability



distributions imply an ability to quantify the consequences of an alternative, which is not the case in complex dynamic systems.

Uncertainty, on the other hand, is when “the consequences of each alternative belong to some subset of all possible consequences, but that the decision maker cannot assign definite probabilities to the occurrence of particular outcomes.” This definition is consistent with the earlier work of Knight, which implies that the use of probabilities— even those derived from best-fit or modified trend extrapolation— under conditions of true uncertainty will result in inaccurate or overconfident outcomes.

Empirical evidence in decision-making supports this distinction. Courtney, Kirkland, and Viguerie (1997) suggest that managers employ different analytical tools for different levels of uncertainty. As uncertainty increases, these authors propose more qualitative tools be used. In support of Courtney et al., Alessandri (2003) found that managers tend to use analytical, quantitative approaches in the face of risk to identify the optimal decision; yet as uncertainty increases, they rely on judgment and experience to a greater extent, employing a more qualitative approach to make the decision, even while attempting to go through the process of an analytical, quantitative analysis. Finally, Alessandri’s (2003) results show that when considering risk and uncertainty jointly, the effect of uncertainty dominates over that of risk. The implication is that analytical, quantitative tools, even ones that can model dynamic decision-making, are not able to model the more qualitative nature of uncertainty. Other findings from management theory and decision-science support the notion that higher uncertainty is associated with a more “behavioral” approach to decision-making. (Cyert & March, 1963; Dean & Sharfman, 1993; Maritan, 2001).

Qualitative scenario planning takes advantage of stakeholder’s behavioral judgement and creativity by focusing explicitly on the domain of uncertainty and discontinuity, i.e., the zone where probability estimates cannot be had. This approach is different from probability modified trend

extrapolation or other forms of quantitative simulation modeling. Ratcliffe (2002) highlights this difference when he argues that scenarios are intended to provoke strategic thinking about uncertainty in a social context, thereby aiming to:

- present alternative images instead of extrapolating trends from the present
- embrace qualitative perspectives as well as quantitative data
- allow for sharp discontinuities to be evaluated
- allow for qualitative shifts in values and expectations
- require decision makers to question their basic assumptions
- create a learning organization possessing a common vocabulary and an effective basis for communicating complex - sometimes paradoxical – conditions

These characteristics are distinct from the aims of traditional forecasting, whose goals are to reduce uncertainty and enhance accuracy when attempting to predict the future. Qualitative scenario planning acknowledges the difficulties in forecasting a given outcome for the future, focusing instead on the critical uncertainties for which quantitative probability estimations cannot be made or have no meaning. Its goals are primarily educational and perceptual. It intends to help participants overcome cognitive and social biases which might prevent them from detecting and understanding environmental change, and aims to help them prepare for such change by mentally “rehearsing the future” (Schwartz, 1996). Scenario planning is therefore most useful under conditions of deep uncertainty, computational complexity, or ambiguity where past trends cannot be relied upon to provide meaningful information about the future.

Table 2.2: Scenario Planning Definitions and Dependent Variables (Chermack, 2003)

Author	Date	Definition	Dependent Variables
Porter	1985	"An internally consistent view of what the future might turn out to be – not a forecast, but one possible future outcome" (Porter, 1985, p. 63).	<i>A view of one possible future outcome</i>
Schwartz	1991	"A tool for ordering one's perceptions about alternative future environments in which one's decisions might be played out" (Schwartz, 1991, p. 45).	<i>Ordered perceptions about alternative future decision-making environments</i>
Simpson	1992	"The process of constructing alternate futures of a business' external environment" (Simpson, 1992, p. 10).	<i>Constructed alternate futures</i>
Bloom & Menefee	1994	"A description of a possible or probable future" (Bloom & Menefee, 1994, p. 223).	<i>A description of a future</i>
Collins	1994	"An imaginative leap into the future" (Collins, 1994, p. 275, in 5 <sup>th</sup> discipline field book).	<i>An imagined future</i>
Thomas	1994	"Scenario planning is inherently a learning process that challenges the comfortable conventional wisdoms of the organization by focusing attention on how the future may be different from the present" (Thomas, 1994, p. 6)	<i>Challenged comfortable conventional wisdoms about the future</i>
Schoemaker	1995	"a disciplined methodology for imagining possible futures in which organizational decisions may be played out" (Schoemaker, 1995, p. 25)	<i>Imagined possible decision-making futures</i>
Van der Heijden	1997	<ul style="list-style-type: none"> <li>o External scenarios are "internally consistent and challenging descriptions of possible futures"</li> <li>o An internal scenario is "a causal line of argument, linking an action option with a goal", or "one path through a person's cognitive map" (van der Heijden, 1997, p. 5)</li> </ul>	<i>Descriptions of possible futures Explicit cognitive maps</i>
De Gues	1997	"Tools for foresight-discussions and documents whose purpose is not a prediction or a plan, but a change in the mindset of the people who use them" (De Gues, 1997, p. 46)	<i>Changed mindsets</i>
Ringland	1998	"That part of strategic planning which relates to the tools and technologies for managing the uncertainties of the future" (Ringland, 1998, p. 83).	<i>Managed future uncertainties</i>
Bawden	1998	"Scenario planning is one of a number of foresighting techniques used in the strategic development of organizations, which exploit the remarkable capacity of humans to both imagine and to learn from what is imagined". (University of Western Australia, GBN)	<i>Human imagination and learning made explicit</i>
Fahey & Randall	1998	"Scenarios are descriptive narratives of plausible alternative projections of a specific part of the future" (Fahey & Randall, 1998, p. 6)	<i>Plausible alternative projections of a specific part of the future</i>
Alexander & Serfass	1998	"Scenario planning is an effective futuring tool that enables planners to examine what is likely and what is unlikely to happen, knowing well that unlikely elements in an organization are those that can determine its relative success" (Alexander & Serfass, 1998, p. 35)	<i>Examined future likelihoods and unlikelihoods</i>
Tucker	1999	"Creating stories of equally plausible futures and planning as though any one could move forward" (Tucker, 1999, p. 70).	<i>Stories of equally plausible futures that inform planning</i>
Kahane	1999	"A series of imaginative but plausible and well-focused stories of the future" (Kahane, 1999, p. 511 in 5 <sup>th</sup> discipline field book).	<i>Plausible stories of the future</i>
Kloss	1999	"Scenarios are literally stories about the future that are plausible and based on analysis of the interaction of a number of environmental variables" (Kloss, 1999, p. 73)	<i>Informed, plausible stories about the future</i>
Wilson	2000	"Scenarios are a management tool used to improve the quality of executive decision making and help executives make better, more resilient strategic decisions" (Wilson, 2000, p. 24)	<i>Improved executive strategic decision-making</i>
Godet	2001	"A scenario is simply a means to represent a future reality in order to shed light on current action in view of possible and desirable futures" (Godet, 2001, p. 63)	<i>A represented future reality</i>

### *Current Applications*

Scenario planning and related approaches are in wide use in the corporate, defense, and government sectors, and to a much smaller degree in academia. The financial crisis of 2008 sparked a recent increase in demand for scenario planners, similar to that experienced after the oil crisis in 1973. As a result, several large multi-national corporations have expanded their in-house scenario staff, including Shell, Intel, Price-Waterhouse-Cooper, and others. A great many more outsource this expertise to consultancies such as Monitor/GBN, NormannPartners, Kairos Futures, SAMI Consultants, and a host of smaller firms.

Military and intelligence planners also retain both in-house and external scenario planning expertise. The US Government outsources much of its scenario planning expertise to the consulting firm Monitor-360, a spin-off of Monitor/GBN in San Francisco, as well as to other quasi-governmental think tanks such as RAND and MITRE. The UK Ministry of Defense, the Australian Ministry of Defense, the Swedish Defense Force and others also retain a mixture of internal expertise and external consulting.

National and regional governments such as the Government of Singapore and the UK also retain in-house, non-military related foresight services. The Government of Singapore's Strategic Futures Group is considered to be the world's best model for this approach, whereby a dedicated staff of scenario planners work on long-range and on-demand issues directly out of the Prime Minister's Office. Other government foresight units like UK Foresight rely heavily on external consultants, including many of those firms already mentioned. Some city and regional governments in Europe also maintain active scenario planning staff as well, such as the Region of Lyon in France, whose Millenaire3 group rivals the size and scope of some national units.

Scenario planning's role in academia is more limited and is almost exclusively found in business schools. International centers for scenario planning include the University of Oxford's Saïd Business School, the University of Hawaii, the University of Houston at Clearlake, INSEAD in France, London Business School, and the Wharton School at the University of Pennsylvania. Despite scenario planning's relevance to urban planning and design, it is notably absent from most planning curricula and design schools. This may be due to the different focuses business and planning schools. Where-as business schools train their students to succeed in competitive environments that are often "win or lose", planning schools train students for public policy arenas in which multiple goals and objectives must be balanced and decision-rights are often fragmented and contested. This also suggests that the underlying techniques and methods of business scenario planning may need to be adapted to the public policy context as well; a notion which will be explored in more detail below.

#### *A Typical Scenario Planning Process*

The "intuitive logics" approach created by Wack and later popularized by Schwartz's (1991) and others (van der Heijden, 1996) is the most widely identified and commonly utilized approach to qualitative scenario development. Ringland (1998), Shoemaker (1995), and many others all utilize a similar approach with minor variations. This section outlines the process of scenario planning from this perspective.

#### *The 'intuitive logics' approach to qualitative scenario planning*

Schwartz (1991) outlines a general approach to scenario planning based on Wack's original methodology. This process involves the eight steps listed below and then presented subsequently in more detail using van der Heijden's (1997) elaboration.

The scenario planning process includes the following steps:

1. Identify the issue
2. Identify the key factors
3. Research driving forces
4. Rank key factors and driving forces
5. Develop scenario logics
6. Develop scenario details
7. Consider implications
8. Identify indicators

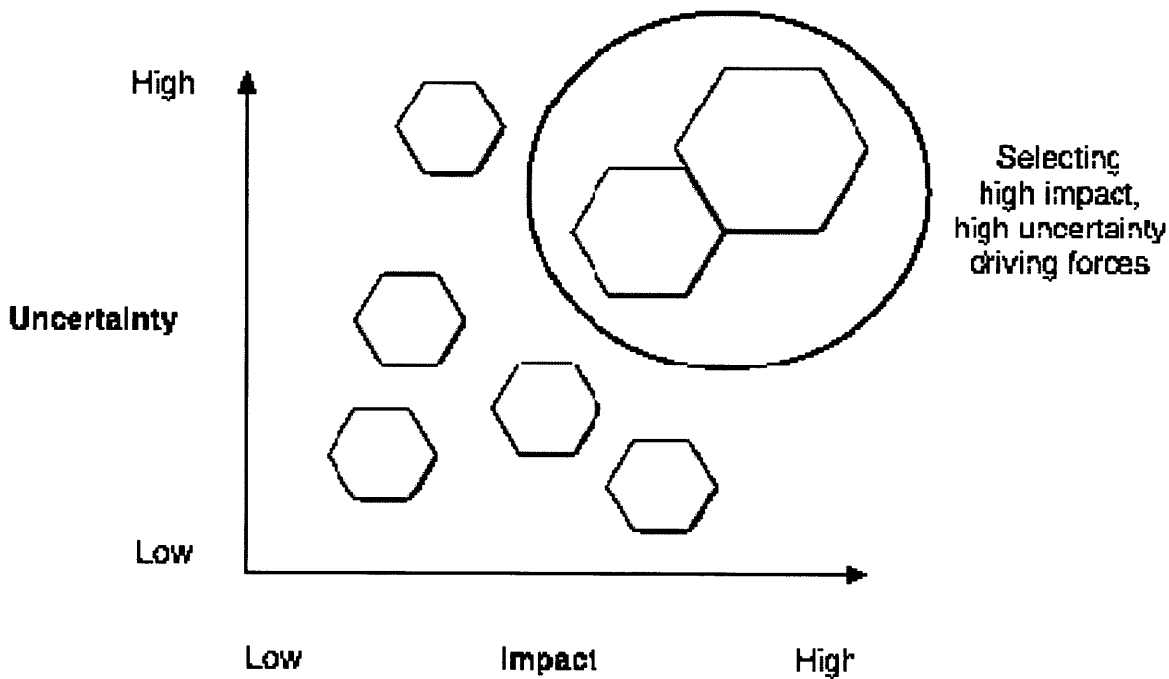
*Step 1: Identify the issue:* This stage consists of a series of scoping conversations to define the goals of the project, the time frame, the boundaries, and a general agenda. This is most often conducted through a series of initial meetings and conversations, resulting in a scoping document to clarify the terms of the project.

*Step 2 Identify key factors:* A series of individual interviews with subject experts, diverse contributors, organization staff, and stakeholders then follows. These interviews are designed to elucidate both the internal dynamics of the client organization, as well as early indicators of major external variables that may drive environmental change for the organization.

*Step 3 - Research driving forces:* Schwartz defines driving forces as “the elements that move the plot of a scenario, that determine the story’s outcome, the motive, the things that influence the outcomes of events”. This step combines interview themes with more detailed desktop research on the subject area, including market research, literature reviews, position papers, stake holder analysis, and trend analysis. Other techniques often include creating trends and timelines from history, lists of key events that influence the present, and other factors with lag-times that will influence the future.

*Step 4 - Rank key factors and driving forces:* A variety of techniques are then used to sort key factors and driving forces into themes and clusters. This often takes place in a two step workshop process, whereby participants group factors into thematic clusters, name them, then rank these themes by impact on the organization and level of uncertainty in their outcome. Variables with the highest impact on the organization and level of uncertainty in their outcome. Variables with the highest impact and highest degree of uncertainty are then selected to carry forward into Step 5, in combination with variables determined to be high impact and high certainty. Wack refers to the former as “critical uncertainties” and the latter as “critical predetermined”.

**Figure 2.1 Typical Example of How Clusters of Driving Forces are Sorted into Critical Uncertainties (after van ‘t Klooster and van Asselt, 2006)**



*Step 5 - Develop scenario logics:* Scenario logics refer to the primary variables to be considered when developing draft scenarios, as well as the relationships between them. These include both the critical

predetermined variables (high impact, high certainty) and the critical uncertainties (high impact, low certainty) developed in Step 4.

van der Heijden (2003) discusses two general approaches to developing scenario logics at this point, termed *inductive* and *deductive* (sometimes called *bottom-up* and *top-down* scenario logics). Deductive scenario logic development is most often associated with Shell-style scenario planning and works by first establishing a logical framework, then deducing scenarios from this framework. This process is often conducted in a workshop setting, using multiple groups to decide upon the two dominant critical uncertainties. These uncertainties are then presented in the form of a 2x2 grid encapsulating the key characteristics of the critical driving forces. Individual driving forces are then fit into this framework and combined in different, plausible, internally consistent scenarios. **Figure 2.2** displays this approach to building scenario logics, where Driving Forces A and B are contrasted in extreme variables and their combination is then used to produce four scenario sketches.

An *inductive* scenario approach uses a more intuitive logic to develop the relationship of driving forces without putting them in a 2x2 matrix. Inductive scenario development is often also completed in groups, with small groups mixing key variables along internally consistent dimensions to produce larger narrative outcomes. This process focuses on building relationships between the drivers first, then building an argument organically into an overall structure. This process also follows a step-by-step process, such that different combinations of outcomes can be produced relative to the internal variables considered. As a result inductive scenarios do not always produce 2x2 grids and can sometimes cover a wider range of critical differences.

Van der Heijden describes the difference between the two in more detail when he writes that a deductive scenario process develops the inter-scenario structure first (i.e., how each scenario differs), whilst an inductive scenario process develops the intra-scenario structure first (i.e., how an



Figure 2.2 A Typical 2x2 Deductive Scenario Grid

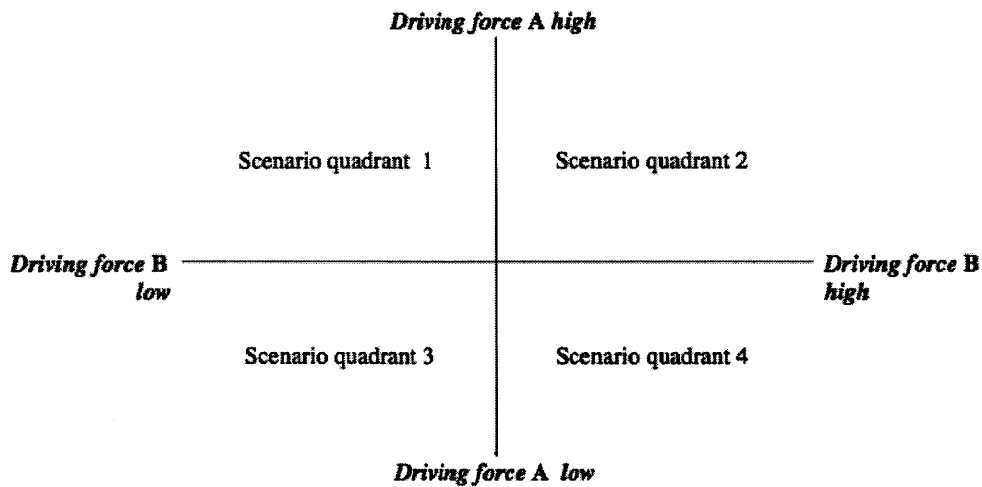


Fig. 2. 'Scenario axes' as starting point for scenarios.

individual scenario plays out). In either case, both intra- and inter-scenario relationships are explored, the difference being the order in which they are produced.

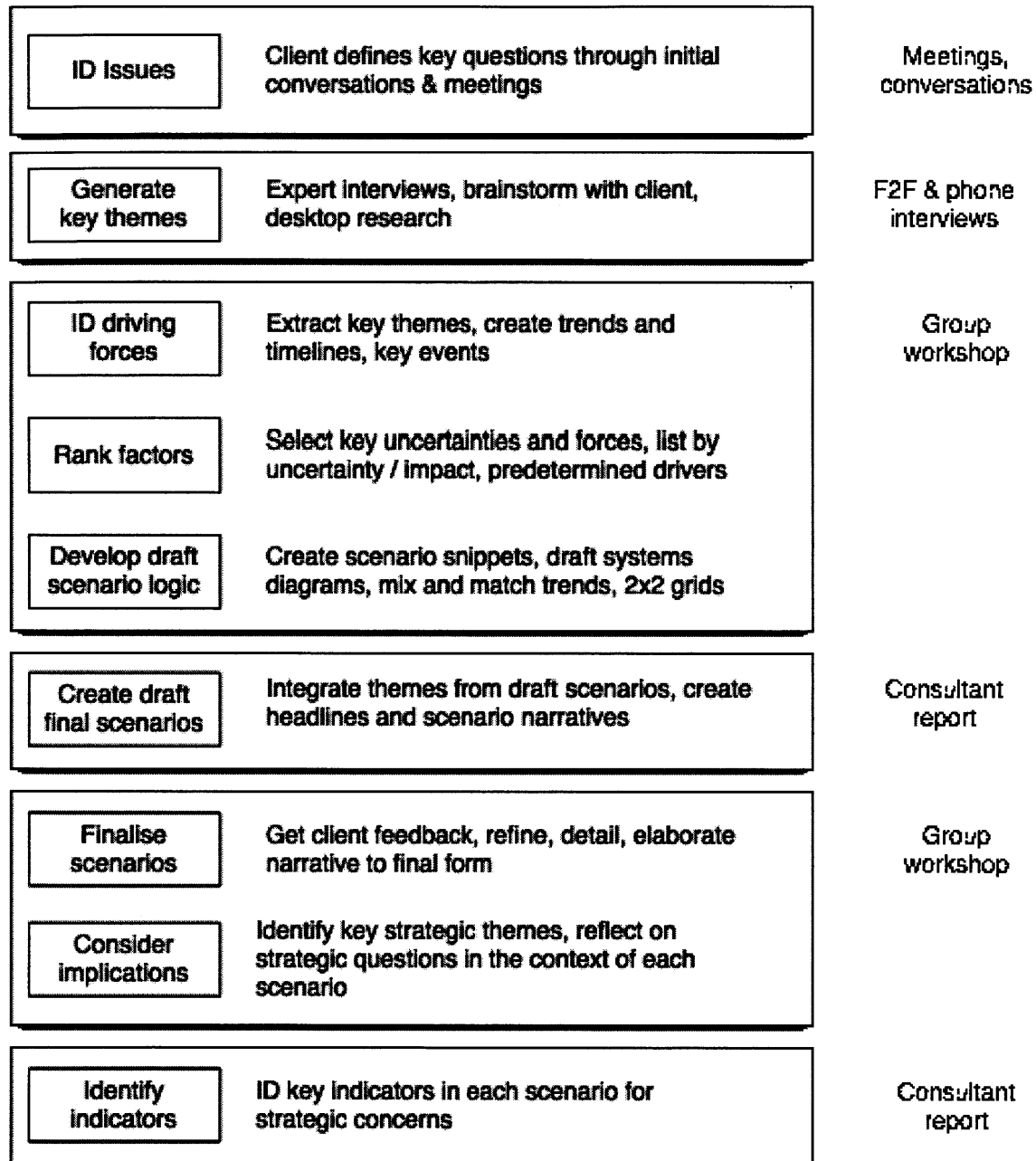
*Step 6 - Develop scenario details:* The various draft scenarios from Step 5 are then taken away by the consultant to synthesize into a single scenario structure, or selected from by the client in meetings or a workshop. Once a final set of logics is decided upon, each key factor and driving force is given individual attention and then manipulated within the structure developed in the scenario logics phase. At this stage, consultants elaborate upon the key actors, motivations, plots, and histories to create “mini-stories” or scripts which describe the difference between the two. Internal plausibility is also reviewed at this time. This is often done through the use of qualitative cross-impact grids, comparing the impact of each variable against each other within a given scenario to ensure feasibility. External experts can be consulted or additional workshops can also be held. Whatever the process, the resulting scenarios are often represented to the main client group for feedback and refinement before finalization.

*Step 7 - Consider implications:* After finalization, scenarios can then be put to use in an actionable strategic context. This is most often done by reflecting back on the original purpose of the scenarios exercise and “wind-tunneling” various strategic decisions in the context of each alternate future. Quantitative models are often introduced at this point if relevant, or various SWOT analyses and stakeholder role playing can be conducted relative to the organization’s mission and goals. This is a critical component of the scenarios process because it forces the organization to test what it has just learned, and plot future decisions against each alternative.

*Step 8 - Identify indicators:* The final step after testing various policies and strategies in a scenario context is often the creation of an “early warning system” or war-room. This process is used to help planners monitor the unfolding environment around them, track progress relative to critical bifurcation points in the scenario tree, and revise the organization’s position and strategy relative to emerging changes.

Many scenario practitioners advocate repeated environmental scanning, or “horizon scanning”, to make sense of external events in the context of strategic scenarios. They also suggest that it is important to revisit and recreate the scenario creation process at appropriate time scales (such as every 3 to 5 years) to reposition their understanding and “relearn” about the future relative to recent changes and events. This so-called “institutional foresight process” is often most practiced in government, although a range of private clients also offer Bloomberg-style environmental scanning and scenario updating services. This is also the stage at which most scenario projects are reputed to fail, in that they lose relevance after the workshop engagements are completed and “gather dust on the shelf.”

**Figure 2.3 Summary of a Typical Eight Step Scenario Planning Process**



## 2.5.2 Theoretical Foundations of Qualitative Scenario Planning

A common assertion among scenario planning practitioners is that its main purpose is to challenge dominant perceptions of “the official future” and combat “the perils of too narrow thinking” (Schwartz, 1992). Schwartz and others suggest that the “illusion of certainty” and the “tyranny of the past” can be a significant impediment to understanding and preparing for uncertain outcomes in rapidly changing environments, and that organizations must be more perceptive and adaptive in order to successfully compete (Ringland, 2003; Wilkinson, Heinzen and Van der Elst, 2008).

Divergent sources of information are therefore sought out which challenge the status quo and reveal implicit assumptions about the future (van der Heijden, 2003) and narrative strategies and story-telling techniques are often employed to increase the effectiveness of scenarios on management’s attitudes and perceptions.

This section explores the theoretical foundation of such claims, drawing heavily on Thomas Chermack’s work, “A Theory of Scenario Planning” (2003). It then goes on to link Chermack’s theory of scenario planning to that of organizational learning and the social construction of strategy. It concludes with a discussion of the implications of these theories in the context of public participation in urban planning and design.

### *Chermack’s Theory of Scenario Planning*

Although previous authors provide anecdotal argument for how and why scenario planning works, Thomas Chermack’s PhD thesis (2003) and subsequent peer-reviewed papers (2004, 2005, 2006) represent one of the more rigorous attempts at theory-building within the scenario planning literature. Chermack used Dubin’s (1978) model of theory development to clarify the specific units of measurement, laws of interaction, boundaries, system states, propositions, and hypotheses at the heart of scenario planning. Chermack uses Dublin’s model to explicate a proposed body of theory

for scenario planning. Beginning with Step 1, Chermack proposes five units for theory building related to scenario planning. These include: (a) scenarios; (b) learning; (c) mental models; (d) decisions; and (e) performance.

Scenarios as theoretical units are defined using Porter's (1985) definition, which Chermack clarifies in the following way; "Scenarios are narrative stories of the future that outline several possible paths through various challenges to arrive at varying future states." De Geus (1988), Schwartz (1991) and van der Heijden (1997) argue that scenarios are used for learning. Chermack therefore defines "learning" as the "process of gaining knowledge or skill" based on Trumble et al.'s (2002) definition. Mental models are also often reported as an important aspect of scenario planning. Chermack uses Doyle and Ford's (1999) definition of a mental model as a "relatively enduring and accessible, but limited, internal conceptual representation of an external system (historical, existing, or projected) whose structure is analogous to the perceived structure of that system." Decision is defined as "an act or process of reaching a conclusion or making up one's mind" (Trumble et al., 2002). Finally, Chermack defines performance as "the valued productive output of a system in the form of goods and services" (Swanson, 1999).

Chermack then uses these definitions as theoretical entities to determine their laws of interaction, system boundaries, and system states, producing several testable propositions about the nature of the scenario planning process. These are presented below, from Chermack (2004).

*Proposition 1:* If scenarios are positively associated with learning, then learning will increase as a result of participation in scenario planning.

*Proposition 2:* If learning is positively associated with the alteration of mental models, then mental models change as a result of learning.

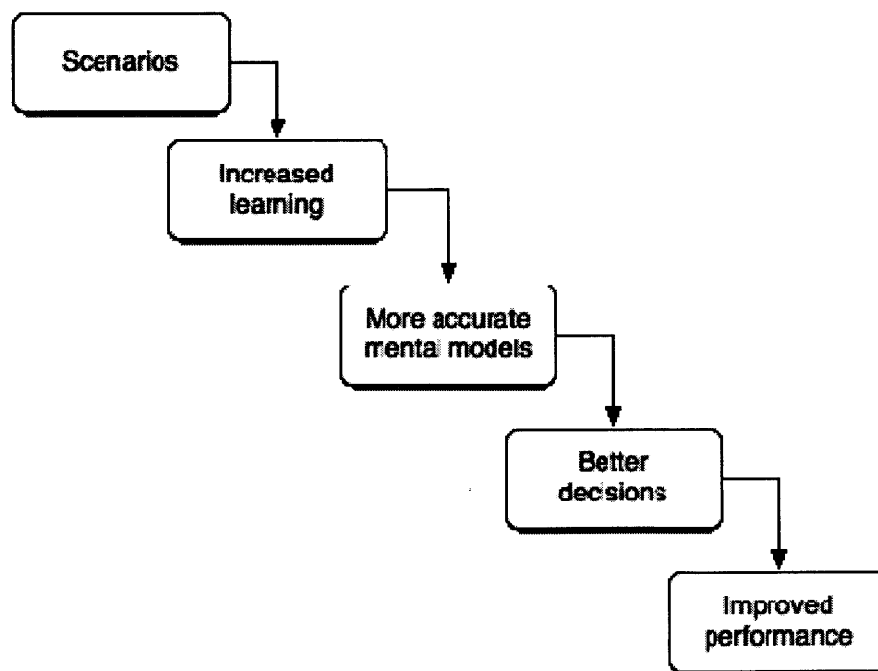
*Proposition 3:* If a change in mental models alters decision structure, then a change in mental models implies a change in the approach to decision making.

*Proposition 4:* If changes in decision making are positively associated with firm performance, then firm performance will increase as a result of altered decision making strategies.

*Proposition 4:* If scenarios are positively associated with learning, learning is positively associated with altered mental models, altered mental models are positively associated with firm performance, then scenarios can be positively associated with firm performance.

Chermack's theoretical propositions and their relationships are summarized visually in **Figure 2.4**. His formulation provides a clear, logical, and testable foundation for hypothesis generation and testing at any stage in the scenario planning process, although the specific constructs he employs are open to criticism and may be difficult to operationalize as research instruments. The following sections elaborate on the causal mechanisms of these steps in more detail, drawing from theories of constructivist learning, cognitive bias and the social construction of strategy.

**Figure 2.4** Chermack's (2003) Theoretical Model for the Process of Scenario Planning



### *Organizational learning and change*

Chermack's theory of scenario planning fits into a range of other scholarly investigations into the process of organizational learning and change. In their seminal article on organizational learning, Fiol and Lyles (1985) refer to the "environmental alignment" school of scholars who argue that the ultimate success criterion of any organization is longer-term survival and growth, and that alignment between the organization and its environment helps maintain competitiveness and survival over the long run (Barnard, 1938; Lawrence & Lorsch, 1967; Thompson, 1967). A firm (or indeed any individual or organization) must have the potential to "learn, unlearn, or relearn" based on past behaviors in order to sense environmental change and respond appropriately. Management thinkers such as Chakravarthy (1982) go so far as to argue that organizational adaptation should be the main goal of strategic management, because, "it is the key activity for dealing with changes occurring in the environment and involves the continuous process of making strategic choices." They conclude that an organization's ability to learn and adapt is key to its survival.

Weick et al. (2005) suggest that learning occurs when individuals and groups perceive a state of the world which is different from what they expect. "In such circumstances," they write, "there is a shift from the experience of immersion in projects to a sense that the flow of action has become unintelligible in some way." To make sense of this disruption, they argue that people look first for reasons that allow them to explain it away and resume "business as usual." These "reasons" are "pulled from frameworks such as institutional constraints, organizational premises, plans, expectations, acceptable justifications, and traditions inherited from predecessors."

Weick and his colleagues refer to such reasoning as "sensemaking" (1979). "To focus on sensemaking is to portray organizing as the experience of being thrown into an ongoing, unknowable, unpredictable streaming of experience in search of answers to the question, 'what's the story?'" (Weick, et. al., 2005). This process is supported by Klein (1999) and other's studies of how

people make decisions under circumstances of high stress in uncertain environments such as house fires, combat situations, and emergency rooms. Klein's Recognition-Primed Decision Model (RPDM) corresponds closely to Weick's process map of sensemaking, presented above.

Klein and Weick's process of sensemaking and iterative recognition testing are supported by Argys and Schon's (1974) process of "double-loop learning" in organizations. They argue that learning to change, or *learning about learning*, is qualitatively different from simply learning about a subject. Schon (1983) suggests that this process has five steps:

1. People learn through doing; they develop theories in action. It would help if they became more conscious of the learning in action, becoming 'reflexive'.
2. There are two dimensions to such learning; single loop, involving how to perform a task better within given parameters, and double-loop, which involves learning about the parameters and thereby changing the conditions under which the tasks are performed. The reflective practitioner focuses on the latter.
3. Double-loop learning can take place in social situations through dialogue in which people explore and learn about issues and each other's attitudes towards them.
4. Problems and objectives, facts and values, emerge through such group processes; they are not waiting out there to be discovered.
5. Group discussion processes which achieve double-loop learning can reset parameters for subsequent action, creating a new framework.

### *Social learning*

Weick (1979), Klein (1999), and Argys and Schon's (1974) models of organization take place in explicitly social contexts, through an interactive process of discussion, action and interpretation.

This process of verbalization and embodied learning in the context of organizational activities is thought to produce "communities of practice" (Lave and Wenger, 1991). Communities of practice are described as a group of individuals with a common repertoire of knowledge about, and ways of addressing similar shared problems and purposes. The key insight connecting communities of



practice with the process of organizational learning in uncertain environments is that learning is a *collective, distributed effort*. “Activities can be distributed among a group of students [for example], such that distinctions that might be hard for an individual student to maintain can be encoded in the organization. The organization becomes the interpretive frame that provides the basis for a change in understanding” (Newman, 1989).

This has important implications for organizational learning and performance in uncertain, rapidly changing environments. First, groups and organizations constantly pattern match their expected picture of the world with available data. Quality of perception, in particular detection in gaps between expected and experienced information, is an essential first step towards organizational performance. An organization must therefore be able to perceive change in its environment before it can begin to act on it.

Second, the interpretation of environmental information and the creation of planned response always occurs in the context of social practice. The social norms, habits and behaviors of an organization can produce dominant frames of interpretation— commonly referred to as the “official wisdom” or “party line”— which profoundly color a group’s ability to judge the significance of environmental data and strongly influence their response pattern. Studies of individual and group cognitive bias suggest that organizations revert to shared norms based on past experiences and accepted definitions in the face of uncertainty, a strategy which may not produce the most successful results in a changing environment.

The theory of scenario planning outlined by Chermack focuses explicitly on the social aspect of environmental perception and organizational strategy making. Chermack (2005) writes that, “the process of scenario planning creates categories for stakeholders, competitors, and in order to accomplish the task of shifting mental models, must frequently consider the perspectives of different communities of practice.” Van Der Heijden (1997) goes on to write, “scenarios are developed

collectively to build shared images of possible futures... scenarios nurture openness to change by allowing more complexity in futures states of a system and environment to be taken into account.” This is done through seeking out differing points of view, divergent information sources, paradoxical perspectives and uncertain variables.

Scenario planning is therefore theorized as an intervention in the social process of environmental scanning and interpretation in an organization, producing a shift in the internal representation of the world through exploration of outside trends and forces in a way which highlight gaps between “how the world is” and “how the world is perceived to be.” This process is intended to force sensemaking inquiry into the meaning of these changes and the potential directions of their growth, resulting in organizational learning and increased change ability.

### *Limitations*

Despite widespread application of qualitative scenario techniques, there are significant constraints to the discipline as currently practiced (Pang, 2009). First, the process is labour-intensive, involving significant investment in background interviews, data collection, face-to-face discussion, and group workshops. This creates a limit on the number of people who can participate in, and benefit from the process. It is also expensive to execute, thereby limiting the organizations and companies which can afford to use it. Next, it commonly involves a predominance of senior decision-makers and subject matter experts, many of whom exhibit conscious or unconscious biases towards vested interests and status quo perspectives. By reducing the range of sources considered and relying upon the input of established figures and subject experts, important perspectives and information sources can be excluded (Tetlock, 2006). Finally, scenario planning is highly dependent upon the skill and experience of the workshop facilitators and scenario writers. Different futures consultants working

with the same group may produce totally different outcomes, a fact which makes the process highly idiosyncratic (Curry and Schultz, 2009; Shoemaker, 1995).

The combination of participation limits, participant bias, facilitator bias, and author subjectivity can cause important viewpoints to be missed, important data or trends to be ignored, or unpopular and unpleasant futures to be dropped. More importantly, the very nature of a workshop-based process may limit the scalability of such an approach as an economical, robust and large-scale tool for increasing governmental flexibility and stakeholder involvement. Finally, the focus on small-group, business-environment decision-making suggests that elements of the process may need to be adapted for public policy settings, in which more participants need to be involved, the goals of the exercise are often contested and the outcomes must communicate to a wide variety of interests and values.

## **2.6 Chapter Conclusions**

This chapter argued that the future has always been an integral concern for urban planning. It reviewed the evolution of the field's relationship to the idea of the future, using four different philosophical and theoretical traditions. It then explored the role of public participation in the context of urban planning theory and practice. Next, it situated the field's use of prediction, modeling and forecasting in the context of participation, through an exploration of approaches such as PSS, PPGIS and AFA modelling. It then surveyed the perspective that the literature on Web 2.0, online participation and collective intelligence systems had to offer, integrating this with urban planning theory, public participation, and communicative approaches to modelling. Finally, it introduced the history and theory of scenario planning, exploring how it is most frequently practiced and how its strengths and limitations are presented in the literature.

One of the clear areas of limitation in scenario literature is the lack of formal evaluation studies on its effects and outcomes. While the theory of the process is quite clear, there is little empirical evidence for its success. Without such measures, it is difficult to evaluate different kinds of scenario approaches, the effectiveness of different practitioners or the impact of other methods of achieving the same ends. The literature on collective intelligence is still growing rapidly, with multiple contested definitions of what entails a collective intelligence system, how it differs from other approaches to social computing, distributed analytic techniques, social media, etc. Like the scenario literature, there is also a need for more formal studies of the effects of different systems on their stated goals. This would need to both advance and defend appropriate measurement constructs and instruments, as well as apply them across different system designs and interaction types. Finally, the literature on the effects of public participation in urban planning are equally diffuse, subject to multiple competing methodological positions and ideological assertions. If public policy makers are to take the claims of participation more seriously, it will be necessary to link this body of research to those explored above, thereby offering more robust evidence for the value and impact of participation in better decision-making.

The following chapter presents how these ideas informed this research from a methodological standpoint, and how they were used to explore the use of online participatory collective intelligence systems in the urban planning research process.

## **Chapter 3                      Methodology**

### **3.1      Introduction**

This chapter discusses the methodological approach employed in this dissertation, with particular focus on the exploratory case study strategy used. I introduce the research questions and the exploratory hypotheses, introduce the overall research design strategy, and discuss the rationale behind the sampling and case selection. I then describe the three cases conducted, focusing on comparison between the base case and two novel online approaches to explore different aspects of the scenario planning process. The approach to data generation, collection and analysis of these cases is also discussed, including the phases of data collection for each case and the tiers of data analysis. Finally, the limitations of the method are outlined.

### **3.2      Research Questions**

This dissertation explores the role of online participatory futures systems as a novel methodological approach for data generation at different stages of the scenario planning process. Such approaches are both novel and untested, requiring a mix of exploratory research and comparative reflection.

Towards that end, the primary research questions guiding this dissertation are:

- Do web-based participatory approaches add value to the traditional scenario planning process, and if so, where and in what ways?
- If not, where do they fall short, in what ways, and why?

More specifically, what impact do the web-based approaches explored in this dissertation have on:

- The *number* and *type* of participants involved, and in what phases?
- The *geographic scope* of participation enabled?
- The range of *expert professional disciplines* consulted?

- The *number of variables and opinions* incorporated?
- The *mechanism* of analysis, ranking and clustering?
- The *time spent* on data collection and analysis?
- The amount of *user debate* and *reflection*?

In light of evidence raised by these research questions, the following discussion points will also be explored:

- How might different levels of *interface structure* influence user participation?
- What role does *participant recruitment* play in the process of user engagement and analysis?
- What impact might such approaches have on the *pedagogical* impact of scenario planning engagements?
- What potential do such tools have to incorporate the “wisdom of the crowds” for more in-depth analysis and large-scale engagements?
- What impact might such approaches have on the facilitation of *consensus-building* and *debate*?
- How might such systems help *preserve dissenting ideas* and challenging debate?
- What potential do such tools have to help minimize *facilitator bias*?
- What methodological considerations do the use such tools as data generation instruments raise for urban planning research more broadly?
- What does this research suggest for a more rigorous evaluative approach in the future?

### 3.3 Research Strategy and Design

A mixed method approach was employed to investigate these questions. Specifically, two novel online platforms were developed and deployed as case studies in order to generate data for the research question. Results were then compared pair-wise to the base case: representative face-to-face scenario planning process typical of those used in urban planning and public policy settings. These in-depth case studies were then augmented with a comparative analysis of three additional

examples of online participation platforms in disciplines other than urban planning. Finally, in-depth qualitative interviews were used to help add context and interpret the results of both.

Such a mixed method approach departs from traditional experimental design. An ideal experiment would allow for the isolation of key outcome variables in advance, manipulation of specific independent variables through a controlled set of randomized or semi-random tests, and then measurement of their impact on the dependent variables of interest through standardized measurement techniques and instruments. This would include adequate control for error, variance and exogenous factors, thereby providing evidence if such approaches are “better” or “worse” than traditional scenario planning approaches.

Such an approach was infeasible for this research for three reasons: 1) the relevant categories and variables for measurement were unknown in advance; 2) there was little empirical evidence for, or agreement on the key outcome variables of scenario planning and; 3) there whereas no standard measurement instruments or protocols that could be applied in their testing. As a result, both the dependent and independent variables were unknown and no standard method for comparison could be established. An alternative research strategy was therefore required.

Yin (1994) suggests that an exploratory case study approach is useful in such a situation, specifically using “*revelatory cases*” to highlight key areas of difference and similarity. This approach is useful for a research subject, such as this, which is still developing or that was otherwise previously inaccessible to investigation for various reasons. The research questions of this dissertation were good candidates for revelatory case study research precisely because online participatory scenario systems are novel approaches, with aspects of both methodology and practical design still in formation, and because scenario planning lacks a well-established baseline for key outcome variables that could serve as measurement proxies.

This approach involved two stages: first, platform design and second, application and comparison to the base case. Because no online participatory futures systems for urban planning existed at the time of this research, it was first necessary to design and produce a series of prototypical system designs that could generate data for these research questions. Before their development, various concepts and designs were tested with expert interviews and groups of participants to determine design features that could be relevant. These were then used to create measurement constructs that could be used to evaluate them.

The first of these data generation platforms was then tested against the base case. Data from this study was compared against both the process and results of the base case and used to reflect upon the research questions. Next, the lessons from this case were incorporated into the design of a second online system for application on the second case. This second system was explicitly different from the first, entailing an intentionally different approach to data collection, measurement, and evaluation. This was done in order to explore gaps in the research questions that the first system was unable to answer. As a result, cross-case comparison of key data was not possible between the two online cases, thereby necessitating pair-wise comparison with different aspects of the base case.

For each case study, I generated a significant amount of detailed data from a number of sources, including interviews, focus groups, rapid prototypes workshops, online participatory futures system instruments, and primary document review (Gomm et al. 2000, p. 2). Each of the cases was designed to illuminate different aspects of how these novel methodological approaches could be of use for urban planning research in general, and qualitative scenario planning in particular. This approach enabled rich descriptions, concept development and understanding through the analysis of both the structured and unstructured data as it emerged.

Due to the limitations of the case study approach employed and the systems developed to generate data, the core cases were supplemented with a detailed review of three comparative



examples of online participation platforms in other disciplines. Comparative examples were chosen specifically to address key weaknesses or data gaps from the case studies, thereby providing a richer, more robust source of evidence for review. The results of both the cases and comparative examples were further supplemented by a series of in-depth, semi-structured interviews with experts in the field of scenario planning, online participation or public policy. These interviews helped provide depth and context to the findings generated previously. This aided in concept definition, interpretation and evaluation, thereby completing my multi-method approach to this area of emerging research.

The following sections describe the cases as developed and present the rationale behind their choice and development.

### **3.4 Case Selection**

In this section, I detail the approach to case selection and describe the cases chosen. Preliminarily, a range of potential projects over a three-year period provided possible insights into my research questions. In an iterative, reflective manner, I then considered and narrowed down these possibilities to the three presented in this dissertation.

#### ***3.4.1 Base Case: The Future of a Northern Spanish Region***

The base case selected for comparison was a face-to-face scenario planning exercise conducted for a regional urban planning think-tank in the north of Spain. This project was conducted on behalf of the regional government, by a world-leading scenario planning consultancy. The case involved a scenario generation exercise for the area's main metropolitan region, which involved creating four, research-based narratives on different potential futures for the region's development. The focus of the exercise was on economic, political and social shifts, not geospatial or design issues, and was

therefore conducted purely as a qualitative scenario generation exercise without the aid of GIS or quantitative simulation.

In summary, the method of this case employed a standard qualitative scenario generation process, typified by Schwartz's (1991) eight-step process described in Chapter Two. This involved a detailed research period on the historic trends and issues influencing the history of the region's economy and politics, a round of in-depth qualitative interviews with regional officials and experts, a face-to-face scenario creation workshop, and then summarization and reporting by the consulting facilitators. A total of 15 experts were interviewed and a total of 20 stakeholders participated in the scenario creation workshop, which took place over two days in Bilbao, Spain. From start to finish, the process took approximately 12 weeks to complete.

### **3.4.2 Case 1: Futurescaper, The Impact of Climate Change Impacts on the UK**

#### **Government**

The first online data generation platform was developed as part of a project with the International Futures Forum (IFF), run by Tony Hodgson on the implications of climate change impacts for the UK Government. The purpose of this project was to identify the systemic linkages between climate change impacts in other parts of the world and the secondary and tertiary impacts on critical supply chains and governance functions within the UK. The online data generation platform for this case, entitled *Futurescaper*, was designed by myself and implemented and developed in the programming languages MySQL and PHP by a colleague, Nathan Koren.

This case was designed to be used in the early and middle stages of scenario creation research. It sought to address the task of generating trends and drivers, exploring their interactions, ranking them, clustering them into high-level themes, and then assembling them into analytically

useful visualizations. It was not designed to address the latter stages of scenario creation, including scenario logic creation, selection, detailing, or narrativization.

Towards this end, an expert scientific panel selected 186 representative scientific articles and news clippings, which were then uploaded onto the system for analysis and clustering. Users could browse this data, add new trends and drivers, explore how they interact, and download them for subsequent visualization.

### ***3.4.3 Case 2: SenseMaker Scenarios, the Impact of Financial Uncertainty on Government Public Services***

The second online case adapted an existing commercial software platform to build upon lessons from the first case. In particular, the case sought to address several themes raised by the Futurescaper case; notably, a desire to involve a greater number of participants, to explore new formats of data collection, and to improve the user interface to facilitate collective analysis.

This case was developed with two colleagues, Dave Snowden and Wendy Schultz, and deployed in an online engagement for the 2010 International Risk Assessment and Horizon Scanning Conference for the Government of Singapore. A total of 265 participants from around the world contributed mini-scenarios, narratives, anecdotes and opinions as part of this case. These were then clustered using a structured evaluation process and summarized by the researchers into three representative scenarios.

The topic of the case study was the future of urban public services under financial uncertainty. The goal was to explicitly explore different formats for user contribution, including free-form narrative or anecdotal formats, and to prototype methods for generating draft scenario logics more directly.

### 3.5 Comparative Examples

A number of other examples were developed during this course of this research by other parties, which were found to contain additional data or insight relevant to the research questions. These were used as supplementary evidence to help plug gaps in the case study data and supplement understanding from their analysis.

The three examples analyzed were:

- The Institute for the Future's *Foresight Engine*
- The *WikiStrat* collaborative forecasting platform
- OpenForesight's *Future of Facebook* project

Although none of these systems were designed for urban planning research, they nonetheless offered useful lessons for various aspects of online user engagement, crowdsourcing or scenario planning. Each was selected because it represented either pioneering, unique or typical efforts in one or more of the following ways: a) it was an adaptation of a similar function like scenario planning in an online environment; b) it used emerging Web 2.0 and collective intelligence tool kits to model similar activities or processes (but focused on different content); c) it employed design decisions that were exemplary of different approaches to generating data relevant to the key variables and/or; d) it was notable or unique for its originality or early-mover status. Each comparative example is described briefly below.

#### 3.5.1 The Institute for the Future's Foresight Engine

The *Foresight Engine* is an interactive gaming platform developed by the Palo Alto-based technology forecasting non-profit, The Institute for the Future (ITF). Foresight Engine uses a card-game like interface, in which thousands of players submit ideas to the future of a subject during a curated engagement period. The example chosen for the dissertation comparison was an engagement exploring the future of the United States utility network, entitled "Smart Grid 2025". The event,

sponsored by the Institute of Electrical and Electronics Engineers (IEEE), engaged almost 700 participants from 81 different countries over a 24-hour period, generating nearly 5,000 submissions and interactions. Aside from participants, over 26,000 people viewed the project website and associated content. Participants included subject matter experts, academics and students, IFTF staff and members of the general public. This project was selected as the first comparison example because its game-like interface and open-ended participation is a strong example of leveraging stakeholder participation online.

### **3.5.2 The WikiStrat collaborative geo-strategy forecasting platform**

*WikiStrat* is an online geo-strategy platform. The platform operates as a for-profit strategy consultancy, using a distributed network of analysts and subject matter experts who contribute piecework or competition-based analysis in a crowdsourced format. Compared to the Foresight Engine, WikiStrat uses a fairly simple, Content Management System (CMS) / wiki platform. In contrast, however, it supports a more complex community of experts, who participate over time for both recognition and financial reward. Paying clients pose topics or questions to the community, via moderation by WikiStrat staff, who then contribute essays, analysis, trends and drivers into the WikiStrat system via web forms and surveys. Participants are asked to select and evaluate different trends and factors, suggest implications, and draft narrative comments via questionnaires, which are then scored by a combination of algorithm and staff to select “winners” for each engagement. Winners are then paid a portion of the proceeds generated by WikiStrat client engagements. Past topics included the outcome of the Arab Spring, the future of China, and other geopolitical and security topics.

The particular example chosen for this dissertation was WikiStrat’s “International Grand Strategy Competition”, a four-week invitation-only engagement exploring geopolitical scenarios

around the world, for a cash prize of \$10,000. This event engaged approximately 30 teams from universities in 13 countries who produced an average of 7,000 - 8,000 words of content per week on a range of subjects. While somewhat atypical of the usual WikiStrat engagement, it is a valid example for exploring how the system worked and how the competition format functions at scale.

### **3.5.3 OpenForesight's Future of Facebook project**

The last comparative example selected explored the future of the social media platform, Facebook, through an “open foresight” process. This project used entirely free, existing services such as Facebook, Twitter, YouTube Quora and Kickstarter to conduct an “open source” scenario planning exercise. The process began with a video on Kickstarter project (the crowdfunding platform) to generate interest and funds to execute the project. This announcement was promoted via Facebook, Twitter, blogs and emails and received significant social media coverage. The second phase engaged approximately 25 thinkers in the field through in-depth video interviews over Skype. These were then edited into short clips and posted on a public YouTube channel for distribution and review. The administrators also created a Quora page, an interactive, user-driven question and answer site, with which users posed and responded to various questions raised by the interviews. Finally, traditional desktop research was conducted offline. The results were represented back to the open community of users in the form of several blog posts and videos, resulting in a series of scenarios describing several possible futures for the Facebook platform. In addition to the 25 experts interviewed via video (which received over 17,000 views on YouTube), the project received 109 responses from over 220 subscribers to the Quora page and extensive interaction on Facebook from over 50 users.

### **3.6 Informant Interviews**

The last component of the research design involved in-depth, semi-structured interviews with experts in scenario planning, crowdsourcing, and urban planning. The interviews were conducted over a period of six months with the aim of generating a range of themes about how online participatory collective intelligence systems may work, as well as a series of methodological insights related to their study.

Over 45 semi-structured interviews were conducted, of which 30 were substantially transcribed. Individuals were selected for interviews in a purposive manner. Securing interviews with desired participants was an ongoing, iterative process of gaining and maintaining access. (Bardach 2000, pp. 49-50). As Bardach discussed, this process of securing interviews snowballed. Interviews with key informants led to recommendations of further suggestions for interviews, secured primarily through my own personal, professional, and academic connections.

These interviews served two purposes: first, to solicit input on platform design and measurement protocol used for this dissertation and second, to help interpret the meaning and context of the data generated from them and the comparative examples.

### **3.7 Case Selection Criteria**

I employed *theoretical sampling* to guide the selection of these cases and sources. Theoretical sampling refers to an approach to identifying and choosing research sites, cases, and informants to compare with the ones that have already been selected and studied. Theoretical sampling focuses on achieving deeper understanding of cases and resulting concepts. Both case selection and data generation was purposive, ongoing, and oriented towards understanding and developing categories of understanding (Glaser and Strauss, 1967, p. 45).

Consistent with a theoretical sample approach, I selected cases, informants and scenario planning participants that would help generate full pictures of categories and facilitate their comparison (Glaser and Strauss 1967, p. 49). As distinct from probabilistic sampling - which aims to capture data that is representative of general variations - this sampling approach does not aim to collect representative data. Instead, it maximizes variance in the selected cases and participants in an effort to achieve a deeper understanding of different dimensions of the concepts and phenomena under study.

My prototypical online participatory scenario systems were designed in an iterative, progressive manner to support this sampling approach, and cases chosen for their application were selected to vary the richness of data generated for analysis. Theoretical sampling thus enabled concept development, modification and refinement through the intermittent analysis and generation of additional data sources during the course of this research.

Deliberately generating varied data helps to identify the range of types, variations, conditions, relationships, processes, and mechanisms relevant to the research questions. Glaser and Strauss argue that with “theoretical sampling, no one kind of data on a category nor technique for data collection is necessarily appropriate. Different kinds of data give the analyst different views or vantage points from which to understand a category and to develop its properties; these different views we have called *slices of data*.” (1967, p. 65)

### **3.8 Data Categories and Availability**

The following data categories were developed for data generation. Data categories were divided into two groups: *participation* characteristics, which deal with aspects related to who participates with the data generation system and why, and *interaction characteristics*, which deal with aspects about how users participated, what actions they took and how they interacted with each other.



**Table 3.1 Data Categories and Availability, by Data Source**

Data Category	Base Case	Case 1	Case 2	Example 1 IFTF	Example 2 WikiStrat	Example 1 Open Foresight
<b>Participation Characteristics</b>						
Degree of public openness (including promotion & recruitment efforts)	Measured	Measured	Measured	Measured	Estimated	Measured
Amount of preparation required	Measured	Measured	Measured	Measured	Measured	Measured
The number of participants involved	Measured	Measured	Measured	Measured	Measured	Measured
Reasons for participation	Measured	Measured	Measured	Estimated	Estimated	Estimated
Degree of user anonymity	Measured	Measured	Measured	Measured	Measured	Measured
<b>Type of participants involved</b>						
Level of Education	Estimated	Estimated	Measured	None	Estimated	None
Professional Experience	Estimated	Estimated	Measured	None	Estimated	None
Professional Discipline	Measured	Estimated	Measured	Measured	Estimated	None
Age	Estimated	Estimated	Measured	None	Estimated	None
Geographic Origin	Measured	Estimated	Measured	Measured	Estimated	None
<b>Interaction Characteristics</b>						
<b>Tasks Performed</b>						
Driver Identification	Measured	Measured	Measured	Measured	Measured	Measured
Driver Exploration	Measured	Measured	Measured	Measured	Measured	Measured
Driver Ranking & Selection	Measured	Measured	Measured	Measured	Measured	Measured
Driver Clustering & Aggregation	Measured	Measured	Measured	N/A	Measured	Measured
Scenario Logic Creation	Measured	N/A	Measured	N/A	Measured	Measured
Scenario Logic Selection	Measured	N/A	Measured	N/A	Measured	Measured
Scenario Logic Detailing	Measured	N/A	Measured	N/A	Measured	Measured
Implications Development	Measured	N/A	N/A	Measured	Measured	Measured
Implications Detailing	Measured	N/A	N/A	N/A	Measured	Measured
Full Scenario Narrative Creation	Measured	N/A	Measured	N/A	Measured	Measured
Types of input considered	Measured	Measured	Measured	Measured	Measured	Measured
Amount and type of visualization tools used	Measured	Measured	Measured	N/A	N/A	N/A
Amount and type of analytical tools used	Measured	Measured	Measured	Measured	Measured	Measured
Amount of socialization enabled	Estimated	Measured	Measured	Measured	Measured	Measured
Amount and kinds of feedback provided	Measured	Measured	Measured	Measured	Measured	Measured

**Table 3.1** presents the data categories and their availability for each case, each of which is then described in greater detail. Green cells represent categories for which empirical measurements have been made. Yellow cells represent categories for which evidence-based estimates have been made. Red cells represent categories for which no data is available because none was captured, while grey cells represent categories for which no data was captured because that activity was not performed for that case and therefore could not be measured.

### ***3.7.1 Construct Definition***

The following definitions were developed to add resolution to the data categories introduced above.

#### *Degree of public openness (including promotion)*

This category measures the degree of accessibility each system allowed during observation. This includes whether or not the system was public, required registration but allowed anyone to register, was invite only, or was completely private. This also relates to the degree of external promotion each case involved, ranging from none to extensive advertising on multiple media channels and outlets.

#### *Amount and type of preparation required*

This category measures the amount of pre-work required by participants for their participation. This could range from none, to reading or watching basic background texts and video, to extensive pre-work requiring the review of complex material, completion of exercises, training courses, etc.

#### *The number of participants involved*

This measure simply records the number of people involved from start to finish in the entire process.

### *Reasons for participation*

This measure, most often estimated, begins to explore people's reasons for participating in the case. At the most basic level, this construct follows a modified version of Malone et al.'s (2010) discussion of why people participate in CI activities. This includes "direct compensation", "for learning", "for influence / self promotion", and for "love / friendship".

### *Degree of user anonymity*

This measure records the amount and type of privacy involved with using the system. This could range from *none*, in which every user is required to register with a high burden of identity proof, to *significant*, in which users are provided with significant privacy, either in the form of log-ins or more explicit means.

### *Type of participants involved*

This category includes the following sub-categories:

- *Level of Education*: Number of years of education, a proxy for expertise
- *Professional Experience*: Number of years of professional experience, another proxy for expertise
- *Professional Discipline*: Professional training, discipline or industry
- *Age*: Estimated participant age
- *Geographic Origin*: Place of residence relative to project location

### *Interaction Characteristics*

The following measurement categories reflect upon data related to how users interact with the system, with the process of scenario planning and with each other.

### *Tasks Performed*

The first sub-category of task categories relates to the various aspects of the scenario planning process. The activities in **Table 3.2** were measured if they were present or not and if so, how they were performed and by whom.

*Types of Input Considered:* The format of information collected, ranging from text-based input of facts, article summaries and other analytical abstracts, to user opinion, narratives, photos or links.

*Amount and Type of Visualization Tools Used:* Whether and in what way visualization tools were used as part of the process, where, how, and by whom.

*Amount and Type of Analytical Tools Used:* Whether and in what way various supplemental analytical tools were used as part of the process, where, how, and by whom. These include network analysis tools, clustering algorithms, cross-impact analysis support tools, etc.

*Amount of Socialization Enabled:* How much, and what kind, of reflective dialogue and interaction between users was allowed. This includes voting, forums, commenting and discussion boards, as well as more advanced features such as user accounts, scoring, leaderboards, social networking, friend circles, etc.

*Amount and Kinds of Feedback Provided:* Whether and in what way the system, or other users, recognizes user input and interaction. This may range from timely, on-screen feedback to input and inquiries, or email notification, elaboration and response from other users.

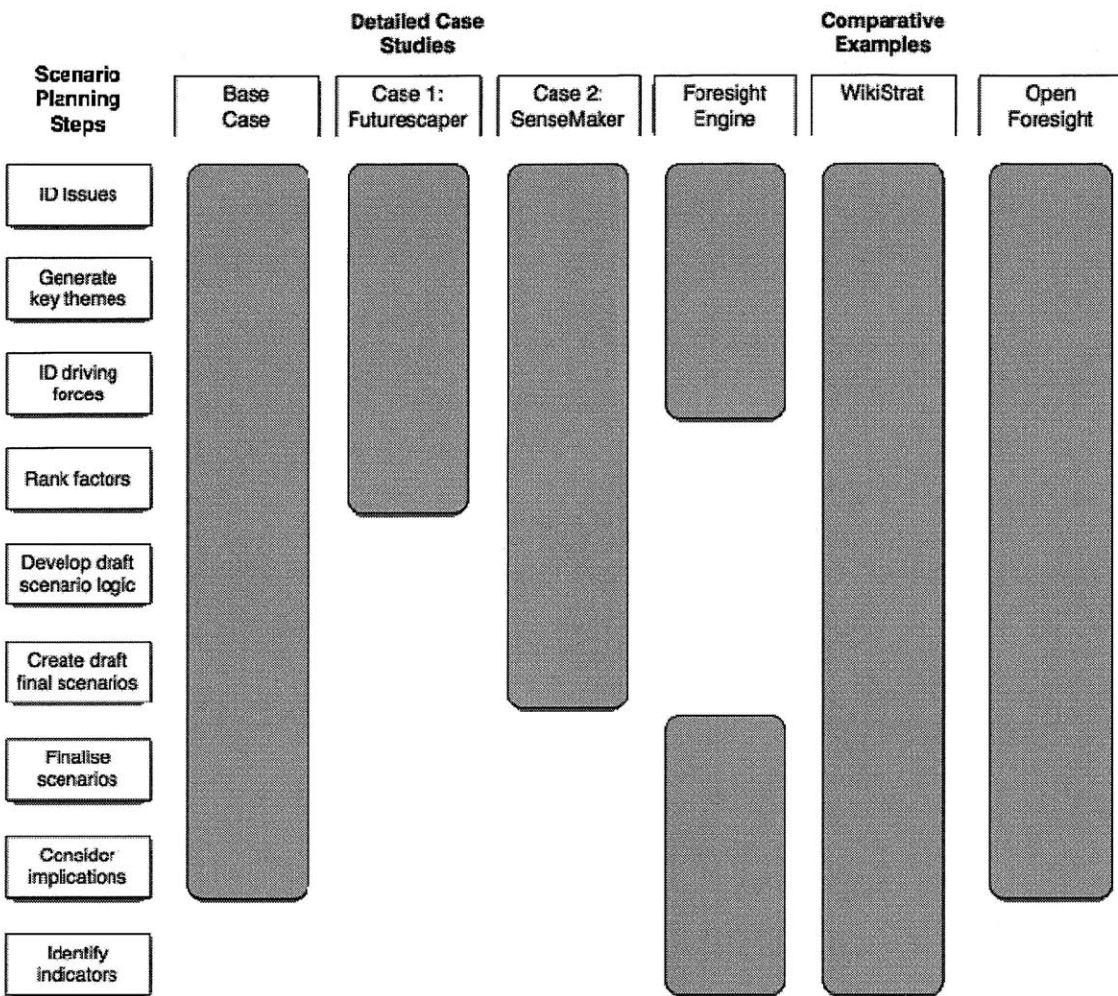
**Table 3.2 Tasks Performed and Measured**

Task	Description
<i>Driver Identification</i>	The process of scanning for trends, drivers and uncertainties that may influence the focal question of the research. This includes entry of these drivers into the system.
<i>Driver Exploration</i>	The process of exploring, reading, sorting through and making sense of drivers. Essentially a pedagogical engagement exercise, sometimes performed through video or web-resources.
<i>Driver Ranking &amp; Selection</i>	The process of ranking and selecting key drivers from a larger list from which to build scenarios.
<i>Driver Clustering &amp; Aggregation</i>	After exploring interaction between drivers, this phase involves synthesizing lower level trends into higher-level themes and issues, both for communication and for scenario building.
<i>Scenario Logic Creation</i>	The process of creating draft logical frameworks and causal arguments for later refinement and filtration.
<i>Scenario Logic Selection</i>	The act of choosing from competing alternative scenario logics to define the driver characteristics and uncertainties to drive final scenario creation.
<i>Scenario Logic Detailing</i>	An intermediate step involving the fleshing out of basic plot elements, story arcs, characters, actors and events in a scenario logic framework (but before writing up as a narrative).
<i>Implications Development</i>	Preliminary exploration of implications, including high level review of winners and losers, impacts on policy, etc.
<i>Implications Detailing</i>	Fleshing out these implications in significantly more detail for the purposes of scenario narrative writing and working group pedagogy.
<i>Full Scenario Narrative Creation</i>	The process (usually consultant-led) of converting the aggregated drivers of change, the final scenario logic and draft implications into full, text-based stories.

### 3.8 Relationship of Each Data Source to the Scenario Planning Process

As explained in the Research Design, each case was compared pair-wise against the base case, which represents a fairly typical face-to-face scenario planning engagement. Due to the constraints of the data generated and research method used, not every case was directly comparable to all phases of the scenario planning process. **Figure 3.1** clarifies the relationship between each data source and the eight-step scenario planning process, as outlined by Schwartz (1991).

Figure 3.1 Overlap of Data Sources with the Scenario Planning Process



While **Figure 3.1** illustrates the overall relationship of each data source to the core components of a face-to-face scenario planning process, it should be noted that each case and data source employs very different approaches to execute each step. For example, Case 1, Futurescaper, spends significant time and effort on the identification of driving forces and their relationship. Case 2, SenseMaker, covers this step as well, but in an indirect fashion. Thus **Figure 3.1** should be considered a rough road map for how each data source relates to the core process, and will be explained in more detail in the sections dealing with each source.

### **3.9 Data Analysis**

After generating data in the described categories, I undertook a systematic consideration of the evidence relative to the research questions. After Hammersley's (1992) guidelines, I first developed a list of data relevant to each research question. I then clustered data thematically by identifying repetitive sources or like responses from the interviews, or relevant descriptive statistics from the cases.

I also sought to triangulate consistencies between the various forms of data. Simple descriptive statistics were employed to understand gross variation in measurement variables across the cases. Great care was taken given the small sample size and non-experimental research design to limit the claims of such data. Given the range of exogenous factors affecting the cases, descriptive statistics were taken to represent the general *magnitudes* of effect, not precise measurements. At no point were causal claims made based on this data, given the significant limits to the accuracy and precision of both the theoretical constructs employed and the measurement instruments used.

Upon coming to preliminary findings, these were reviewed with expert practitioners and researchers in the field, ensuring that the conclusions and insights generated through the exploratory interviews and case studies were accurate, and comprehensive. This helped to verify and test my conclusions, which further provided both social and professional sensitivity (Glaser, 1992).

### **3.10 Chapter Conclusion**

This chapter introduced this dissertation's research strategy and research questions. It proposed a multi-method research design in the context of a case study approach, discussed how cases were selected, how data was generated, how these data were measured, and how they were analyzed. Finally, it discussed the limitations of this approach and explored various pitfalls and risks associated with such an approach.

## **Chapter 4 Base Case: The Future of a Northern Spanish Region**

### **4.1 Chapter Introduction**

This chapter presents the findings of the base case, which included a face-to-face scenario planning exercise for a regional urban planning think-tank in northern Spain. This chapter discusses the background on the case, details of the approach taken and the relevance of these findings relative to the research questions. It also discusses the relative comparability and representativity of this example, compared both to other typical scenario planning exercises and the online cases explored as part of this research.

### **4.2 Case Background**

This project was conducted on behalf of a regional government in northern Spain, by a world-leading scenario planning consultancy. Both the name of the client and the consultancy have been anonymized. The case involved a scenario generation exercise for the main metropolitan region, which involved creating four research-based narratives on different potential futures for the region's development. The focus of the exercise was on economic, political and social shifts, not geospatial or design issues, and was therefore conducted purely as a qualitative scenario generation exercise without the aid of GIS or quantitative simulation.

### **4.3 Process Description**

The case followed a standard qualitative scenario generation process, typified by Schwartz's (1991) eight-step process described in Chapter Two. In summary, the process involved a detailed research period on the historic trends and issues influencing the history of the region's economy and politics.



These were supplemented by a round of in-depth qualitative interviews with regional officials and experts. Interviews and research data was then summarized into a “pre-reading” packet, which was distributed to a group of approximately 30 people in the run-up to a face-to-face scenario creation workshop. The workshop took place over two days in Bilbao, Spain, and involved a total of 20 participants.

During this workshop, the past trends and issues document was reviewed, including the key themes from the interviews. Various brainstorming exercises to generate additional driving forces were conducted, which concluded in a clustering exercise to generate a series of higher-level themes. Finally, these clustered themes were combined into draft scenario matrices, from which the participants chose to develop draft scenario logics. Draft implications were also discussed and recorded.

After this workshop, I developed the material created into a series of draft scenario narratives (in my capacity as a consultant on the project). These were then reviewed by a small group from the client, who provided specific feedback on plausibility and narrative interpretation. A final set of qualitative scenario narratives was then created and distributed to the workshop participants. Later, these scenarios became the basis for a second series of workshops that developed the implications in more detail and made strategic recommendations for the region to follow. The latter workshops are not considered as part of this case study, which instead focuses on the scenario creation and detailing aspects of the process. This is done for comparability with the other cases in this research.

#### **4.4 Findings**

This section presents descriptive findings from the case relative to the measurement constructs defined in Chapter 3.

#### 4.4.1 Participation Characteristics

##### *Degree of Accessibility*

Like most face-to-face scenario planning projects, this case was invitation only. Pre-workshop research drew from both public databases and statistical sources, as well as private, proprietary trend databases and market reports. The qualitative interviews comprised a significant contribution to the data generation phase before the workshop. This was done on the basis of handpicked invitations, curated on behalf of the organizing group. The list represented a mix of regional elite and various subject matter experts, ranging from the heads of regional banks to expert consultants who had worked in the region in the past.

Invitation to, and participation in the scenario generation workshop was also private and chosen by the consultants and organizers. This involved a mix of local residents, professionals and content matter experts. Finally, the circulation of the draft reports for comment and review was also restricted to a limited, private group of experts.

##### *Amount of preparation required*

No preparation was required of the experts interviewed, although they were given the interview protocol in advance. Participants in the scenario creation workshop were asked to read the pre-reading packet distributed a week before the workshop, which summarized the results of the pre-workshop research and interviews. Anecdotal observation on the day of the workshop suggested that relatively few attendees had read the pre-reading material in depth, although no data was collected to support this observation.

### *The number of participants involved*

A total of 15 experts and stakeholders were interviewed, and 20 stakeholders attended the workshop. Six consultants and three staff members from the organizers also participated, bringing the total number of participants to 23. The actual scenarios were written by a consulting team of one full-time consultant with the oversight of two additional consultants who edited and reviewed drafts.

### *Reasons for participation*

Using Malone et al.'s (2010) framework, participation in the case of the interviewees was most likely governed by the desire to *influence* the process, as well as *personal interest*. Only one of the experts interviewed was paid for their participation, so financial reward was not likely to be a factor.

Participants in the workshop, however, were likely to be there for a combination of *influence, learning* and *personal interest*. Over 80% of those invited to attend the workshop did, indicating a high degree of interest in the process and its outcomes.

### *Degree of user anonymity*

Interviews were conducted under Chatham House rules, whereby no statements were attributed to specific individuals. Participation in the workshop was face-to-face, however, and many of the participants seemed to either know, or know of each other in both personal and professional capacities. While no recording of the scenario creation workshop was made, and no attribution or quotation was made of specific contributions in the scenario write-up, it was clear that the workshop participants were operating in familiar territory with full attribution, reputation and identity-awareness.

### *Type of participants involved*

Participants in the interview process were all male with one exception, almost all over the age of 40 years old, and all well established professionally and economically. All were also residents in and around the region of Bilbao, with the exception of two external experts interviewed who were consultants familiar with the region. Workshop participation was more balanced in terms of gender and age. Participants were a mix of independent creative artists and shop-owners, local politicians and notable personalities, researchers, academics and business-people. The mean level of experience was approximately 10 to 15 years of professional practice and the mean age was approximately 40 years old. Most participants were well educated by their professional standards, either in terms of PhD's and higher qualifications, MBA's, or fine arts degrees. The facilitators noted after the fact that the "harder professions" such as economics, business and industry were not well represented, leading to a possible bias towards more creative, community-oriented input.

#### **4.4.2 Interaction Characteristics**

##### Tasks Performed

The following **Table 4.1** presents a checklist of the activities performed during this case.

**Table 4.1 Tasks Performed in the Base Case**

<b>Task</b>	<b>Performed in Case 2</b>
Driver Identification	Yes
Driver Exploration	Yes
Driver Ranking & Selection	Yes
Driver Clustering & Aggregation	Yes
Scenario Logic Creation	Yes

Task	Performed in Case 2
Scenario Logic Selection	Yes
Scenario Logic Detailing	Yes
Implications Development	Yes
Implications Detailing	Yes, post-workshop
Full Scenario Narrative Creation	Yes, post-workshop

### Driver Identification

Drivers were generated both before and during the workshop. An initial list of drivers, with explanation and supporting data, was generated from the in-depth interviews before the workshop. These were summarized into four overall themes: Economy, Society, Politics and Culture, for a total of 14 themes. Initial themes included topics such as “the failure of the education system”, “large companies are leaving the region”, “it is harder and harder to get credit,” etc.

These themes were then presented in the workshop, which were used to spark a series of discussions and brainstorming sessions. Participants were then asked to create a new list of drivers in the form of topic headings. This was done through an “open-outcry” brainstorming session lasting approximately 30 minutes, in which any participant was permitted to call out a driver or factor they thought might be important to the future of the region. A total of 90 additional drivers were created, ranging from the vague and non-directional, such as “religion”, to the specific and directional, such as “the creation of new architectural icons like the Guggenheim”. These were categorized by hand on a wall chart using a traditional STEEP framework (Social, Technological, Environmental, Economic, Political).

Upon reflection, the facilitators agreed that the general quality of the drivers was less than ideal. Drivers were biased towards more vague, general headlines with little specific consideration of economic factors in particular. It was thought that this was a direct outcome of the professional composition of the room, leading one senior facilitator to reflect that, “there wasn’t enough horsepower in the room” to generate a more comprehensive or high-quality list.

### *Driver Exploration*

Preliminary drivers from the interviews and pre-read packet were presented as a PowerPoint presentation, lasting approximately 20 minutes. This was followed by a 20-minute discussion of the drivers and their implications. Drivers generated during the brainstorming session were discussed for approximately 15 minutes after their generation, to answer any questions and clarify their meaning.

### *Driver Ranking & Selection*

After generating the list of 90 additional drivers (which contained the original list of 14 drivers and themes as well), participants were asked to prioritize which of these they felt was the most important *and* most uncertain. This was conducted over an approximately 30 minute period, during which participants were given five red dots to distribute across the drivers as they saw fit. Participants were instructed to allocate the dots to the drivers they felt were both the most important and uncertain, thereby selecting for factors which were most likely to influence the region’s future in an uncertain way. Drivers were thus ranked based on those which received the highest number of dots.

### *Driver Clustering & Aggregation*

After the initial selection process, high-ranking drivers were then clustered together into a smaller subset in a facilitated session. This involved two steps, both of which were done initially by the facilitators while participants were at lunch, then repeated with the participants upon their return.

First, drivers with similar names or concepts were joined into one, based on the facilitator's suggestion and group agreement. Drivers such as "civil participation" and "citizen involvement in politics" were joined into one, for example, on the grounds that they were different ways of describing the same phenomena. The votes for both were then summed into a new driver indicative of both. This shrank the number of drivers by approximately 1/3.

After the first round of clustering based on definitional similarity, a second round took place exploring higher-level conceptual similarities. Drivers such as "educational standards", "parental involvement in education" and "educational funding" were grouped together, for example, into meta-categories such as "quality of education". This was done through a process of guided facilitation whereby the facilitator suggested clusterings to the group, who then debated, rephrased or agreed with the proposed suggestions.

In the end, a clustered list of three to four themes was chosen for further exploration. These high-level themes, now called "critical uncertainties", were then reviewed as a group to create a series of linear, binary "end points" for each uncertainty. Thus, "quality of education" was given two end-points, representing plausible extremes for how this uncertainty might play out. This included examples such as "high quality, open access education" versus "lagging standards, poor enrolment and exclusive access".

It is worth noting that this process took a significant amount of time when compared to the effort invested in driver filtration and clustering. Participants were very involved in debating the specific wording of the end points and appeared to be more heavily invested in the naming of the

axes and their extremes than in the choice of drivers in the first place. Subsequent experience in other workshops suggests that this is a typical experience, whereby participants recognize that a finalization of content is approaching and become invested in bundling their ideas and agendas into the specific wording of the final subset of variables.

### *Scenario Logic Creation*

The final subset of three critical uncertainties, with endpoints, were used to create a series of draft scenario frameworks. These took the form of typical Shell-style 2x2 scenario matrices that combined two critical uncertainties from the final list. **Figure 4.1** illustrates the combinatorial possibilities that were explored, including AxB, AxC, and BxC. These matrices, referred to by the consultancy as “candidate matrices” were then tested out one by one, with the facilitator spending a few minutes imagining with the group what each combination of key variables might look like.

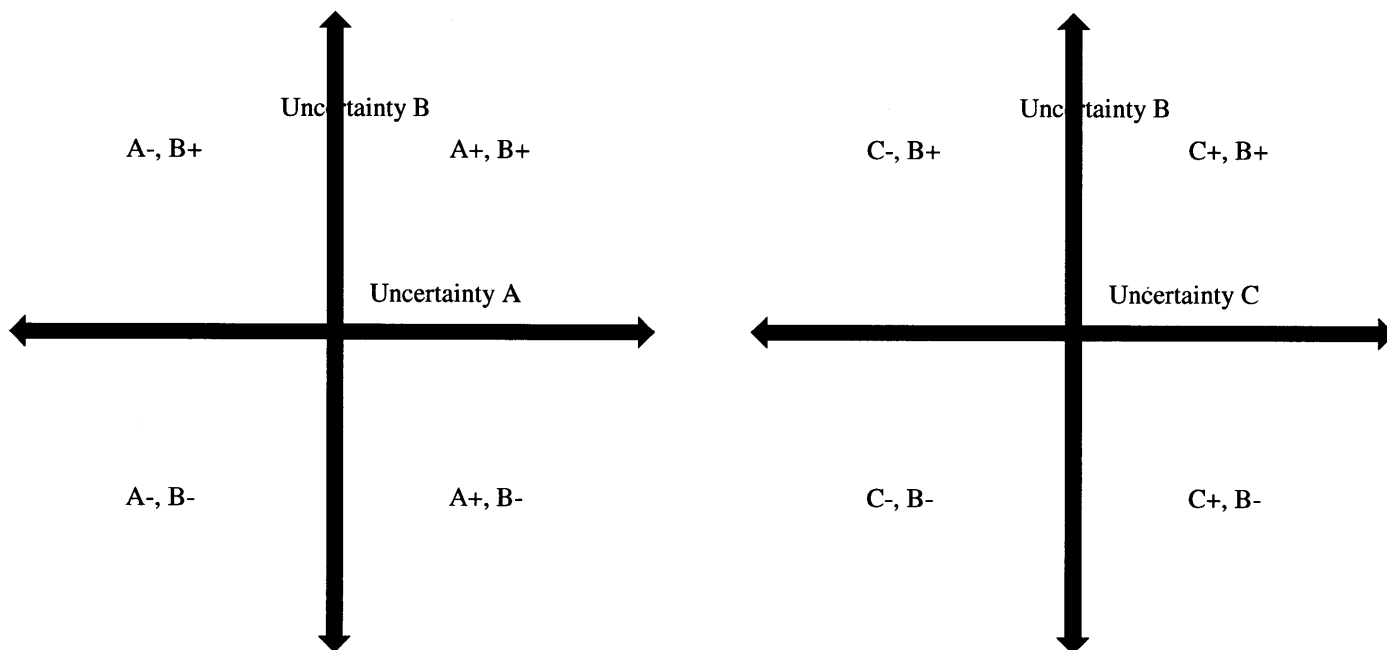
One candidate matrix, for example, used the drivers of “quality of education” and “quality of public leadership” to create four discrete worlds. Scenario A involved high quality education and high quality leadership; scenario B involved high quality education but low quality leadership, and so on. Next, a short sentence and a suggestive name was given to describe the feel of each scenario quadrant. Participants then voted on which matrix they thought “felt right”, was the most logical and plausible, and offered the most descriptive power to capture the key dynamics in the region’s future.

Given the pivotal role that this decision would play in defining the outcomes, relatively little time was allocated to the discussion and debate of the meaning of each axis and their combination. This is often typically the case in time-limited workshops. While it is important to acknowledge the logistic realities involved with running such workshops, the process involved little room for nuance



or discussion, a fact which many participants commented on as feeling artificial or forced. Thus the degree of conflicting judgement and debate, or the lack there-of, was highly influential at this stage.

**Figure 4.1 Example Scenario Logics**



### *Scenario Logic Selection*

The selected scenario matrix was then used to divide the workshop participants into four groups, each of which spent approximately 90 minutes imagining the future end-state in more detail and imagining how the region could evolve from today to that state. This involved the use of wall-sized paper templates, onto which participants affixed sticky notes of indicative events or headlines that could move present-day conditions towards the endpoint of their scenario. These notes were divided into standard STEEP categories.

Participants found it somewhat difficult to work backwards from a high level scenario description towards a plausible chronology of events, starting from today. A good deal of time was

spent discussing the scenario “end state”, then brainstorming possible events that could get the region from what it was today to that state. This process of deduction resulted in several false starts and blind-alleys, requiring the professional facilitators to intervene at several points and suggest actions of events that could get the group towards the desired goal. In this way the professional facilitator played yet another decisive role, helping to guide the group’s thinking towards storylines that were consistent with the end goal, even if the end goal appeared not to make sense from the perspective of events and trends described by the participants. It should also be noted that of the many ideas and post-it notes created by participants in the process, only a small subset were used by the consultants after the fact to construct the actual narrative. This involved a further round of judgement and filtration (and potential bias or manipulation).

#### *Draft Implications Creation & Selection*

After creating draft scenario narratives, participants were asked to spend approximately 60 minutes detailing high-level implications for the region in their scenario. This involved selecting key “winners and losers” from among present day stakeholder groups, identifying what major industries and economic sectors would succeed or fail, and what the major challenges and opportunities may be. This process was also conducted in small groups, by scenario. Finally, participants then presented their scenario sketches to the group in approximately five-minute segments and the workshop concluded.

#### *Detailed Scenario Narrative Creation*

At the end of this process, consultants took these results back to their office and produced a draft report of the scenario process. This involved first a detailed review of the suggested storylines and plot events created by participants in the workshop, as well as minor- to medium-degrees of

interpretation, revision, and rationalization. After this process of review, the consultants created a draft report describing the event and its outcomes. This included a summary of all the trends and drivers selected in the workshop, an overview of the two major critical uncertainties chosen, a presentation of the scenario matrix, and a detailed 5-10 page narrative write-up in the form of a fictional story. This narrative described in detail the kinds of events suggested by the participants and modified by the consultants. This process took approximately two weeks of full-time analysis and writing to produce.

#### *Kinds of inputs considered*

Inputs considered in this case involved baseline statistical data from various official State and private sources, news clippings and journal articles, in-depth interviews, and suggested “headline” drivers.

#### *Amount and type of visualization tools used*

Aside from PowerPoint visualization of representative pictures and quotes from the pre-read document, no visualization was used in any part of the process.

#### *Amount and type of analytical tools used*

No special analytical tools were utilized to collect, interpret, analyze, or summarize the interviews, nor were any such tools used during the scenario creation or write-up.

#### *Amount and kind of socialization enabled*

The face-to-face workshop enabled a significant amount of both directed and undirected conversation. Numerous opportunities were provided for participants to discuss key issues and implications, both as a group and in smaller, breakout groups. The workshop also allowed for

behind-the-scenes side conversations, between the event organizers, the facilitators, and amongst the participants themselves. This informal sharing of opinion, ideas and reactions, often over coffee and between cigarette breaks, is considered by many experienced scenario practitioners to be as important as the formal workshop itself. This is especially true when it comes to the secondary goals of scenario planning, which include enhanced socialization of different stakeholders and interest groups and, in its ideal form, increased consensus building and appreciation of diverse perspectives.

*Amount and kind of feedback provided*

During the workshop several opportunities for “checking in” were allowed. This helped to moderate the timing and focus of the workshop. Participants were also given chances to offer and receive feedback in the form of questions, comments and observations, both in the large group and in small breakout groups. No formal feedback mechanisms were conducted, such as post-workshop evaluation surveys or the like. Aside from client review of the scenario document drafts, no subsequent feedback on the final scenario set was solicited.

*The overall speed and timeline of the process*

The entire process, from start to finish, lasted approximately 12 weeks. This included the project set-up, research question discussion, interviews, workshop and post-workshop write-ups. The actual amount of time involved in each phase of scenario construction was less, however. Background research before the interviews lasted approximately two weeks. Setting up and conducting the interviews lasted approximately one week. Analysis and summarizing of the interviews, including production of the pre-read document for the workshop, lasted approximately three weeks. Setting up the workshop occurred in parallel, lasting approximately two weeks. The workshop itself

comprised two days, and the post-workshop write-up took two weeks for the initial draft and two additional weeks for all comments and revisions to be completed.

#### **4.5 Discussion**

The base case represents a fairly robust example of the current state of the art in mainstream, face-to-face scenario planning. Other instances may involve slightly more or less participants, more or less interviews, or slight variations on the overall process. But the core process involved is strongly representative of best-practice in scenario planning, particularly for government and public-sector clients.

One of the key strengths of such an approach is that it engages influential stakeholders in-depth discussions about these issues before bringing them together as scenarios. This has two effects: first, collecting data and information for the study itself and second, ensuring understanding and buy-in from influential political figures who will later be instrumental in the scenario's reception. The dual nature of both the interviews and, to a lesser degree, the workshop, enabled the consultants and scenario sponsor to spend significant one-on-one time with key influencers throughout the process. This helped to build social capital, build awareness and understanding of the work and concepts and get high-level input to the process. The purpose and benefit of such a labor-intensive face-to-face approach is therefore to maximize the social interaction component of the scenario process.

The same can largely be said for the scenario creation workshop, although this served a more functional role as well. The goal of such workshops is to bring together diverse stakeholders interested in or affected by the issues at hand and solicit their input and discussion on the topics presented. The importance of diversity also therefore serves two purposes: first, to ensure adequate breadth of perspective so that important trends and perspectives are included and second, to ensure

a vibrant and stimulating social experience. Even though the workshop in particular suffered from a slightly lower than desired diversity of professional expertise, it was highly successful as a social networking and capital building event. Several experts interviewed in relation to this topic suggested that while online systems may be perfectly suitable for the former goal (data gathering and analysis), they are far less likely to be effective at the latter (social capital construction and the creation of entertaining, stimulating experiences).

While both the interviews and workshop clearly met their political and social goals, there were questions as to whether or not they adequately met their data collection and synthesis goals. As explained, the lack of professional diversity in the workshop itself, combined with the short period of time to explore driver interactions, understand and agree on clustering approaches, and develop scenario logics, meant that the material itself coming out of the workshop required significant post-processing by the scenario consulting team. While the client felt that the final product was ultimately very successful, there is a clear danger that core concepts, participant perspectives and attitudes may be lost during this period of expert production. This could become a significant issue in the hands of inexperienced or biased facilitators, or in situations with highly contentious interpretations and agendas.

The strength therefore of this approach is its ability to successfully convene deep social interactions between key stakeholders. This, by necessity, limits the number of participants involved. It may therefore have indirect impact on the quality of the scenarios created, either because critical factors are missed, under-analyzed, or subject to conscious or unconscious bias on behalf of the scenarios team. Keeping a balance of the social richness of the scenario experience and the analytical richness that software systems may provide was therefore identified as a clear goal by several experts interviewed.

## **4.6 Conclusion**

This chapter introduced the base case, which will be used for pair-wise comparison with the two in-depth online cases and the three comparative examples. It explored how the process of face-to-face scenario planning typically works, elaborating on each of the key measurement dimensions defined in Chapter 3. It then discussed the relative strengths and weaknesses of this approach, setting the stage for further reflection in Chapter 8: Discussion. The following chapters presents the two in-depth case studies, followed by a short chapter on the comparative examples to complete the presentation of findings.

## **Chapter 5 Case 1: Futurescaper, The Impact of Climate Change Impacts On the UK**

### **5.1 Chapter Introduction**

After completing the Base Case, the first prototypical collective intelligence system was developed to generate relevant data for the research questions. The first system was called Futurescaper. This chapter presents the background on this case, an overview of the system design and functionality, the findings it generated relative to the constructs defined, and discussion of how these categories relate to the research questions.

### **5.2 Case Background**

For this case, I designed and developed a prototypical data generation and analysis platform for exploring various aspects of the qualitative scenario planning process online. Data generation for this case was completed using data from the International Futures Forum (IFF) as part of a project run by Tony Hodgson on the implications of climate change impacts for the UK Government. The purpose of this project was to identify the systemic linkages between climate change impacts in other parts of the world and the secondary and tertiary impacts on critical supply chains and governance functions within the UK. The Futurescaper system was designed by myself and implemented and developed in the programming languages MySQL and PHP by a colleague, Nathan Koren.



### 5.3 System Description

Futurescaper used a structured, form-based approach to the collection of trends and drivers that could affect the future of the research topic. It stored these trends in an online database and provided basic analytical tools to aid in their analysis.

This case platform was designed to be used in the early and middle stages of scenario creation research. It sought to address the task of generating trends and drivers, exploring their interactions, ranking them, clustering them into high-level themes, and then assembling them into analytically useful visualizations. It was not designed to address the latter stages of scenario creation, including scenario logic creation, selection, detailing or narrativization. Towards this end, an expert scientific panel selected 186 representative scientific articles and news clippings, which were then uploaded onto the system for analysis and clustering. Users could browse this data, add new trends and drivers, explore how they interact, and download them for subsequent visualization.

**Figure 5.1** presents a flow chart detailing the steps undertaken by a typical user of the system, and **Figure 5.2** presents a screen shot of the main user interface. Figure 5.1 shows how a user first selected a scientific or news article for entry, entered its details into the form, and then explored how this new data point related to others within the system. It can be seen that the major emphasis was on data entry, exploration and analysis. There were no in-built functions for story-building, discussion, voting or socialization in any way. This is one of the limitations of the system that will be described below, but one that makes it a focused example for considering different ways of collecting, exploring and clustering driver data for early-stage scenario generation.

Figure 5.1 Futurescaper Process Overview

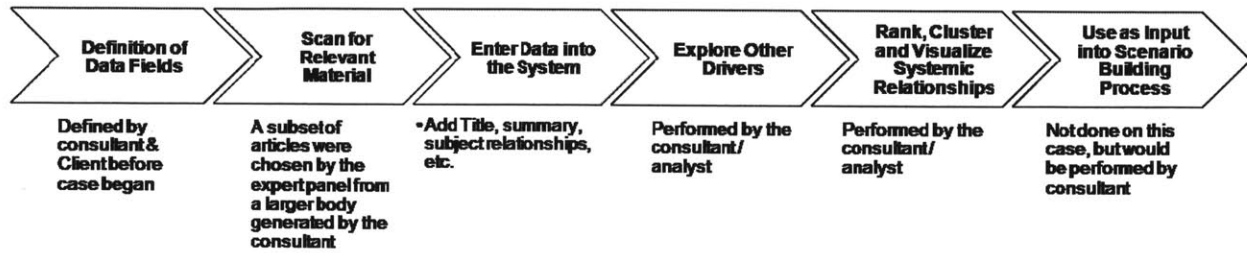


Figure 5.2 Futurescaper Trend Entry User Interface

**Title :**

**Primary Node :**

<input type="radio"/> Climate	<input type="radio"/> Community	<input type="radio"/> Economics	<input type="radio"/> Ecosystem
<input type="radio"/> Energy	<input type="radio"/> Food	<input type="radio"/> Governance	<input type="radio"/> Infrastructure
<input type="radio"/> Trade	<input type="radio"/> Water	<input type="radio"/> Wellbeing	<input type="radio"/> Worldview

**Related Node(s) :**

<input type="checkbox"/> Climate	<input type="checkbox"/> Community	<input type="checkbox"/> Economics	<input type="checkbox"/> Ecosystem
<input type="checkbox"/> Energy	<input type="checkbox"/> Food	<input type="checkbox"/> Governance	<input type="checkbox"/> Infrastructure
<input type="checkbox"/> Trade	<input type="checkbox"/> Water	<input type="checkbox"/> Wellbeing	<input type="checkbox"/> Worldview

**Horizon :**

<input type="radio"/> Crisis (H1)	<input type="radio"/> Capture (H2-)	<input type="radio"/> Neutral (H2#)	<input type="radio"/> Transition (H2+)
<input type="radio"/> Viable World (H3)			

**Description :**

**Tags :**

**Relationships :**

	Increasing :	Decreasing :
<b>Driven by :</b>	<input type="text"/>	<input type="text"/>
<b>Drives :</b>	<input type="text"/>	<input type="text"/>

## 5.4 Findings

This section presents descriptive findings from the case relative to the measurement constructs defined in Chapter 3.

### 5.4.1 Participation Characteristics

#### *Degree of Accessibility*

Use of the Futurescaper platform for this case was confined to the project team working on the project, the panel of experts involved, and the client working group. There was no promotional effort conducted to enhance participation or encourage additional participants. The platform was tested on a password-protected server and all data was considered confidential.

#### *Amount of preparation required*

The case began with an expert panel who identified over 800 scientific papers, journal articles and press clippings related to various aspects of climate science, hydrology, food supply, shipping infrastructure, epidemiology and other fields. This collection of articles, which was prepared before the platform was developed, was summarized by a consulting intern. 186 of these summaries were then uploaded into the Futurescaper prototype to test the driver entry and clustering components of the process. Articles were selected for inclusion based on those deemed most useful by the expert panel.

Although extensive background research was conducted for the preparation of material as part of this case, the system was designed to accept input without the need for rigorous background screening. Any kind of driver or trend, entered into the form described below, could hypothetically be entered and used with minimal preparation. The high degree of participation required in this

instance was therefore a feature of the project, generating data for this case, not of the system design itself.

#### *The number of participants involved*

Approximately 12 experts participated on the expert panel. A single intern input the article summaries into the system for analysis. Four distributed analysts from the consulting team then used the platform to explore, summarise and visualize the data. In this case, the experts acted as “users”, in the sense that they selected data for input, the intern mirrored the role of a user actually entering data into the system and the consulting analysts acted as users making use of the output of the system as part of their larger project goals. Thus participation in this case was more a function of the project logistics from which the case derived its data, and not a design of the system itself.

#### *Reasons for participation*

Participants were either involved because it was their job (vis-a-vis the expert panel), because they were being paid as consultants, or because they were interested in the research and motivated by the topic. As per Malone et al.'s (2010) framework, participation was governed by direct compensation and learning.

#### *Degree of user anonymity*

No user-account system was created as part of this platform for this case study; thus all entries and user actions were anonymous.

### *Type of participants involved*

Given the small number of participants, the demographics of the participating population were skewed heavily towards highly educated content experts. Although a formal demographic survey was not conducted, their general level of education was PhD and above, they were well-respected experts in their fields with over 20 of years experience, and from a range of specialities within the fields of physical sciences, biology, economy and public policy. Few business interests were represented.

The average age of the participants was estimated to be over 50 years old; most were Anglo-Saxon white men. Thus, while the sample represents a highly educated, professionally diverse group of participants, they were unrepresentative of the general population mix of Great Britain; no efforts were made to include specific minority groups or young people.

### **5.4.2 Interaction Characteristics**

#### *Tasks Performed*

The following **Table 5.1** presents a checklist of the activities performed during this case.

**Table 5.1 Tasks Performed During Case 1**

Task	Performed in Case 1
Driver Identification	Yes
Driver Exploration	Yes
Driver Ranking & Selection	Yes
Driver Clustering & Aggregation	Yes
Scenario Logic Creation	Partial

Task	Performed in Case 1
Scenario Logic Selection	-
Scenario Logic Detailing	-
Implications Development	Partial
Implications Detailing	-
Full Scenario Narrative Creation	-

### *Driver Identification*

Drivers and trends deemed useful by the expert panel for qualitative scenario planning were derived from over 186 article summaries of scientific papers, news clippings and journal articles. The following dimensions were entered manually into a web form, which is reflected in **Figure 5.2**, above:

1. Title
2. Primary Subject Category (using pre-defined subject “nodes”)
3. Secondary Subject Category
4. Time scale (vis-a-vis a “horizon” metaphor defined by the lead researcher)
5. Description
6. Subject tags
7. Relationships to other themes
8. Quality

These data fields were determined by the consulting team in advance of data entry, meaning that participants had no control over the kinds of information the system was set up to collect.

Although useful as a data collection mechanism (as well as a facilitation mechanism to help focus user attention on variables of importance), a true collective intelligence system would also allow user reflexivity on the fields collected. This would impose a wide range of technical challenges, however, so for both project-specific and technical reasons, a more static form was chosen.

When entering each item, users were also asked to map the relationships between that item and other driving forces. In this case, this means the consulting intern entering the data was asked to spend time thinking about how this article related to others, vis-a-vis systemic relationships of influence. This was achieved through a two-by-two matrix which prompted users to consider what subjects or data items may be driving forces for the subject, and what impacts the subject or trend might have on others. This was built upon a predictive text engine that drew from a database of futures-related key words based upon the UK Government’s database of trends and drivers called “Sigma Scan”.

By typing any letter into one of the boxes, the system suggested additional subject tags with similar patterns of letters to the user. If no tags existed that were close to what the user typed, the system would save their entry to the tag database for future use. This combination of pre-coded subject tags and folksonomic data entry techniques allowed for flexible categorization of subject tags and driver relationships. **Figure 5.3** displays an example of this process.

**Figure 5.3 Subject Tag Relationship Definition**

**Relationships :**

	<b>Increasing :</b>	<b>Decreasing :</b>
<b>Driven by :</b>	au	
<b>Drives :</b>	causality	
	automation	
	authoritarianism	
	automated vehicles	

*Driver Exploration*

The platform provided basic tools for exploring related trends and drivers. Once the amount of data in the system reached a critical threshold, users could begin exploring the trends and linkages

between them. This was achieved using tag-based relationships with the information specified by the user in the “Relationships” fields. For example, if Item A was coded as being “Driven by Increasing water scarcity”, and Item B was coded as “Driving Increasing water scarcity”, than the platform would identify this linkage and connect the drivers in a functional, direct connection. This allowed for both direct linkages (i.e., A is connected to B) and secondary and tertiary network connection (i.e., A is connected to B, B is connected to C therefore A and C are partially related). The system employed a modified ‘instant run-off approach’ to evaluate connection strength between nodes, based on how many data points are related in their use of similar key words. One significant feature of the design is that Futurescaper explores the connections of those connections, so that the user gets a networked effect instead of merely a sense of the immediate influence of a trend.

In its simplest guise, this took the form of a browsable database of any of the field categories provided (including title, subject tags, subject categories, etc.), sorted in a variety of ways. Users could search the database of content to explore the articles and then view and modify existing data entries with Wikipedia style revision editing. **Figure 5.4** displays an example of a typical browse query and **Figure 5.5** displays an instance of a single coded data item.

The exploration of such queries operates in two ways. First, is what might usefully be considered a “bottom-up” analysis. This approach starts with a single data point or subject area. It proceeds to explore the types of forces and facts that are linked to that subject. To employ a hypothetical example, a user might start with a single trend or news items, such as “Mexican Zetas Win Firefight with State Police Forces”, and explore what other trends and news items Futurescaper identifies as related via user designated tag relationships.



Figure 5.4 Browsable Driver Database

Title	Description	Primary Node
<u>Global increase in mean temperature</u>	A global increase of temperature	<u>Climate</u>
<u>Food production shifts</u>	Changing temperatures produce global variation in food crops	<u>Climate</u>
<u>Extreme weather events</u>	Increasing storm surges, hurricanes, land slides and other natural disasters cre...	<u>Climate</u>
<u>Decline in crop yields due to global warming</u>	Urgent necessity to develop crops that produce greater yields in harsher conditi...	<u>Food</u>
<u>Generating a 'miracle' for the ailing Baltic Sea</u>	Over-fished, polluted by agricultural nutrient discharge and uncared for, the Ba...	<u>Ecosystem</u>
<u>Cities prepare for life with the electric car</u>	The San Francisco building code will soon be revised to require that new structu...	<u>Energy</u>
<u>Branson Warns That Oil Crunch is Coming Within 5 Years</u>	Sir Richard Branson and fellow leading businessmen will warn ministers this week...	<u>Energy</u>

Another way that the platform enabled users to explore trends and themes was to take a high-level “top-down” approach, beginning with the “Primary” and “Secondary Nodes”, or subject categories. This functionality was developed at the request of Tony Hodgson, project leader from the IFF who was leading the project generating data for this case. When using a top-down approach, a user can select any number of high-level themes such as “water”, “energy”, “governance”, etc. Futurescaper would then generate a ranked list of all the data and trends that influence or connect all three. Thus, instead of going from a specific trend or force and seeing how it links to others, the “top-down” analysis allows the user to pick high-level relationships and see what data points and trends are strongly connected across these themes. This type of analysis proves to be particularly useful in the context of thematic research, as opposed to more exploratory, unguided research.

Figure 5.5 Example of Driver Summary

## Exploitation of groundwater

Entry Date 2010-08-20 00:15

:

**Primary Climate**

**Node :**

**Secondary Infrastructure, Water**

**Node(s) :**

**Horizon : Crisis (H1)**

**Description** Because of the inefficiency of large water irrigation systems, people have been forced to exploit groundwater. The bulk of Indian agriculture remains rain-fed, but also depends on groundwater rather than surface water - a worrying fact in the context of climate change and increasingly variable rainfall. Thus, due to excessive withdrawal of groundwater, groundwater use is exceeding the rate of groundwater recharge.

**Tags :** agriculture, climate change, india, water, water resources development

This Fragment :		
	Increasing :	Decreasing :
<b>Driven by :</b>	<u>inefficiency of large water irrigation systems, variable rainfall</u>	
<b>Drives :</b>	<u>groundwater depletion</u>	

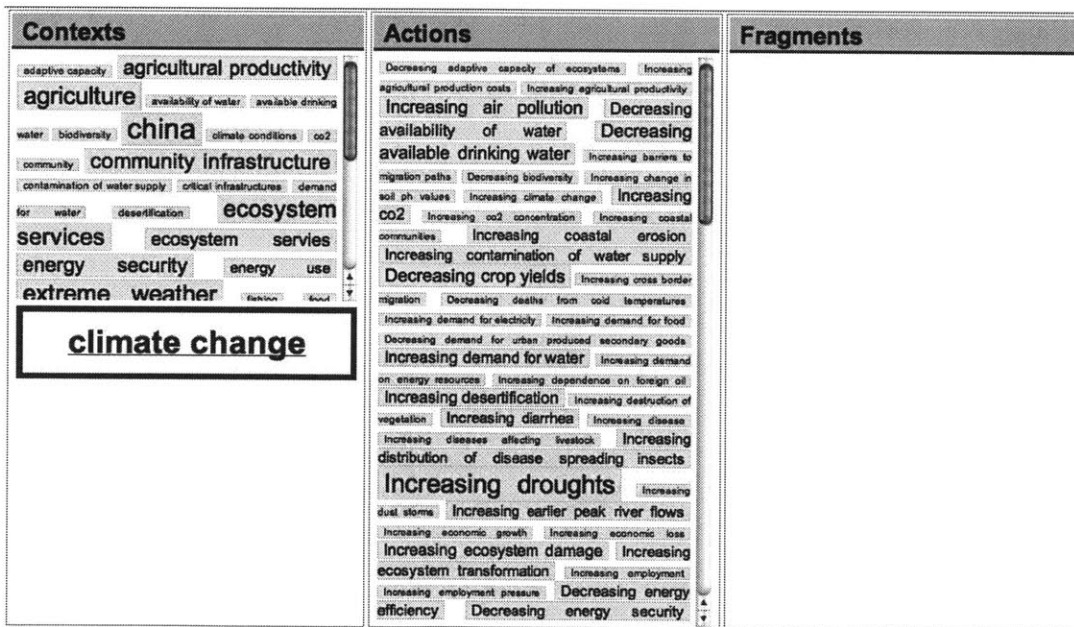
**Quality :** Reliable

**Edit Fragment**

For more complex queries, Futurescaper provided tools for users to explore the primary, secondary and tertiary connections between driving forces. This was accomplished through a tag cloud-like interface, word trees and systems maps. In the first instance, a tag cloud of the most referenced subject tags was presented. Users could then select a single subject tag and see what factors were driven by it (i.e., what its impacts were perceived to be). They could then select impacts and browse a list of data entries associated with it. **Figure 5.6** presents an example, using the subject tag for “climate change”. The subject “context” is selected in blue on the frame on the left, the impacts (or “actions”) associated with that tab are presented in the frame in the center, and any fragments associated with selected actions are displayed in the frame to the right.

In the example from Figure 5.5, “Climate Change” impacts a large number of other trends and forces, which are displayed as a tag cloud whereby font size represents the number of connections between the driver and the impact. Thus “Climate Change” as a subject tag is related to “Increasing Droughts” as a secondary tag, which itself will have a variety of associated fragments linking to evidence from the summary articles. Use of this cloud allowed for users to visually and textually search the database for key trends and subjects, then explore how they related to other drivers and impacts. Figure 5.6 displays the database structure of these relationships.

Figure 5.6 Explore Relationships Between Drivers via Tag Clouds



*Driver Ranking & Selection / Driver Clustering & Aggregation*

In this case, driver ranking and selection occurred after clustering and aggregation. Thus both are dealt with jointly in this section. Recognizing that the tag relationships between articles comprised a directed network of relationships, a network analysis plug-in was created to export data as a Pajek database. This was then imported into an open-source network graphics visualization package

developed by Rosvall and Bergstrom at the University of Washington (2011), which includes various clustering, network analysis, and visualization algorithms.

The first step in drivers ranking involved restructuring the database upon export to make nodes, links and link direction explicit for the software. These followed the standard Pajek network map syntax, summarized below in **Tables 5.2(a), 5.2(b)** and **Figure 5.7**. The reformatted database was uploaded into Rosvall and Bergstrom’s online network analysis platform, allowing for several forms of network analysis to be conducted. The first involved a simple ranking of the number of times a subject tag was mentioned in the database, thereby providing a crude ranking mechanism.

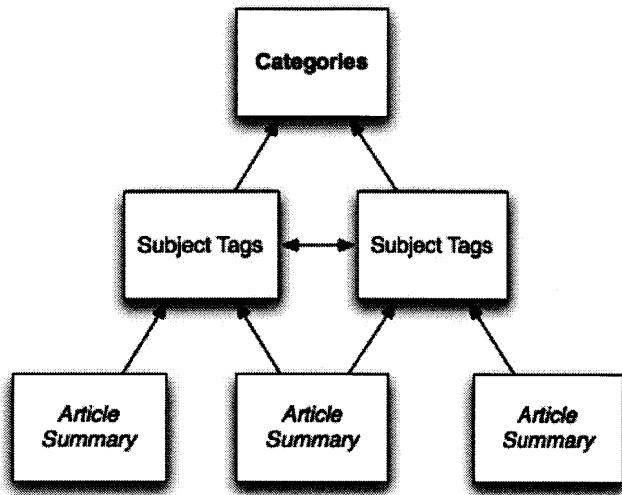
**Table 5.2(a) Pajek Network Syntax**

Vertex Variables	Arc Variables
Vertex ID, “Name”	Vertex 1 ID, Vertex 2 ID, Weight (number of connections)

**Table 5.2(b) Example of Network Export for Driver Relationships**

Vertices	Arcs
1 "Biofuels"	2 3 1
2 "Decreasing cost"	4 2 1
3 "Increasing participation"	4 6 1
4 "Increasing carbon sequestration"	7 12 2
5 "Coal"	7 13 1
6 "Increasing creativity"	7 15 2
7 "Decreasing barriers to trade"	7 17 1
8 "Bubbles"	7 18 1
9 "China"	7 19 1

Figure 5.7 Structure of Database Relationships



A more sophisticated approach involved calculating rank based on the number of connections per node (i.e., its local neighborhood size). This began to take into account the network centrality of a node, but evidence from applied network analysis suggests that local neighborhood size is often a crude measure for the degree of influence or importance of a node in a system. Other, more complex network analysis approaches were therefore explored, including varying the neighborhood size considered for each node, performing multi-radius nearness and centrality measurements within Pajek, and using basic clustering algorithms such as k-means testing.

Proper exploration of the effects of these network parameters was beyond the scope of this research. The default clustering settings based on research by Rosvall and Bergstrom were used to demonstrate proof-of-concept validity of such an approach to driver ranking and influence. This approach works by estimating the probability flow of random walks on a network, then considering that as a proxy for information flows in a real world system. It then decomposes the network into modules by compressing a description of the probability flow using Hoffman encoding. See Rosvall and Bergstrom's 2011 paper for more detail.

Once analysed, ranking and clustering was visualized and performed in four ways:

1. List-based
2. Circle diagrams
3. Causal loop diagrams
4. Cluster-based diagrams

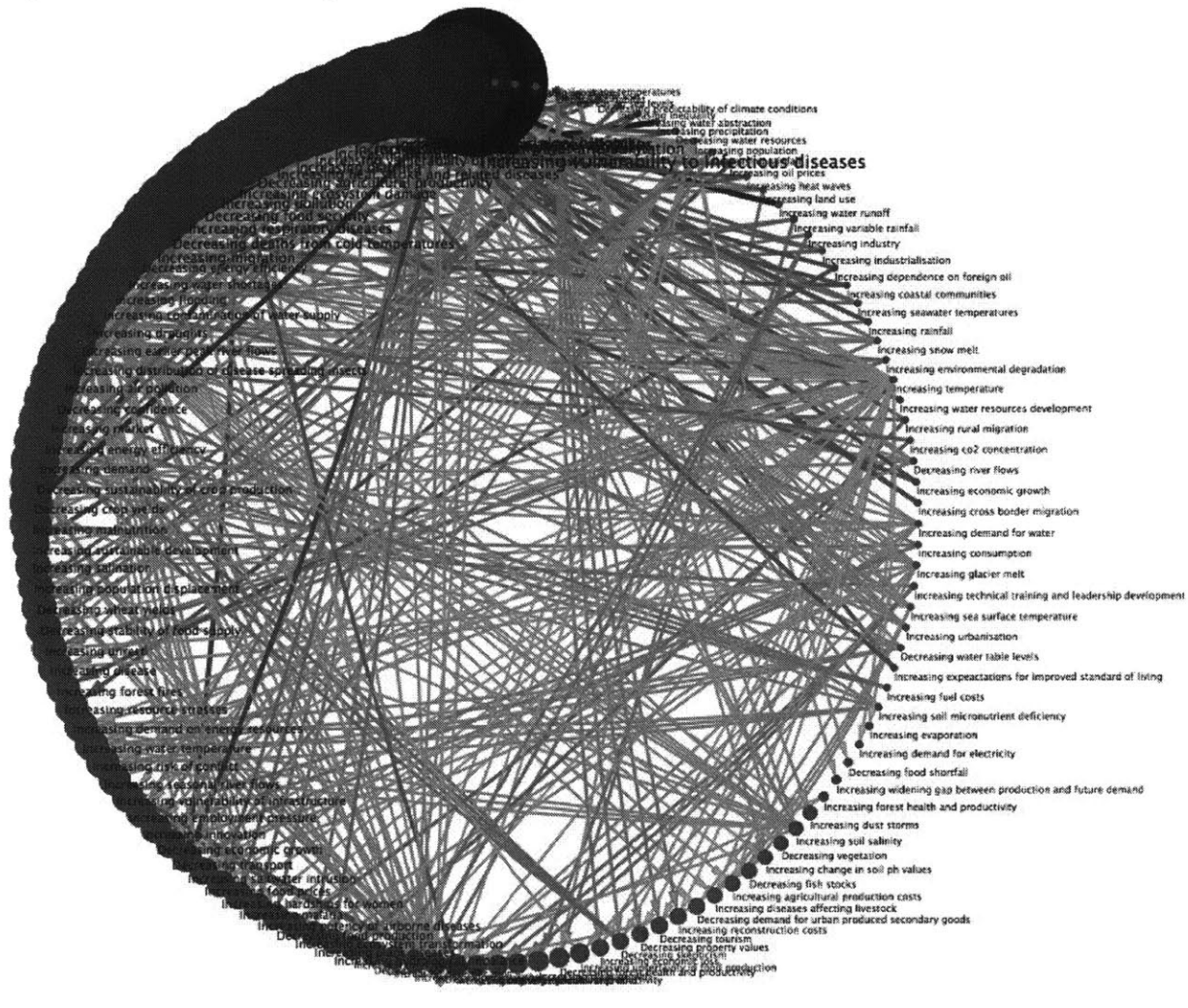
#### *List-based output*

The most basic form of activity made possible by this analysis was a list-based ranking by degree of influence. This straightforward process simply sorted driving forces by their degree of influence on other drivers. As explained above, this ranking score was bi-directional. Variables with the highest degree of systemic influence received the highest score. These could then be exported as any kind of list, allowing analysts to better understand the main drivers of change in a system. This understanding could subsequently be used to suggest their consideration amongst the main drivers in a scenario construction exercise, as opposed (or in addition to) the more traditional voting process often conducted in a workshop.

#### *Circle diagrams*

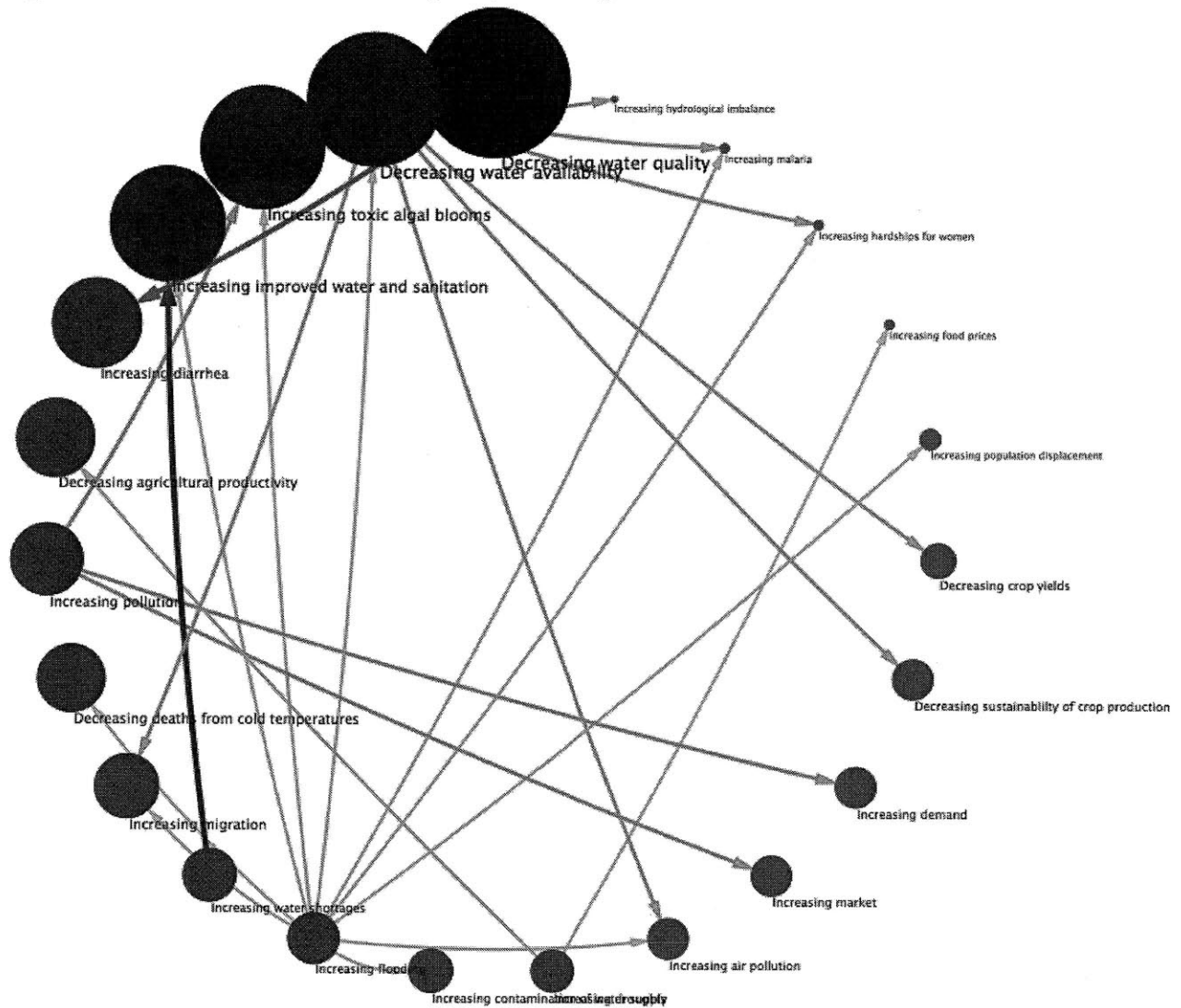
Given the multi-directional interaction between drivers, it was found that simple lists were often inadequate for representing complexity of relational information captured by the Futurescaper platform. Circle diagrams were used to allow for simultaneous ranking of overall influence, as well as visualization of first-order relationships in the context of all other variables. **Figure 5.8** displays the output of this visualization technique for this case. Circle size represents the network centrality of a driver (and thus its implied importance), whereas the color and thickness of connecting lines indicate network edges.

Figure 5.8 Circle Diagram of Driving Forces



Such a full representation of the systemic complexity of the interacting variables can be overwhelming; additional visualizations of subsets can easily be created by confining the number of variables for consideration. **Figure 5.9** displays just the top 20 interacting variables from the Futurescaper climate change case as an illustration. This reduced form allows for a more useful estimation of influence (by rank and circle size) as well as interaction (by links, their direction, and their strength).

Figure 5.9 Reduced Circle Diagram, Ranking Drivers



*Causal loop diagrams*

Further information was able to be extracted from this case using an additional visualisation technique from system dynamics known as causal loop diagramming (Sterman, 2000). One main potential advantage of engaging users to explicate near-term relationships of variables when entering data is that the platform is then able to perform multi-link analysis behind the scenes on the entire set of data generated through user participation. This allows for the automatic creation of relational systems maps, which when combined with the graph analysis techniques explained above, produce a causal loop diagram detailing the main forces of interaction between component parts. Users can



determine the number of variables visualized in the diagram and the level of links to show, thereby allowing users to customize causal loop diagrams to their analytical needs. In the instance of this case, participants created the causal loop diagram presented in **Figure 5.10**.

### *Cluster-based diagrams*

Finally, the case also generated high-level thematic summaries based on Rosvall's clustering algorithms. These summaries, presented in **Figure 5.11**, clustered drivers into high-level themes based on their clusters of influence and similarity. The links between themes were then represented with lines, the thickness of which were indicative of the level of interaction between themes. Thus in the example below, "Climate Change" was found to be linked most directly to "Economic Growth", "Expanding Population" and "Pollution", each of which had various sub-themes and secondary connections between them. Although quite high-level, analysts found the use of such summary diagrams to be a useful and important tool to communicate high-level concepts in the case. These were then supplemented with the more detailed visualizations and analysis explained above.

Figure 5.10 System Map of Driver Relationships

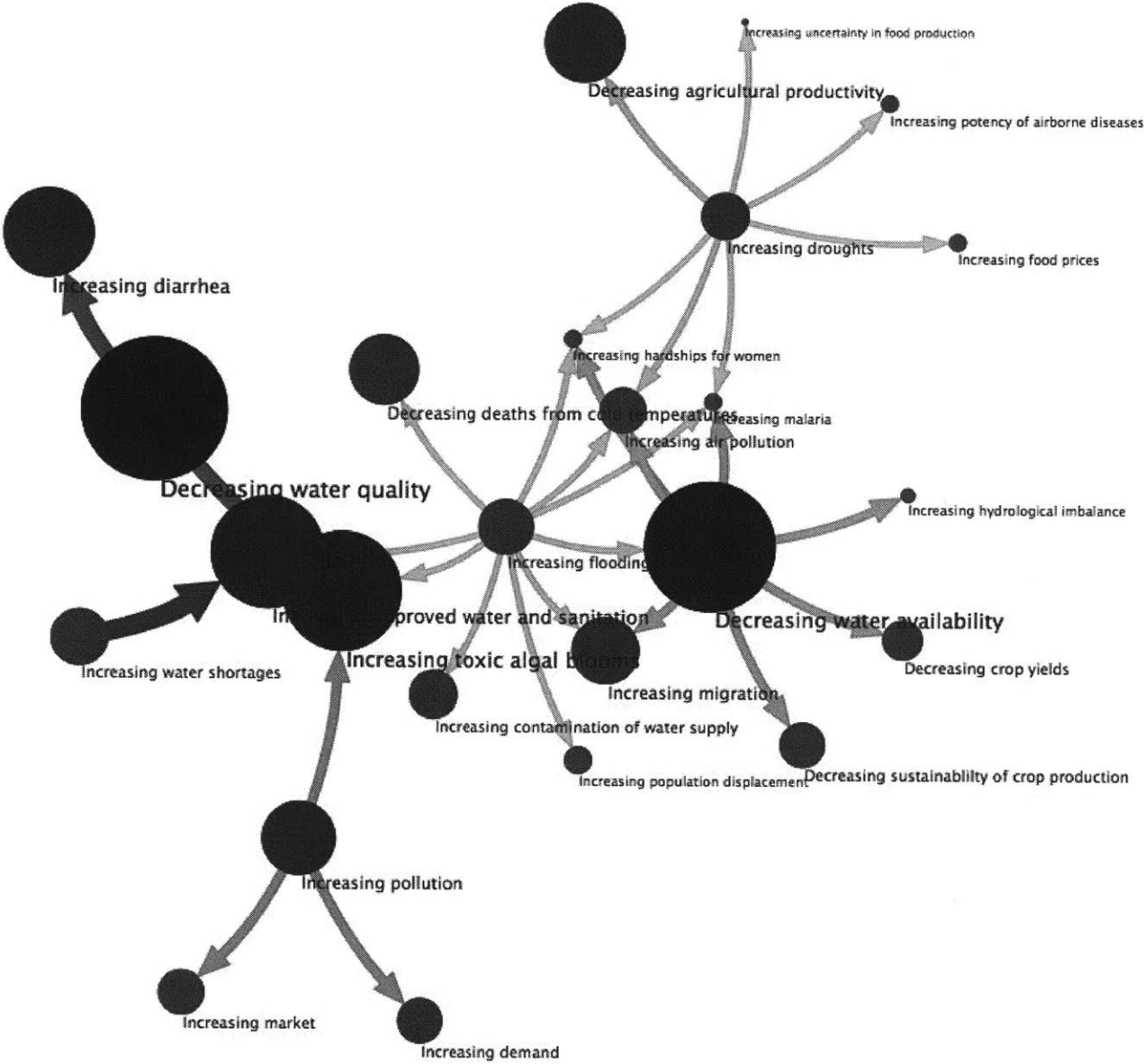
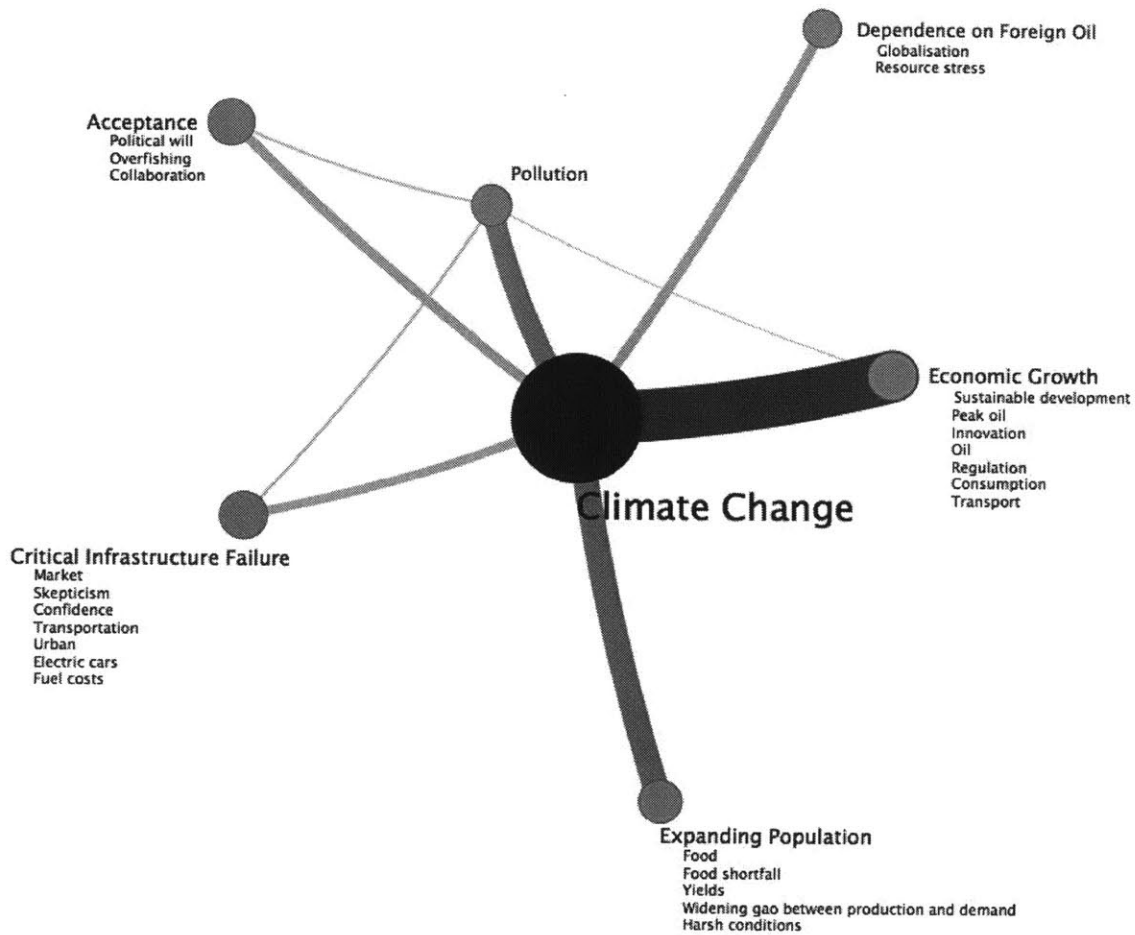


Figure 5.11 Cluster Diagram of High Level Thematic Concepts



*Scenario Logic Creation & Implications Development*

Although this case did not use the Futurescaper platform for full scenario creation (as long form narratives, for example), the ranking and diagramming process generated during this case proved to be useful as input for rapidly prototyping draft scenario logics. This was achieved by identifying the top drivers that were most influential on the system (via a network analysis), then using the systems diagram to explore how perceived changes in these variables are understood to impact other variables. Thus in the example from **Figure 5.10**, “Decreasing Water Availability” would impact “decreasing crop yields”, “increasing migration” and “increasing hardships for women”. “Increasing

droughts” would have implications for “decreased agricultural productivity”, “increasing food prices”, and several other outcomes.

#### *Kinds of inputs considered*

The platform developed for this case accepts abstracted descriptions of trends, forces and events in the form of a text-based web-form. It therefore requires the user to enter data in a somewhat specific epistemological form.

#### *Amount and type of visualization tools used*

As detailed above, Futurescaper relied heavily on Rosvall and Bergstrom’s (2011) clustering platform for visualization and analysis. This involved the export of data from Futurescaper and transfer to their package, in which analysis could then be conducted. After conducting analysis, interactive visualizations could be created for export as standard web graphic formats.

#### *Amount and type of analytical tools used*

The case used a combination of standard sorting and querying tools with somewhat more advanced network analysis and clustering approaches. Given the complexity of the clustering and network algorithms used, and the extent to which the testing of these particular tools were beyond the scope of this research, they are reported “as is” for purposes of this case.

#### *Amount and kind of socialization enabled*

The use of the Futurescaper platform for this case did not incorporate social features such as commenting, discussion boards or user groups which would encourage social interaction. Nor were

social features such as voting enabled. Thus the kind of reflective dialogue and debate typified by many face-to-face scenario generation workshops was not facilitated or captured by this process.

#### *Amount and kind of feedback provided*

Generating data for the system provided users with direct feedback on their entry via acknowledgement notifications and direct, on-screen response to interactivity. Users exploring relationships within the system were also prompted to explore related topics or entries. No form of email notification, Twitter integration, scoring, leaderboards or other feedback mechanisms were incorporated into the design of the system for the purpose of this case.

#### *The overall speed and timeline of the process*

Once the core aspects of the system were operational, the process of inputting trends and evidence comprised approximately three days of effort. Had this effort been distributed amongst many users, as opposed to being centralized with a single intern, this process may have taken less time. Ranking and analysis of drivers and their relationships took between three and four hours total.

## **5.5 Discussion**

Based on the findings from this case, it appears that the Futurescaper online collective intelligence system has the potential to augment, but not supplant, the traditional scenario-building workshop format in the urban planning research process. It appears to have the greatest utility at the early phases of scenario creation, specifically at the horizon scanning, trend generation and thematic analysis stages. It offers a way to engage a broader and more diverse audience in the scenario creation process, has the potential to speed up the drivers ranking process, and has the potential to provide increased transparency in the choice of key drivers. Futurescaper also allows for further

interactive exploration of complex trends and patterns that could be difficult or impossible in the traditional workshop setting. In addition to these general observations, the following key themes were also identified from the findings of this case.

### **5.5.1 Low participation makes this case difficult to evaluate against diversity and participation claims**

One of the core research questions behind this dissertation is what impact online participatory approaches to scenario development may have on the number and kinds of people involved. Given the experimental nature of this case, the number and diversity claims could not be addressed. This shifts the analytical value to the other aspects of the research question, particularly the role that these approaches can play in the speed and timeliness of such cases, as well as the kinds of analysis conducted.

### **5.5.3 The platform offered enhanced transparency and visibility during the decision-making process**

The use of both sortable databases and rudimentary clustering algorithms meant that greater degrees of transparency were possible throughout the scenario-creation process. Because many face-to-face scenario workshops are constrained by time and participation limits, it is not always possible to explain and justify all the design decisions taken in a scenario-creation process. The use of a digital platform like Futurescaper allows for a more transparent “paper-trail” behind decisions taken, thereby offering greater visibility throughout the entire process.

### **5.5.1 Visualization provides significant added value**

While the formal query capability of the system was of some use, it was not until the systemic relationships were visualized as graphs and networks that the platform became truly useful to the consultants. These visualizations, particularly the causal-loop diagrams, allowed for the rapid exploration of 2nd and 3rd order relationships between drivers and enabled analysts to quickly identify potential pivot points within the story. This appears to capture more real-world complexity in participants' understanding of the system dynamics, thereby facilitating the kinds of “strategic surprises” most sought after in scenario workshops. Although not used for such in the formal project of from which this case was derived, subsequent scenario consultants could use this to create draft scenario logics based on inductive, causal reasoning instead of deductive, 2x2 matrices. This could add significant value to the realism and level of complexity that such scenarios can encompass.

### **5.5.2 An explicit focus on uncertainties would be valuable**

That said, the design and functionality of Futurescaper for this case did not incorporate functions or capacity to translate the connections and themes into scenario logics or scenario narratives. The case did not explicitly draw out uncertainties in the form most often used in deductive scenario workshops, therefore placing additional analytic burden on the user to build scenario frameworks. Connections were based solely on the number of times they appeared in the database, which can be a function of both popularity as well as influence. To address this, it is suggested that the addition of either a second round of drivers clustering, selecting for the most influential and uncertain, or the demarcation of uncertainty estimates at the point of data entry, would be useful. This would be useful in both inductive and deductive scenario building modes, regardless of the final form of scenarios chosen.

#### **5.5.4 The expert interface was difficult to use and may discourage use in a more open setting**

Because the process of employing Futurescaper, as executed in this case, required a substantial amount of up front data-entry, this platform was perhaps best suited to situations where a dedicated team of researchers and research assistants had the capacity to scan for relevant news items, data sources and trends, and input them into the system. In this situation, it took about 30 seconds to one minute to enter each trend or force into the system. The data entry process was not particularly enjoyable or intellectually stimulating.

#### **5.5.5 Incorporation of other forms of data entry and analysis would offer greater flexibility**

The strength of this platform for this case was that it offered a structured way of entering and relating data in distributed ways. However, the use of segmented web-forms may discourage broader participation, which suggests that alternate forms of contribution may be valuable to explore. Instead of abstract summaries of articles and news clippings, this could include more narrative-based inquiry (“Tell me a story that is representative of something important”), opinion, or even graphics and links to other data sets. The ability for other users to critique, comment upon and revise data points would also add more flexibility in this regard.

#### **5.5.6 Socialization and engagement mechanisms were missing**

No effort was made in this case to facilitate user-to-user social interaction. It is clear that as a design and experimental variable, Futurescaper should be integrated with social media in manner consistent with notions of “social scanning” raised by Pang (2009). This idea suggests that users should be able to see what each other are rating as interesting and important, as well as comment or vote upon what others felt was worthy of attention. This could function similar to the Facebook “like” button



or the Google “+1” function, both of which allow a community of users to collectively evaluate the submissions of individuals into the system.

Such integration with scanning would take advantage of the geometry of activity on the web – many people doing many small things in parallel – to create greater scanning breadth, diversity of input, and larger participation. Combined with basic analytical tasks, it could also allow for greater user involvement and processing of the data.

The user interface, which is rather clunky and drab, is not yet effective at facilitating social engagement. Basic Web 2.0 features such as commenting, tagging, and evaluating trends and forces within the system should therefore be considered in future cases.

## **5.6 Chapter Conclusion**

This chapter presented the background on this case, described the design and development of the first prototypical online scenario creation tool, presented findings from its application, and reflected on its relationship to the research questions. The following chapter illustrates how these lessons were incorporated into a second system and applied on a different analytical case.

## **Chapter 6 Case 2: Sensemaker Scenarios**

### **6.1 Chapter Introduction**

Sensemaker Scenarios is the name of the second prototypical collective intelligence system developed to generate data for this research. This chapter presents the background on this case, an overview of the system design and functionality, the findings relative to the constructs defined, and a discussion of how these categories relate to the research questions.

### **6.2 Case Background**

For this case, I adapted an existing commercial software platform to build upon the lessons from the first case. In particular, the case sought to address several themes raised by the Futurescaper case; notably a desire to involve a greater number of participants, to explore new formats of data collection, and to improve the user interface to facilitate collective analysis. The goal of this case was to explicitly explore different formats for user contribution, including free-form narrative or anecdotal formats, and to prototype methods for generating draft scenario logics more directly.

To explore these questions, an approach was developed in conjunction with two colleagues, Dave Snowden and Wendy Schultz, who helped design and develop all aspects of this case. After designing the approach, data was generated in an online engagement lasting approximately one week in conjunction with the 2010 International Risk Assessment and Horizon Scanning Conference for the Government of Singapore. The topic of the case study was the future of urban public services under financial uncertainty.

### 6.3 System Description

SenseMaker Suite is a platform that collects data in the form of stories, anecdotes, and narratives about a topic or theme from distributed contributors. Respondents were given the broad request to relate a story about the subject that would shed light on the topic. **Figure 6.1** displays a flow chart of user activities and **Figure 6.2** displays a screen shot of the story submission screen.

Figure 6.1 SenseMaker Scenarios Process Flowchart

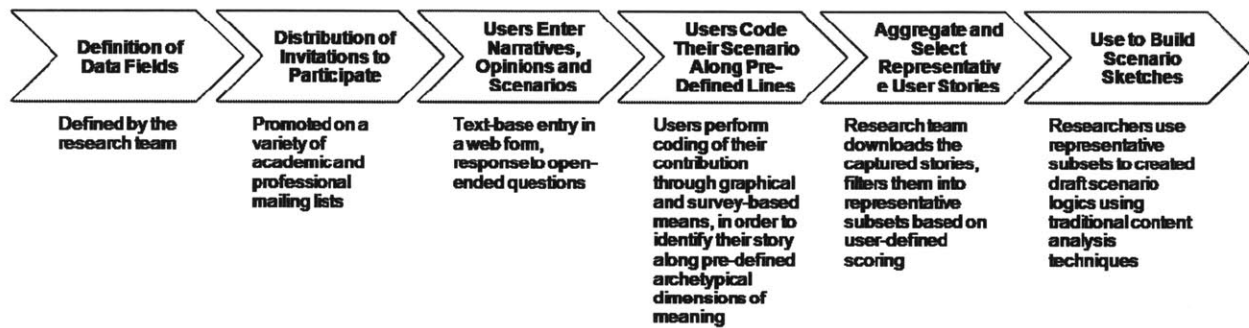
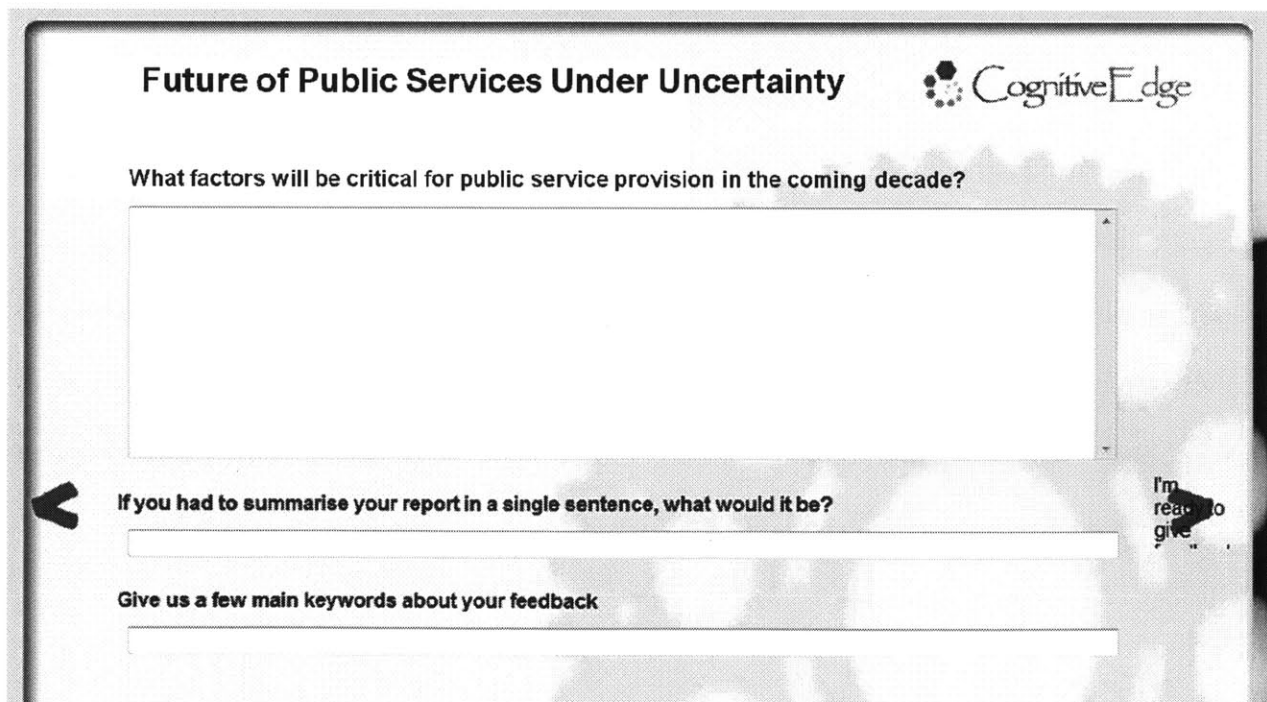


Figure 6.2 Screen Capture of the Driver / Story Entry Screen

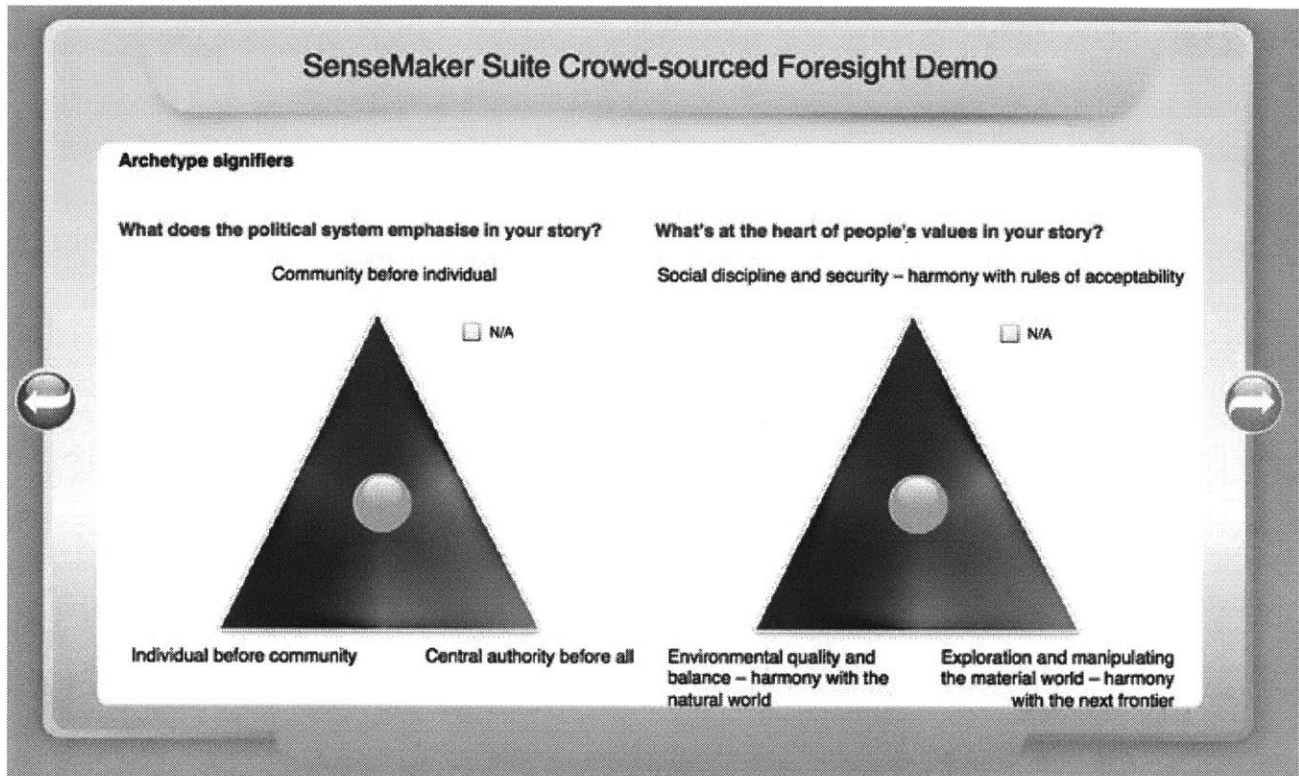


After submitting a story, anecdote or opinion in the free-form textual interface, users were asked to code their story against key themes and concepts. The goal was to blend qualitative research in the form of stories, anecdotes and narratives (which have the potential to convey rich social meaning and are easily recalled and communicated), with quantitative indices allowing for this data to be quickly coded, classified and analyzed. The system therefore generated qualitative open-ended narrative data, wrapped in quantitative descriptions that encouraged easier analysis for scenario creation. **Figure 6.3** displays a screen shot of the codification process with which users tagged and coded their stories.

Although the core platform allowed for the collection of stories on any topic, the system was adapted for scenario creation through the use of the “scenario archetype method” pioneered by Jim Dator (1996) and Wendy Schultz while at the University of Hawaii (2009). This method (explored in the literature review) suggests that many stories of the future fall within a handful of archetypal categories following similar narrative structures and outline. Whilst the details may vary, the overall significance of each archetype remains constant. Examples include story structures such as “the hero’s quest”, “decline”, “collapse”, “continued growth”, etc. Schultz (2010) and others employ these archetypes to create narrative indices, which were adapted for the use of this case.

This platform therefore differed significantly from Case 1 in that it did not explicitly capture drivers as discrete objects for subsequent combination. It also did not employ any algorithmic sorting or clustering mechanisms. Instead, it relied on user input to code stories against quantitative extremes, then sorted and ranked stories that were most representative of key dimensions of each scenario archetype. This subset of narratives was subsequently used to build scenario logics directly in a highly inductive fashion.

Figure 6.3 Screen Capture of the Tagging and Coding Process



## 6.4 Findings

This section presents descriptive findings from the case relative to the measurement constructs defined in Chapter 3.

### 6.4.1 Participation Characteristics

#### Degree of Accessibility

Data generation during this case ran for approximately one week. The process was open to anyone interested in contributing, and participation was encouraged through advertisement on a range of academic list-serves and public fora, including Twitter, Facebook and academic email lists such as the MIT DUSP student body, the list-serves for the Association of Professional Futurists, and various Cognitive Edge practitioners around the world. Because the web-interface was designed to

have a greater degree of openness and accessibility than that used in Case 1, no login information was required for participation.

#### *Amount of preparation required*

No preparation was required on behalf of the users. Participants were asked to submit stories that they felt were representative of the drivers and trends, impacts, and even end-states that would influence the future. The system's focus on open-ended narrative allowed for ease of contribution with minimal cognitive processing, although feedback received after the case suggested that more introductory videos or instructions would have reduced the burden of participation to a greater extent.

#### *The number of participants involved*

A total of 265 participants responded to the open invitation. Over 95% completed the entire submission process. However, no data from server logs was available to compare the submission rate with the response rate. The call for participation was forwarded and retweeted across several interest groups, communities of practice and distribution channels, so it is likely that several thousand people received the invitation to contribute.

#### *Reasons for participation*

Unlike Case 1, participants contributed solely out of their own personal interest in the system, the topic, or the experiment. Using Malone et al.'s (2010) framework, participation was therefore likely governed by personal interest and learning. After contributing, over 60% of users volunteered data on their impression of the platform, which served as a useful data set for further analysis and reflection. Amongst the comments submitted, several participants voiced their strong interest in

both the method and the project, thereby suggesting that personal and academic curiosity was a significant motivating factor explaining why people chose to participate.

#### *Degree of user anonymity*

Although no user-account system was created for this platform, participants were asked to volunteer their name and email information at the end of their submission. This data was not available to other participants, however, and this information was only collected at the end of the process. Thus the platform was functionally anonymous because user details were solicited only after contributions were made. Over 80% of respondents volunteered their contact details at the end of their submission.

#### *Type of participants involved*

Demographic data was collected from a total of 265 participants under a variety of headings . In terms of levels of experience, one of the key metrics for this research, approximately 10% of respondents identified themselves as “expert” in the subject matter, nearly 55% said they had “significant personal or professional experience”, 25% had “some personal or professional experience”, and approximately 20% indicated that they had “read about it” or knew “relatively little” about the subject area. Thus the majority of participants were highly experienced, with approximately half declaring limited or no experience. This suggests a relative diversity of professional experience, although no more detailed data was collected on the exact nature of their field or profession. **Figure 6.4a** displays the breakdown of user expertise for this case.

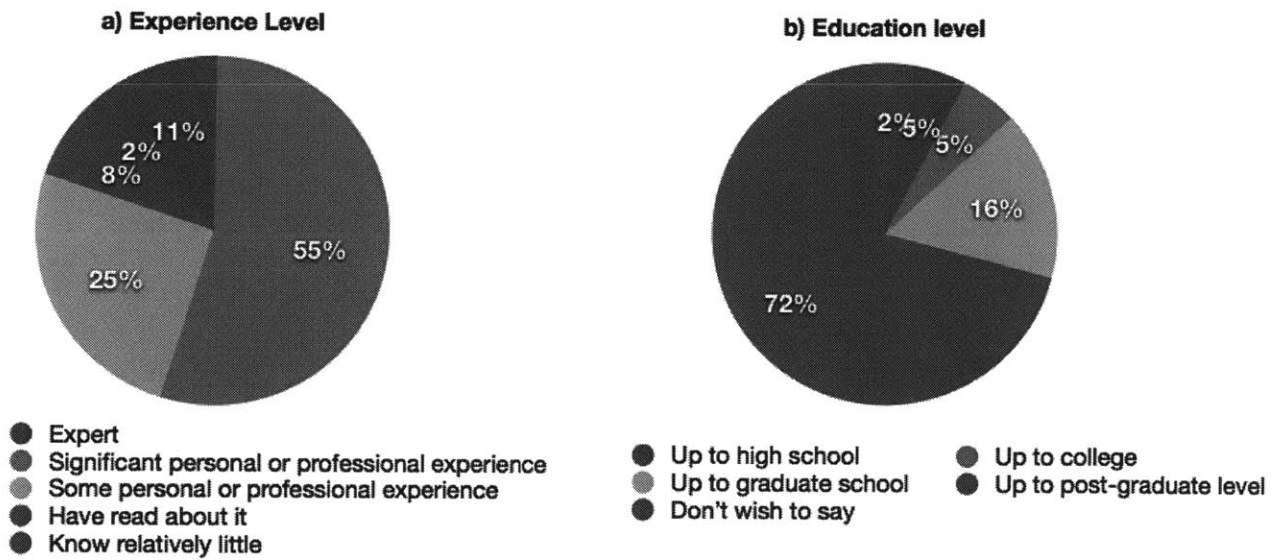
With regards to educational level, 72% of all respondents reported being educated “up to the post-graduate level”, with an additional 16% reporting having education “up to graduate school”. This represents a highly educated population contributing to the data for this case; a situation which is

both unusual and unrepresentative of most multi-stakeholder public participation projects. The distribution of education levels is displayed in **Figure 6.4b**.

Other demographic data such as age was also captured. Over 50% of respondents reported themselves to be aged 50 years old or above, 27% aged 40 to 49 years of age, 17% aged 30 to 39, and less than 5% aged 19 to 29 years old. Geographically the sample was quite diverse as well. Approximately 39% of respondents stated that they were based in the Americas, 39% from Europe, 19% from Asia and the Pacific and the remaining 4% from Africa, the Middle East, or elsewhere.

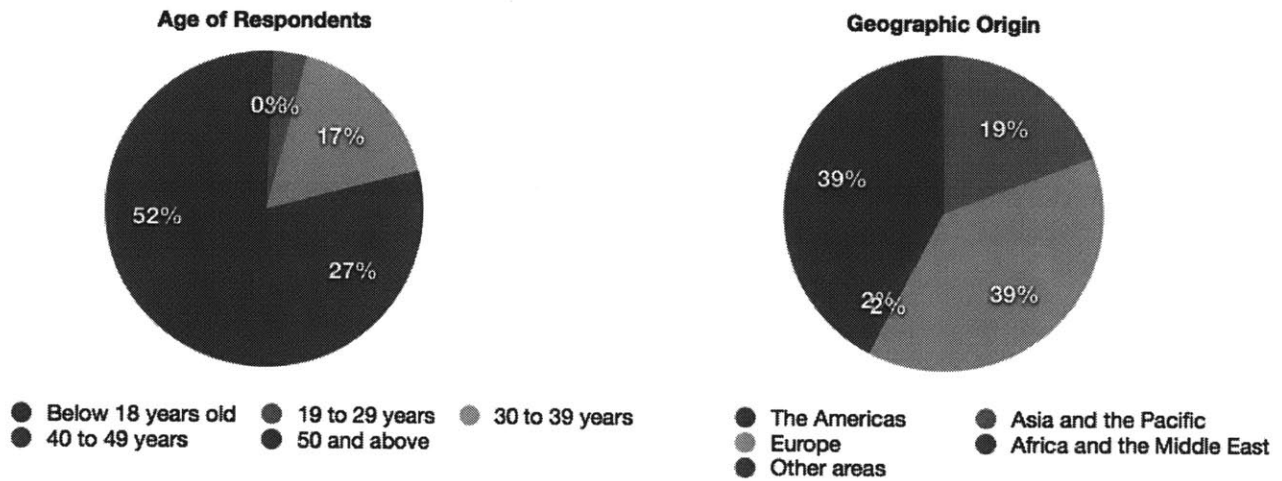
**Figure 6.5a** displays the age profile and **Figure 6.5b** displays the geographic profile of respondents.

**Figure 6.4a/b Experience and Education Level of Respondents**





Figures 6.5a/b Age and Geographic Origin of Respondents



#### 6.4.2 Interaction Characteristics

##### *Tasks Performed*

The following Table 6.1 presents a checklist of the activities performed during this case.

Table 6.1 Tasks Performed in Case 2

Task	Performed in Case 2
Driver Identification	Yes
Driver Exploration	-
Driver Ranking & Selection	Yes
Driver Clustering & Aggregation	Yes
Scenario Logic Creation	Yes
Scenario Logic Selection	-
Scenario Logic Detailing	Yes
Implications Development	Yes
Implications Detailing	Partial
Full Scenario Narrative Creation	-

### *Driver Identification*

Participants were asked to submit narrative answers in response to the following questions:

1. What is the future of public service provision under financial uncertainty?
2. How will governments and cities adapt to managing public resources under increasing constraints?
3. What factors will be critical for public service provision in the coming decade?
4. How will these factors combine to influence public service provision in the 2010s and beyond?

Although 265 responses were received, these submissions were not formatted in a manner that could be readily disaggregated into specific drivers. Instead, each narrative contribution represented a mix of opinions, narrative about the present, speculation on the future, and conjecture about how things might turn out for the topic. Whilst this made the process of data ranking and clustering more efficient, one consequence was that there was no clear methodology for evaluating the total number of independent drivers submitted.

Narratives for this exercise were therefore used in place of the traditional drivers identification phase. Responses ranged from one paragraph opinions to in-depth exploration of trends and drivers over multiple p. s. The average submission comprised approximately two long paragraphs. **Figure 6.6** illustrates a typical response.

After submitting a narrative, respondents were asked to code the significance of their stories along several dimensions, using both graphical and textual interfaces. **Figures 6.7** and **6.8** display examples of these interface types

Figure 6.6 Example of Typical Narrative Submission

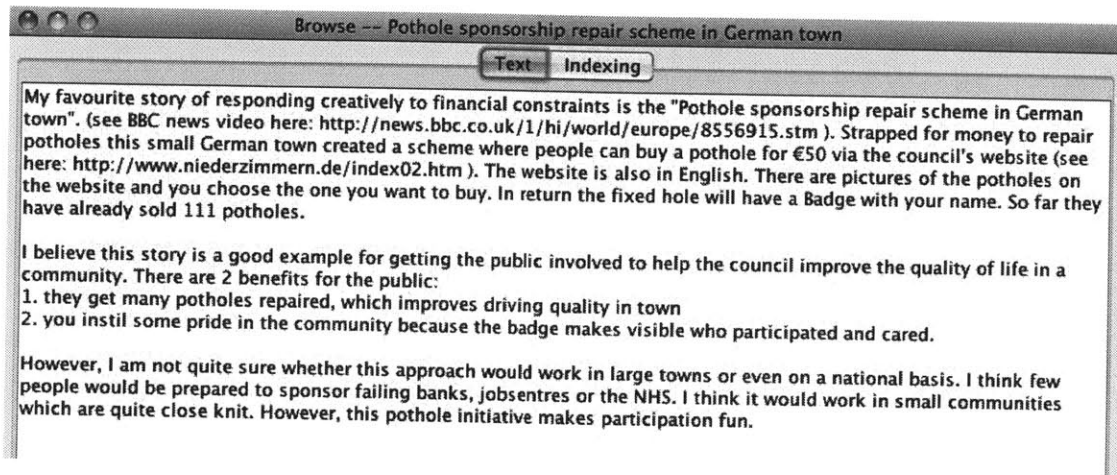


Figure 6.7 Slider-based Narrative Coding

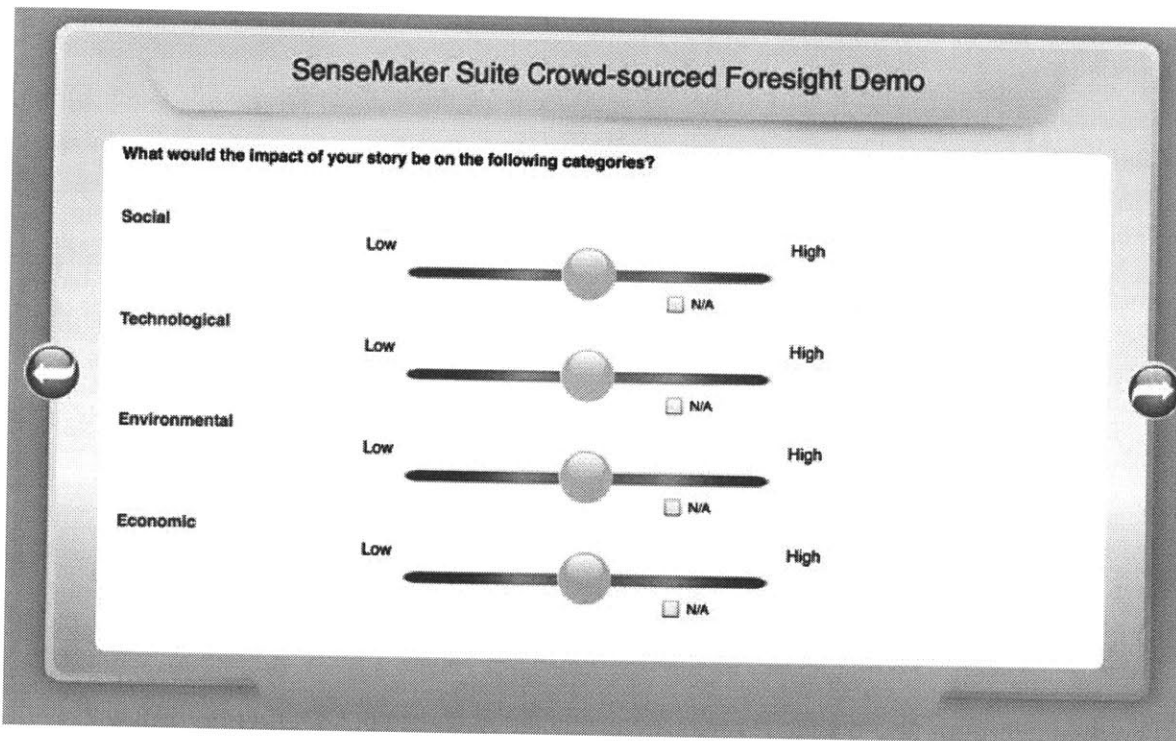
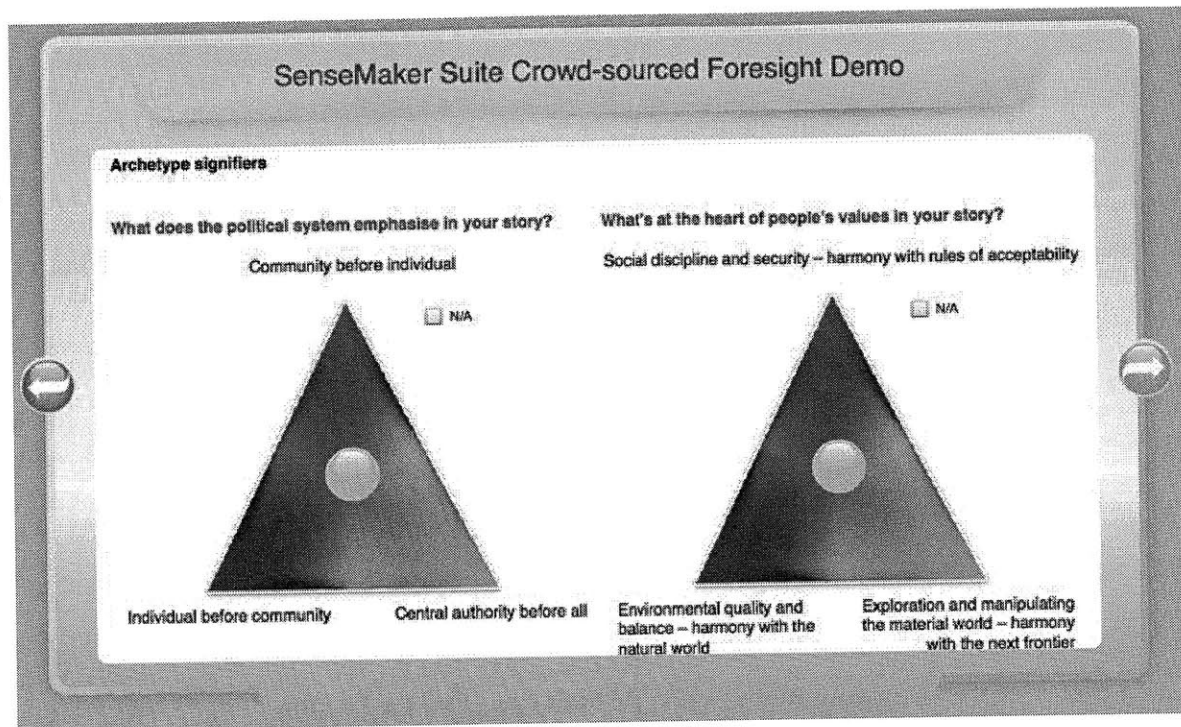


Figure 6.8 Geometry-based Narrative Coding



Whereas sliders need no explanation, the geometry-based interfaces used in the case are slightly new. This coding mechanism worked by asking participants to position a circle representative of their story on a spectrum of mutually exclusive but related values. In this way, users provided quantitative scoring of their narrative against several dimensions that would later be used for sorting and analysis.

This process required slightly more reflection and consideration on behalf of the user, but after explanation, allowed for the expression of more nuanced meaning about why they chose to submit their story. These questions and categories represent “stories about their story”, which proved essential for clustering and analysis in later stages.

The final questions and coding formats are presented in **Table 6.2**. Definition of the questions and their end-states were taken directly from Schultz’s 2009 work on the distinguishing characteristics of scenario archetypes. This linked participants’ open-ended responses to a coherent theory of scenario building that could be used to generate draft scenario narratives.

Whereas Schultz defined a total of six archetypes frequently found in the futures literature, the limitations of the SenseMaker Suite software deployed at the time of this case study only allowed for three to be tested at any given time. Thus, three exemplary archetypes were selected for use in this case study and are presented in **Table 6.2** below.

**Table 6.2 Narrative Coding Categories Employed**

Question	Interface Type	Option 1	Option 2	Option 3
Social Impact	Slider Bar	Low	High	-
Technological Impact	Slider Bar	Low	High	-
Environmental Impact	Slider Bar	Low	High	-
Economic Impact	Slider Bar	Low	High	-
Political Impact	Slider Bar	Low	High	-
Level of Uncertainty	Slider Bar	Low	High	-
What is the time scale of the impacts in your story?	Geometric Placement, Triangle	Short Term	Medium Term	Long Term
How new are the ideas you describe in your story?	Geometric Placement, Triangle	New to the public	New to businesses and entrepreneurs	Totally new, even to scientists and designers
Impact subject tags	Textual, tag-based	Primary	Secondary	-
What does the political system emphasize in your story?	Geometric Placement, Triangle	Individual before community	Community before individual	Central authority before all

Question	Interface Type	Option 1	Option 2	Option 3
What is at the heart of people's values in your story?	Geometric Placement, Triangle	Environmental quality and balance - harmony with the natural world	Social discipline and security - harmony with the rules of acceptability	Exploration and manipulation of the material world - harmony with the next frontier
What does "winning" look like from the point of view of people in your story?	Geometric Placement, Triangle	Win = exclude other people from power	Win = maximize the benefits to everything in the system	Win = invent an entirely new game
How do people learn and explore in your story?	Geometric Placement, Triangle	Set boundaries and acceptable definitions first	Look for systemic interconnections first	Experiment and invent first
How do people relate to change in your story?	Geometric Placement, Triangle	Distrustful, control it	Adaptive, evolve with it	Addictive, accelerate it
What long term outcome do people in your story fear the most?	Geometric Placement, Triangle	Social anarchy	Ecological collapse	Technological and infrastructural collapse

### *Driver Exploration*

One limitation of the prototype platform generated for this case was that it did not offer facility platform for users to explore the narratives submitted by other users online. Once collected, the researchers were required to download the data from the collection server (in the form of an XML and text dump) and analyze it in Cognitive Edge's SenseMaker Suite desktop software package. While this allowed for robust querying and filtering along a range of dimensions, the system lacked

the capability for users to do this online. Thus driver exploration was confined entirely to an off-line, desktop analysis by the researchers after the capture period of this case study was complete.

### *Driver Ranking & Selection*

In addition to the quantitative scoring process explored above, respondents were asked to score their contribution in terms of the “Magnitude of Impact” on various topics. They were also asked to identify the relative levels of uncertainty associated with their story and the relative time frame within which the impacts implied by their story might unfold.

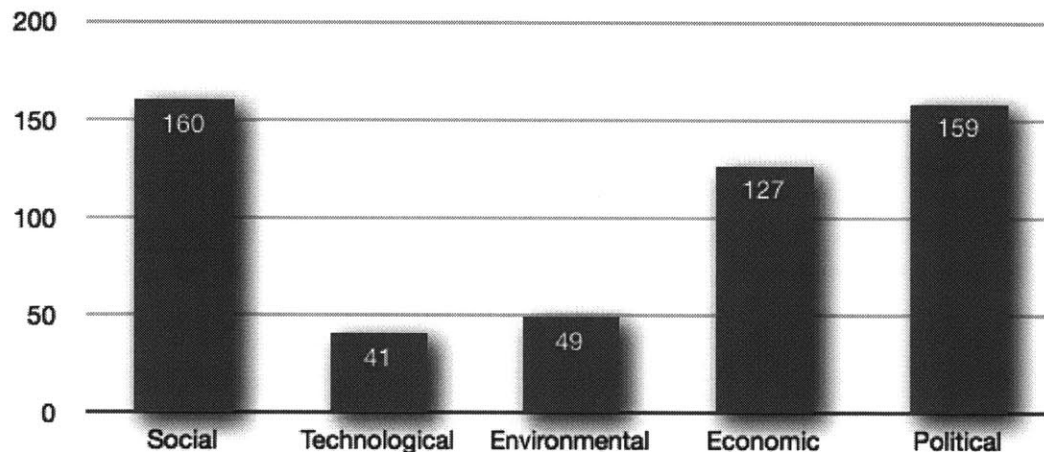
This data was used to rank narrative data along a number of dimensions. The first was the degree of uncertainty, which applied to the entire narrative. The second was the level of impact, which participants were asked to score separately for each of the five categories traditionally used in scenario planning: Social, Technological, Environmental, Economic and Political, also known as STEEP. Using this framework, narratives were ranked in the following ways:

- 160 stories were classified as having high Social impact
- 49 stories were classified as having high Environmental impact
- 127 stories were classified as having high Economic impact
- 159 stories were classified as having high Political impact
- 41 stories were classified as having high Technological impact

Of these responses, 83 were classified as having a “High” level of uncertainty and 21 were classified as having a “Low” level of uncertainty. Finally, 29 stories were classified as “Short term”, 88 as “Medium term” and 55 as “Long term”. Because a single story could be classified as having impact in multiple categories, the total number of high impact scores was higher than the total number of stories submitted. Impact rankings are displayed in **Figures 6.9** as an intermediate step in the drivers ranking process.

This mix of subject factors, uncertainty levels, and time frames provided the basis for the identification and clustering of impact factors into critical certainties and critical uncertainties in the next stage.

**Figure 6.9** Number of High Impact Drivers Generated for STEEP Category



#### *Driver Clustering & Aggregation*

After narratives were ranked by impact and uncertainty, the top 25 high impact, high uncertainty narratives and the top 25 high impact, high certainty narratives were exported as a subset for clustering and analysis.

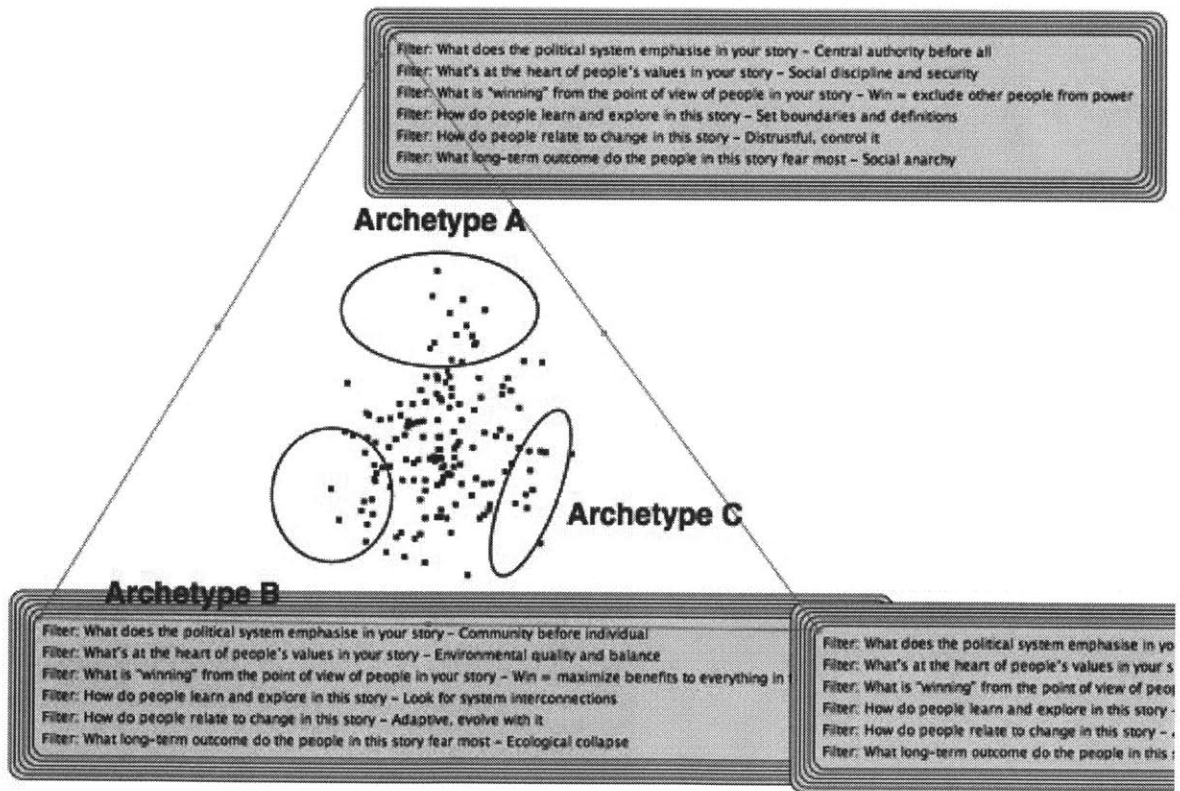
The sample size of 50 narratives was chosen based on a qualitative assessment about how these stories clustered relative to the mean scores of all other stories in the sample. The number 50 was chosen because it captured both those with highest values, but also included a strong sample of those within one standard deviation of the mean. The goal was to produce a rich enough sample for in-depth analysis, but one that did not select only outliers and extreme examples. Samples with 20, 40, and 60 were also tested. These 50 narratives were then clustered into those that scored the highest across each of the key archetypal dimensions. In other words, narratives that scored highest in *all* dimensions were selected. While this is useful to capture explicitly representative



stories, it does mean that “weak signals” and outliers that could be important were excluded. This final selection of stories were then used for preliminary scenario logic creation, as described below.

**Figure 6.10** presents the visual query interface which SenseMaker provides for sorting and querying narrative data along these lines. The blue dots represent the normalized score of each narrative in the analytical sub-set. Their position on the graph is determined by their normalized value across the five archetypal dimensions introduced previously, in **Table 6.2**.

**Figure 6.10** Visually Querying Extreme and Representative Examples for Driver Aggregation



### Scenario Logic Creation

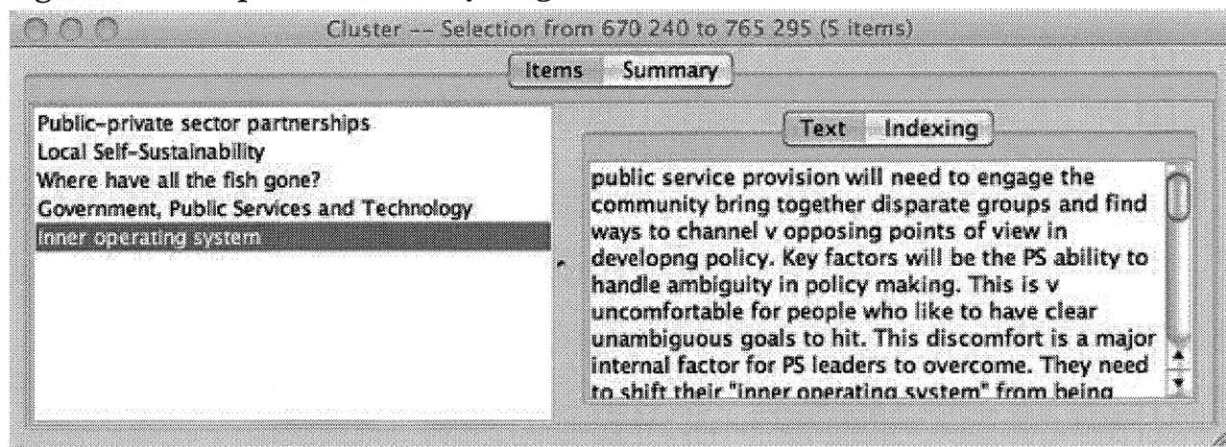
A final subset of representative narrative fragments was then used to create draft scenario logics.

This was done by exporting the top 5-7 fragments from each narrative archetype for traditional

textual content analysis. The narrative content of each fragment was analyzed for consistency, repetition and intensity to extract the key themes for scenario construction. This process was aided by the fact that each fragment was given “Primary” and “Secondary” impact tags, which served as useful proxies for general subject tags.

**Figure 6.11** provides an example of the kinds of stories clustered around narrative archetype values. The window to the left displays the title of five stories displaying the highest values that were associated with the “Environmental and Social Balance” archetype. The window to the right displays the text for the highlighted story. All of this information was entered by participants and is just displayed as a summary, here. The highlighted story, which the used called “Inner operating system” describes a situation where different groups need to reassess their values and collaborate together to create balanced policy. Both the tone and the language of this story are highly consistent with the values of this archetype, which typifies values of balance, harmony, equality, and integration.

**Figure 6.11** Representative Story Fragment Used to Build Draft Scenario Narratives



Additional analysis of the emotional content of anecdotes coded by archetype provide further detail. Respondents were asked how their story made them feel, through a drop-down menu

of various emotional states. Clustering anecdotes by archetype uncovered rough groupings of emotional states, with the “Socio-ecological balance” archetype attracting stories coded primarily as “Angry” and “Informed”, the “Centralised control” archetype coded predominantly as “Sad”, and the “Free market exploration” archetype coded primarily as “Glad”.

The combination of subject tags and narrative analysis produced themes for each scenario archetype, which were then sorted into multiple scenario plot lines. **Figure 6.12** displays one of the draft scenario narratives generated during this process.

### *Scenario Logic Selection*

Draft scenario plot lines were selected from this sample of drafts by the researchers, based upon their internal consistency and narrative plausibility. This entailed a degree of professional judgement and discretion typical of a normal scenario planning project. No user or participant feedback was used at this stage. The final scenario logics were then sorted into a system of relationships linking inter-scenario themes into a plausible framework. This used a modified inductive approach which explored the causal links between scenarios as part of the overall scenario selection process. **Figure 6.13** displays the system of scenarios resulting from this process.

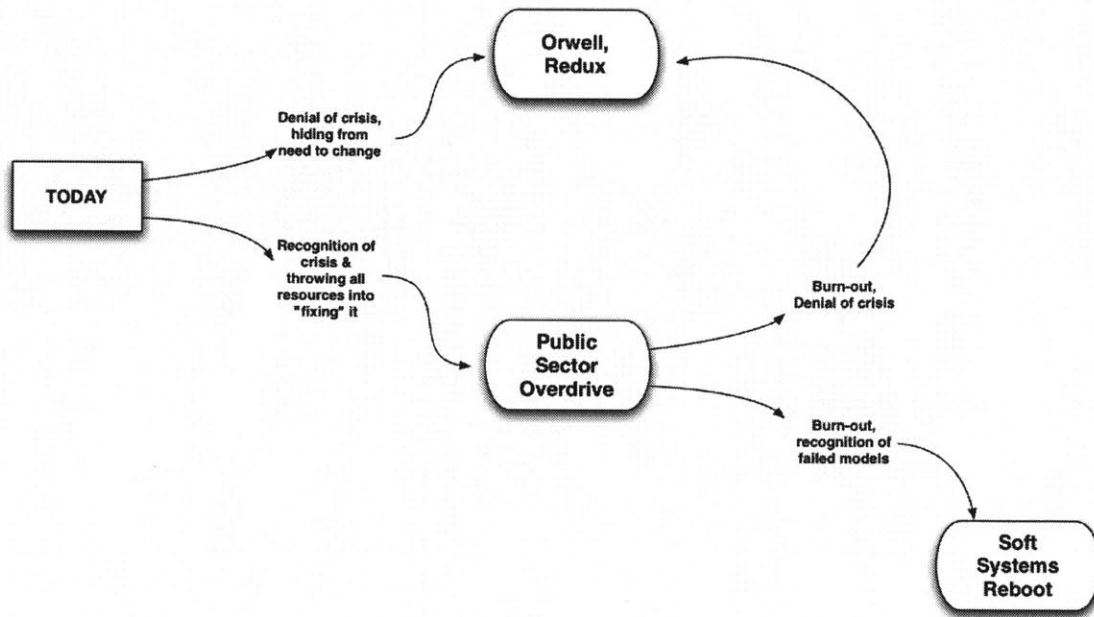
## Figure 6.12 Draft Scenario Narrative Themes, Example

**Given:** Diminished resources  
Higher expectations from the public

### Thematic headlines:

1. **Internal control & pressures to produce**
  - “My organisation is into ‘operational efficiencies’, which means losing staff.”
  - “I have noticed that what we do is has become increasingly tinged with messages about ‘picking up the metabolic rate, doing more and more, 80% is good enough, don’t over-deliver.”
  - “Getting tighter and harder, less loving and generous”
2. **Attempt to control risk by changing as little as possible**
  - “Don’t over-deliver”
  - “Control the risks, don’t do anything that might rock the boat.”
  - “Doing more with less, don’t do anything too risky.”
3. **Deception, double-think & propaganda**
  - “Rhetoric is about partnerships and flexibility when the reality is about control”
  - “They say ‘innovation & collaborate’ but mean ‘giving up responsibility”
  - “Becoming more adept at spin”
  - “Senior management understands the need to consult, but is fearful that this would leave the organisation being held accountable”
  - At the international level, “will they do a Greece and pretend that they can cut things back, lie to Brussels and the Euro central bank, but in reality do nothing?”
4. **Decreased innovation, poor performance and economic stagnation**
  - “I’m working the innovation group at a large public agency. They can’t even open attachments in email.”
  - “Being forced to do more with less.”
  - “Reduce costs and minimise risks while delivering fewer services.”
5. **Slow realization of the public and markets**
  - “It doesn’t take much to send fear into the hearts of the trading public... sell currency and force the hands of govt’s perceived as under-performing.”
6. **Anger & blowback**
  - “US will have to devalue the dollar to repay its loans, the only real question is when? When it does all hell will break loose.”
  - “Large numbers of the population will be in shock when the real crash comes.”
  - “Their malleable souls will be easily manipulated into seeing the benefits of any new order. The tool is fear.”
  - “Chaos in the streets! Like Greece. Willingness to take to the street, take back the streets, but in fact, to see the streets again as public space.”

Figure 6.13 The Final Scenario Set Chosen



*Draft Implications Creation & Selection*

Draft implications were derived from the “Primary” and “Secondary” impact tags associated with the fragments comprising each draft scenario. A prototypical user interface was developed to engage participants in the exploration and generation of more detailed implications, but was not successfully implemented for this case.

*Kinds of inputs considered*

The platform developed for this case differed from Case 1 in an effort to accept more “natural language” expressions of user input. The goal was to engage users in more direct, narrative based expressions of future trends and issues. Thus the primary inputs considered were free-form narrative contributions, supplemented by analytical tagging and coding by the participant themselves.

*Amount and type of visualization tools used*

The SenseMaker Suite platform utilizes both visual and numerical querying approaches. Although basic visualization capabilities are possible within the Suite, particularly in the form of 3D scatter plots and data landscapes, these were not used as part of the analytical or participatory process on this case.

*Amount and type of analytical tools used*

The ability to sort qualitative narratives into thematic clusters based upon quantitative, user-signified values enabled the rapid aggregation of distributed contributions into coherent draft scenarios. The primary goal of this case study was to evaluate how more user-friendly submission formats such as stories, anecdotes and opinions could be incorporated into the distributed data generation process. The key challenge with this kind of data is the relative labor-intensity required to sort, categorize, analyze, and summarize such data. The use of the SenseMaker platform for this case provided a hybrid format, which allowed for nearly instantaneous, real-time sorting and aggregation of user narratives into thematic content areas for easier extraction and summary. While not fully automated, the purpose of this analytic technique was both to enhance the ease with which users could contribute, as well as to minimize the interpretive burden on behalf of the analyst. The analytic tools inherent in the SenseMaker platform were useful and effective in this regard.

*Amount and kind of socialization enabled*

Like Case 1, the use of this prototypical platform did not incorporate social features such as commenting, discussion boards or user groups. Nor were other features such as voting enabled. Although the primary purpose of this Case was the incorporation of unstructured narrative contribution, many participants noted that they missed the ability to browse other users'

contributions and build upon them. As in Case 1, the opportunity for reflective dialogue amongst participants was not available in this process.

#### *Amount and kind of feedback provided*

Several participants noted that they were frustrated with the lack of feedback provided by the prototype system used for this case. Although the user received on-screen notification when they had submitted their story, there was no way to explore other users' stories, add or receive comments, or interact in any meaningful way other than by contributing. One participant noted that they felt that the process was a "mysterious black box", into which they contributed something they cared about but had no idea what happened on the other end.

#### *The overall speed and timeline of the process*

The data generation component of this case took approximately one week to set up and one week to administer and collect, during which the researchers promoted participation through a range of email and web fora. Once data collection was complete, downloading and interpreting the data took approximately two days, not counting methodological experimentation during this period. The largest time savings were achieved in the analysis phase. This process was facilitated through the auto-aggregation of user-contributed narratives, made possible by the quantitative coding indices against key scenario themes.

## **6.5 Discussion**

The selection and execution of this case was designed to explore the role that more natural, free-form interfaces might play in the distributed, collective intelligence process. It also sought to focus

on how these contributions could be used in the later stages of scenario building, particularly with a focus on draft narrative construction.

This case generated meaningful findings that were useful for reflecting on the overall questions of this dissertation. It also generated a large amount of data from a more diverse sample population, the natural language interface worked well, and the process of auto-aggregating scenario narratives based on archetypes proved useful and effective. A lack of socialization and exploration methods was observed to be a drawback of the system as designed for this case, as was the inability of users to gain transparency on the role that their contribution played in the overall effort. Thus the prototypical system designed for this case proved effective as a data generation and analysis platform, but not as a social, participatory experience.

In addition to these general observations, the following key themes were also identified from the findings of this case:

#### **6.5.1 The online approach taken here seemed to afford geographically diverse, but highly educated and experienced, participation**

The data generated as part of this case found that the majority of participants interacting with the system were older, more experienced, and professionally diverse. There could be many explanations for this, ranging from the nature of the user interface, the questions themselves, or simply who responded to the open call for invitations.

Because recruiting was not controlled for in this study, it is impossible to estimate the effects of different recruiting methods on participation. It is therefore difficult to say if the increased participation experienced in this case was a function of different recruitment mechanisms or of specific user interface design features. Although I cannot claim causal or even correlatory connections based on this data, it is worth noting that the case was promoted heavily by researchers



on email list serves at MIT, the University of Oxford, the London School of Economics and the UCL Bartlett School of Architecture. This may contribute to the significantly older and more experienced age profile observed.

While it has been noted that server logs were not available to determine where visitors to the site came from (and therefore what the ratio of visitors to contributors was), it is nonetheless plausible that a large number of university-aged participants accessed the site. This suggests that there may be something in the design of the system itself or the nature of the questions asked which encouraged older, more experienced participants to contribute.

Reflecting on the core research questions of this research, it is clear that the online approach employed in this case offers utility for engaging larger numbers of people in a short period of time. The inputs collected, in the form of anecdotes, stories and opinions, aggregated into useful and insightful stories of the future that appeared to resonate with key issues of concern in many of the contributions.

However, the question of diversity in experience and age must remain an open one from this case alone. Respondents were clearly biased towards higher levels of expertise and age, which does not reflect the hypothesis that online systems are more likely to attract a broader range of participants across key dimensions such as age and expertise. Without more rigorous measurement of the universe of possible respondents that this sample was drawn from, it is impossible to say if the response rate and demographic profile of respondents was in any way representative or valid. We must therefore conclude that while the system used in the case study is capable of handling greater levels of participation in a meaningful way, questions of diversity remain unaddressed.

### **6.5.2 The use of narrative submission formats seemed useful and flexible, but the interface requires better structure**

A significant component of Case 2 was the experimentation with narrative contribution as an alternative form of data generation. The open-ended narrative structure used by SenseMaker allowed users to contribute to the exercise in a manner with which they felt comfortable, ranging from observations that, “there are more potholes on my street” to more reflective, in-depth, reference-heavy analysis of the trends and issues concerning them. This open-endedness allowed for a range of response types to be captured without losing significant analytical depth. Although it is beyond the scope of the data available to suggest which approach “worked better”, it can be said that the narrative-based approach did work well in the context of this case and that it would be fruitful for further exploration.

### **6.5.3 The use of scenario archetypes was an effective way of sorting and classifying user submissions to create representative scenario narratives**

The challenge with large volumes of qualitative data is that it is relatively effort intensive to sort through and analyze it. The use of Schultz’s scenario archetypes allowed for the pre-definition of key distinguishing characteristics which, once users selected where their contribution fit on the spectrum of these values, allowed for fast and effective aggregation of like content into easily manageable buckets. This provided rich material that was sufficiently clustered to be of analytical power, but varied enough to develop rich draft scenario logics. The material generated in the process fed directly into the scenario creation task, effectively facilitating the rapid generation of scenario plotlines.

One challenge to this method, however, is the crucial influence of the values chosen for the rating scale at the beginning of the process. As mentioned, Schultz and others argue that most

scenario planning projects rely on between four and six generic story-types. Despite this, how a user defines the key characteristics of these stories, the dimensions along which they vary, and the values which comprise their end points is still subject to significant interpretation. Further, given the limitations of the platform as deployed for this case study, only three archetypes were able to be tested at any time. Thus the researcher faced two design choices that are likely to strongly influence the outcome of any scenario narratives created.

Finally, even though research indicates that a significant degree of qualitative variance in scenarios can be captured through archetypical representation, it is possible that idiosyncratic, non-archetypical scenario structures could emerge and have value in any given process. It would therefore be desirable for this platform to allow for more organic clustering of one form or another. This would also safeguard against significant survey bias introduced by design choices at the beginning of this research process. Although the utility of such an approach was demonstrated by this case study, additional research is clearly necessary to evaluate the effect of altering these variables on the types of scenarios generated by the process.

#### **6.5.4 Need for greater levels of interactivity, socialization and visibility**

Another area of clear discussion is the role of visualization, socialization and interactivity in this case. It was already observed that a variety of participants felt that the “one way nature” of the experience was unfulfilling and mysterious. Although the use of user generated content was clearly spelled out at the beginning of the process, there was no readily available way for participants to see the results of their efforts, nor those of others, nor interact with them in any way. This posed a major disadvantage for interaction and user-driven analysis, which is one of the hallmarks of collective intelligence systems of this type. Greater user involvement and visualization of systemic input would therefore make a significant improvement to the case study system as developed here.

### **6.5.5 Impact on workshop process and timeline**

Despite these challenges, the process proved to be robust to a variety of challenges and served to address the main goals of this case study: first, can alternative formats of user input be utilized instead of highly structured, expert-analytical web forms, and second, can scenario archetypes be used to “auto-generate” draft story lines for subsequent refinement? Given that the capture and analysis period took less than two weeks in total, it appears that this approach could be adapted to a more rapid engagement process. The inclusion of more granular demographic capture information, for example, would also allow more fine-scale stakeholder based representations to be made.

Whereas the current case study drew upon the entire sample population to generate the scenarios, it is easy to see how, with enough participants, different scenario sets could be generated for different stakeholder groups. This would provide rich material for implications development, as well as useful meta-data on conflicting points of view and images of the future. These could be useful either as a stand-alone exercise or as part of a larger process (either workshop-based or otherwise). It is therefore suggested that this case demonstrates a proof-of-concept data generation tool that may be of further use for urban planning researchers in other areas of inquiry.

## **6.6 Chapter Conclusion**

This chapter presented the background on this case, described the design and development of a second prototypical online scenario creation tool, presented findings from its application, and reflected on its relationship to the research questions. The following chapter illustrates how these lessons were incorporated into a third system and then applied to the last analytical case.

## Chapter 7 Comparative Examples

### 7.1 Chapter Introduction

Cases 1 and 2 (described in Chapters 5 and 6) presented two different approaches to the generation and analysis of online data for qualitative scenario planning. A number of other examples developed during the course of this research by other parties were found to contain additional data or insight relevant to the research questions. These were used as supplementary evidence to help plug gaps in the case study data and supplement understanding from their analysis. This chapter presents these examples in a summarized version of the same comparative framework used for the Base Case and Cases 1 and 2.

The three examples considered were:

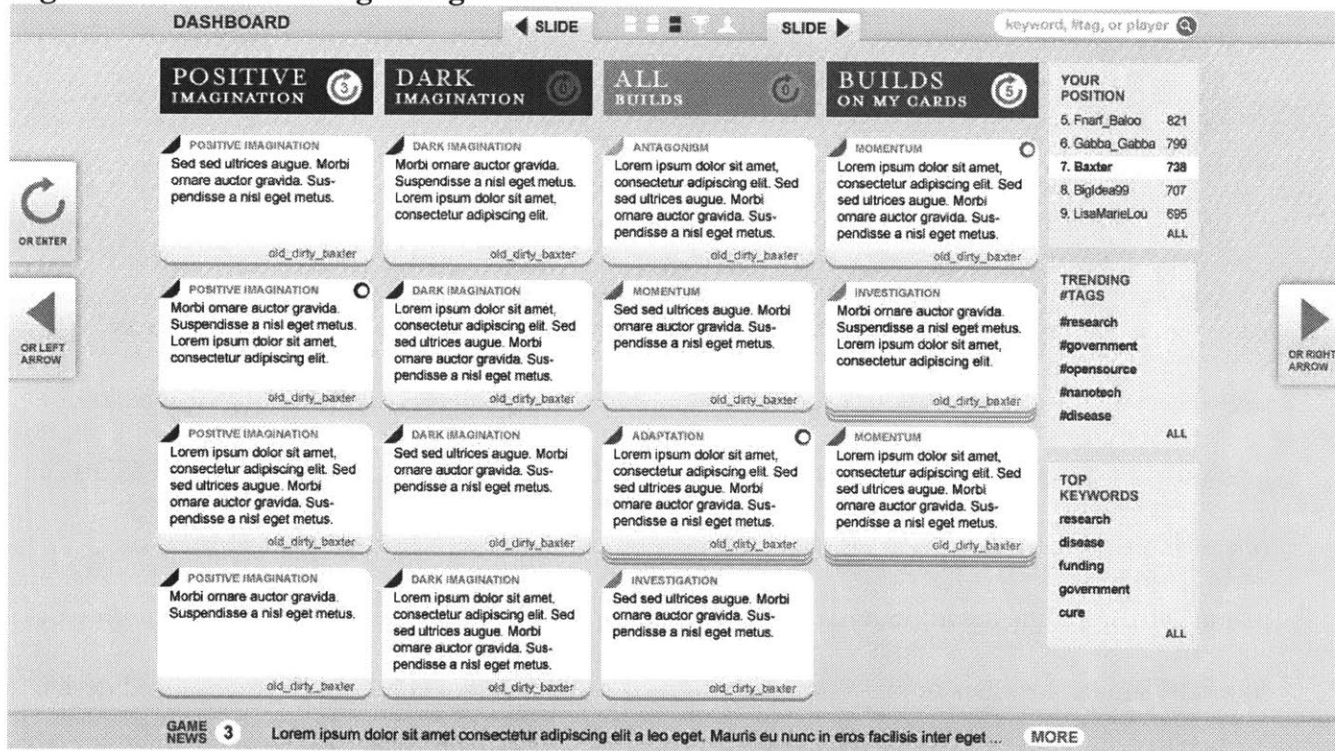
1. The Institute for the Future's *Foresight Engine*
2. The *WikiStrat* collaborative forecasting platform
3. OpenForesight's *Future of Facebook* project

Although none of these systems were designed for urban planning research, they nonetheless offered useful lessons for various aspects of online user engagement, crowdsourcing or scenario planning. Each was selected because they represented either pioneering, unique or typical efforts in one or more of the following ways: (a) it was an adaptation of a similar function like scenario planning in an online environment; (b) it used emerging Web 2.0 and collective intelligence tool kits to model similar activities or processes (but focused upon different content); (c) it employed design decisions that were exemplary of different approaches to generating data relevant to the key variables and/or; d) it was notable or unique for its originality or early-mover status. Each comparative example is described in the section below.

## 7.2 The Institute for the Future’s Foresight Engine

The Foresight Engine is an interactive gaming platform developed by the Palo Alto-based technology forecasting non-profit, The Institute for the Future (ITF). Foresight Engine uses a card-game like interface, in which thousands of players submit ideas to explore the future of a subject during a curated engagement period. This project was selected as the first comparison example because it’s game-like interface and open-ended participation is a strong example of leveraging stakeholder participation online. **Figure 7.1** displays a screenshot of the Foresight Engine interface, which is explained below (note that this screen-shot is from a pre-game capture, with nonsense Greek text taking the place of real contribution for each card).

**Figure 7.1** The Foresight Engine’s Game Dashboard



Participants were first asked to register with the IFTF to create an account. Users were allowed to choose any screen name they preferred and were required to enter very little personal information.

Upon creating an account, a participant arrived at the game's homepage, which featured a one to three minute video outlining the key themes and concepts of the challenge at hand. This served both to excite the participants and to orient them to a common set of tasks. They were then able to begin interacting with the system by submitting data in the form of Twitter-length (140 character) "micro-forecasts". Each micro-forecast was categorized in one of four categories; "Positive Imagination", "Dark Imagination", "Momentum", and "Antagonism". Essentially, each card type represented a different kind of response whereby users would submit a Positive or Dark Imagination card to suggest forecasts and drivers that were either optimistic or pessimistic, and other users could build on these by either agreeing and expanding on them (in the form of a Momentum card) or disagreeing and challenging them (in the form of a Antagonism card). User interaction was therefore funnelled directly into both content creation and content discussion from the very beginning.

The example chosen for the dissertation comparison was an engagement exploring the future of the United States utility network, entitled "Smart Grid 2025". The event, sponsored by the Institute of Electrical and Electronics Engineers (IEEE), engaged almost 700 participants from 81 different countries over a 24-hour period, generating nearly 5,000 submissions and interactions. In addition to the participants, over 26,000 people viewed the project website and associated content. Participants included subject matter experts, academics and students, IFTF staff, and members of the general public.

The game-like nature of this platform meant that very little preparation was required from participants. While it is likely that all the participants watched the video, the platform was designed to engage users directly in contribution and commentary. Because no financial reward was offered, and no explicit public policies would be created, it is likely that most participants were motivated purely out of their interest in the subject or their enjoyment of the process. The explicit competitive

dynamic of the scoring, however, served as an extremely effective “hook” to keep participants involved once they began. The system used leaderboards, individual scores, and specific “attribute” scores to help players track their contributions and reaction of others, creating an engaging and enjoyable experience. Out of all the systems reviewed for this work, the Foresight Engine experience is by far the most enjoyable and easy to participate in. The combination of simple user interface options and engaging user experience dynamics is one of the key lessons that this example offers this dissertation.

The task performed with the Foresight Engine does not map directly to the eight-step process of the Base Case. Submission of “Positive” and “Dark Imagination” cards map loosely to the driver identification phase of the scenario process, while “Momentum” and “Antagonism” cards map to driver exploration. Although there were no explicit ranking or clustering mechanisms, the degree to which a driver sparked conversation and interaction served as a proxy for ranking and selection. This is not to say that those conversation threads which received the most traffic were explicitly chosen to be influential. Instead, they may represent a range of factors which participants found worthy of discussion, ranging from humor to controversy to actual agreement. The role of the game moderators played a particularly important part in this regard. Their attribution of awards and “super-interesting” notifications served to both elevate the visibility of certain cards and ideas, as well as reward players for pursuing those kinds of ideas and insights. Although the degree of socialization and imaginative emotional exploration was the highest of all the examples reviewed, this example also suffered from a lack of synthetic analytic tools to help convert this activity into true analysis and insight. The platform offered no visualization tools in this regard either.

On the whole, the Foresight Engine successfully engages participants in high-volume, high-engagement exercises around futures topics. However, the result was less about generating actual, divergent scenario logics and more about stimulating an in-depth conversation through a distributed



medium. It was successful at participant engagement and early stage driver creation, as well as driver exploration and socialization. It therefore represents a highly relevant example of online attempts to engage large online crowds in futures-related issues, although it is hard to tell if this participation translates into useful synthesis of user-submitted data.

### **7.3 The WikiStrat Grand Strategy Competition**

The *WikiStrat* platform is an online geo-strategy platform. The platform operates as a for-profit strategy consultancy, using a distributed network of analysts and subject matter experts who contribute piecework or competition-based analysis in a crowdsourced format.

Compared to the Foresight Engine, WikiStrat uses a fairly simple Content Management System (CMS)-like wiki platform. This is designed to help support a more complex community of experts, each of whom participate in much greater depth over a longer period of time, for both recognition and financial reward. The process works as follows: paying clients pose topics or questions to the community, via moderation by WikiStrat staff, who then contribute essays, analysis, trends and drivers into the WikiStrat system via web forms and surveys. Participants are asked to select and evaluate different trends and factors, suggest implications, and draft narrative comments via questionnaires, which are then scored by a combination of algorithm and staff to select “winners” for each engagement. Winners are then paid a portion of the proceeds generated by WikiStrat client engagements. Past topics included the outcome of the Arab Spring, the future of China, and other geopolitical and security topics.

Although data was unavailable for a typical WikiStrat project, the site launched a *Grand Strategy* competition during the course of this research which sheds light on the possibilities of the platform. During this time over 30 university teams from around the world participated in the competition, which sought to highlight major geopolitical challenges and potential futures in light of recent

massive changes. Teams participated in over 30 countries, from elite institutions such as the University of Oxford, Georgetown University, the EU University and others. These teams represented a diverse mix of expertise in foreign policy, regional history, economics, military affairs and sociology, drawing primarily upon MA and PhD-level participants.

In terms of user engagement, the platform used a complex format of administrator-led challenges and responses whereby participant teams were required to submit essay-length analyses of complex geopolitical forces. This raised the bar for user submission, suggesting that total participation would be lower, but that quality of submission (and analysis) would likely be greater as well.

Various other awards were given that helped to differentiate very active or particularly high-quality participants. WikiStrat took this principle several levels further, giving participants explicit “ranks” based on their past performance, years of experience, level of education and other criteria. This both recognizes varying levels of expertise, but also provides additional roles and responsibilities for higher-ranking participants. High-ranking participants were also entitled to greater financial returns on their analysis, should it be deemed useful by paying clients or expert judges.

Unlike the Case Studies or the IFTF example explored above which engaged users primarily in the early stages of drivers identification and exploration, the WikiStrat process engaged teams through-out the entire scenario process to produce content at every stage. While the final output was not narrative scenarios per se, they were geopolitical forecasts of different regions and countries. This focus on “end-to-end” full text submission is distinct from the other examples reviewed here. This suggests that, although the Grand Strategy competition may not be representative of the typical scenarios process, the WikiStrat platform does offer a sophisticated environment for highly-qualified participants to think about, analyze, and synthesize drivers and their outcomes. It is unclear how successful the model will be as a business, but as a content creation and analysis platform it clearly

has strong potential. However, as a model of large-scale public engagement, the high standards and in-depth effort required to participate produce relatively strong analytical output, but suggest that it may not be as effective as a mass engagement tool.

#### **7.4 Comparative Example 3: OpenForesight's Future of Facebook Project**

The last comparative example explored the future of the social media platform, Facebook, through an “open foresight” process. This project used free, existing services such as Facebook, Twitter, YouTube Quora and Kickstarter to conduct an “open source” scenario planning exercise.

The project began with a video on Kickstarter (the crowdfunding platform) to generate interest and funds to execute the project. It was created by a pair of researchers and social media experts affiliated with New York University. Before launch, the project was promoted via Facebook, Twitter, blogs and emails and received significant social media coverage. This generated the funds to complete the project, which involved several phases. The first phase, which corresponded to the driver identification and exploration phase of the Base Case, engaged approximately 25 industry analysts and content-area experts in questions about the future of Facebook, through in-depth video interviews over Skype. These were then edited into short clips and posted on a public YouTube channel for distribution and review. At the time of this writing, the channel had received over 18,000 views of these clips.

At the same time, the project team created a Quora p . . Quora is a Web 2.0 question and answer service, through which users can pose and answer each others' questions. In this case, the OpenForesight team posed the same questions to the open community as they did to the experts. This generated 109 responses from over 220 subscribers, and paralleled a second conversation on Facebook between approximately 50 additional participants.

This combination of video-based expert interviews and open, community input maps very well to the traditional driver identification and exploration phase. Like the face-to-face project in the Base Case, the project team then filtered these manually using traditional content analysis techniques. At this stage, analysts underwent a clustering and aggregation process to generate key themes in a process similar to that carried out in the Base Case. This involved reviewing the collected material for patterns, repetition, contrasting viewpoints, and notable examples. The team then synthesized these into another short video presenting them back to the community of participants.

Of the three examples explored here, this project is the least well documented and is, in fact, only partially complete. Unlike the Base Case, where a face-to-face workshop was conducted that integrated key themes and clusters into a scenario framework, it is unclear how the project team will integrate the synthesized drivers it has collected over the Web. This poses an interesting challenge, because without additional analytical or visualization tools to help sort through this increased volume of information, the actual implementation of the traditional scenario process becomes *less efficient* with greater participation. In an email interview, one of the project leaders alluded to this fact when she said, “none of us had any idea it would take this long to complete.” Because the project team is only part way through the exercise, it is unclear how this problem will be addressed in the future.

The Future of Facebook example is notable to this research because of its extensive use of video and multi-media enhancement. The curated clips of key themes and issues from the expert interview process, as well as the summary videos generated by the team themselves, ensures a high level of visibility at each stage completed. Judging by the popularity of these videos and their coverage in the social media sphere (the launch of their first synthetic video received coverage on CNN.com, for example), this appears to be a particularly effective way of presenting both raw

concepts and more synthetic themes and issues. It also served to differentiate this process from other, more traditional means and helped engage a range of users in a way that helped “make ideas come alive.”

The explicit use of social networking services such as Facebook, Twitter and Quora also prompted a vibrant discussion of these themes and issues amongst the participants. However, no demographic data is available from the participants, so it is difficult to determine who was participating, or why. Like much web-based commentary, the majority of this social interaction consisted of short affirmation or disagreements. Very little in-depth, rich discussion occurred, at least in the public forums visible from the outside, despite the rich material presented by the experts interviewed on video. While there may be significant analytical activities taking place in the background, the use of video and social media in this capacity seems to serve primarily as a data generation and early stage driver exploration tool. It is possible that more intensive reflection similar to the WikiStrat platform could be achieved, but on its own this approach seems primarily promotional as opposed to analytical.

## **7.5 Conclusion**

This chapter introduced three comparative examples meant to supplement data from the primary cases. The first example employed a game-like interface to create an enjoyable social experience that helped generate and discuss various drivers and trends. The second employed a more rigorous, competition process to produce high-quality, rich text analyses of geopolitical issues. The third leveraged existing social media platforms to collect interviews and commentary relevant to drivers creation, but with an unclear methodology for synthesis.

Together, these three examples represent effective ways of incentivizing participation (vis-a-vis enjoyment of the experience, interest in the subject, or desire for reward), leveraging multi-media

to enhance understanding, and employing transparent mechanisms to facilitate more open analysis and decision-making. The WikiStrat platform was the only example that produced scenario-like narrative outputs, although the Future of Facebook example will, in time, presumably do the same. The tension between the deeper analytical insight generated by WikiStrat, and the more open, engaging experiences created by the Foresight Engine, suggest that the design decisions taken while creating online collective intelligence systems for scenario research may have significant impact on their participation rates and depth. Because neither Case 1 nor Case 2 could address these elements of rich socialization, deep narrative investigation or aesthetically pleasing presentation, the examples represent an important, if secondary source of data for this work.

The following chapter, *Chapter 8, Discussion*, reflects upon the findings of all three cases and examples in order to better understand what they mean for the research questions of this dissertation.

## **Chapter 8 Discussion**

### **8.1 Introduction**

This chapter reflects upon the findings from previous chapters, relative to the core research questions of this dissertation. The core questions guiding this dissertation are:

1. Do web-based participatory approaches add value to the traditional scenario planning process, and if so, where, and in what ways?
2. If not, where do they fall short, in what ways, and why?

The chapter explores these and related sub-questions in two parts: first by identifying where the multiple sources of evidence generated in the case studies address the questions in robust, defensible ways and second, by exploring the more speculative issues and implications suggested by the evidence but for which data is unclear, unavailable or ambiguous. The first section discusses the impact and character of increased participation, where this participation fits into the traditional scenario creation process, the relationship between task structure and data generation / analysis, and the role of social dynamics in these systems and in the process. The second section discusses the possible impact of these systems on the outcomes of the scenario process (i.e., quality, learning, etc.), impacts on the profession and trade-craft of scenario planning and public participation, various methodological considerations for the use and study of such systems in urban planning research, and speculation on future development pathways for online scenario planning systems. The chapter then concludes with a reflection on how these discussions and supporting evidence address the research questions and what this implies for future research.

## **8.1 Core Themes**

### **8.1.1 Increased Participation**

It is clear that online collective intelligence systems can provide a variety of mechanisms to facilitate increased participation in the scenario creation process. At their most basic level, the data generated in the cases studies and comparative examples shows increased participation along three key dimensions: 1) numerically, in terms of the absolute number of participants involved; 2) geographically, in terms of the distribution of participants, and; 3) professionally, in terms of the range of disciplines and expertise able to be involved. Each is discussed in detail below.

From a purely numerical standpoint, Case 2, the SenseMaker Suite case study, provided the most obvious evidence for increased participation, involving over 265 participants in the scenario creation process. The Institute for the Future's SmartGrid 2025 example also had nearly 700 registered participants, of which 166 participated substantially. Quora (the online question and answer platform) discussions for the Future of Facebook project solicited over 100 responses, with nearly twice as many registered users following the conversation as observers. Finally, over 30 teams participated in the WikiStrat Grand Strategy competition. Compared to the base case, in which a total of 35 participants were involved from beginning to end, it is clear that such systems are capable of facilitating at least an order of magnitude more participation in the scenario planning process than traditional, face-to-face means.

The same appears true from a geographic standpoint. All cases indicated the ability to focus diverse participants from around the world on scenario creation tasks. The IFTF's Foresight Engine involved users from 82 different countries (comprising nearly 50% of total participation), for example. Case 2 involved participants from the Americas, Europe and Asia. WikiStrat's Grand Strategy competition involved teams from over 30 countries. While it is clear that global or even national contribution may not be appropriate for every project, the evidence presented here



demonstrates that such online systems have the ability to convene participants from a much larger geographic area than possible in the traditional process.

Finally, from a professional diversity standpoint, a similar pattern was found. While participation in these cases did not bridge the “digital divide” in its totality (by involving a representative sample of a given population, for example), they were able to successfully convene a wide range of subject matter experts and professional disciplines in almost every case. Case 1 drew explicitly from the published literature involving over 35 different academic disciplines and peer-reviewed research communities. Over 70% of participants in Case 2 had post-graduate education and nearly 65% classified themselves as either “expert” or as having “significant professional experience” in the subject. The WikiStrat Grand Competition also brought together more in-depth expertise in foreign policy, regional history, economics, military affairs and sociology.

To a lesser degree, with the exception of Case 1 and the WikiStrat example, each system also involved members of the general public. Anecdotal evidence suggests that these participants also had a deep subject-matter interest or local expertise in the topic at hand, without which they would probably not have chosen to participate. While none of the cases and examples achieved true demographic or statistical representativity of a given community (which was not their aim), they do appear to be successful at attracting a wide range of professional disciplines and levels of experience.

The combination of increased numerical participation, increased geographic participation, and increased diversity of subject matter expertise helps to address the main concerns raised with the scenario planning process. The following section explores the nature of this participation in more depth, reflecting specifically on the role of participants and depth of participation in various stages of the process.

### 8.1.2 Areas of Influence in the Scenario Planning Process

While increased participation is clearly possible, what is the nature of this participation? Was it uniform throughout the process? Was it substantive and deep? Did it add value, where and in what ways?

Looking at the nature of participation in more detail, we can see that most instances of participation from any given participant were fairly limited. In Case 2, each person contributed on average only a single entry, with an estimated involvement of 6-12 minutes. In the IFTF example, the median number of contributions per user was six, which varied between original content creation (1.5 median submissions per user) and responses to others' submissions (4.5 median responses per user). Participation was also heavily skewed towards a small group of very active participants in this case: less than 20% of the total users (48 out of 237) contributed over 70% of the content. The same patterns appeared to apply in the OpenForesight example as well.

It also appears that most participation was focused on the early stages of the scenario process in the cases and examples explored, specifically in the driver generation and analysis phases. Case 1, Futurescaper, focused exclusively on driver entry and analysis, building open-ended relationships between drivers, and the creation of emergent systems maps as analytical tools. Case 2 took a different approach, asking users to submit complete stories of the future or stories they thought would influence the future. The IFTF and OpenForesight examples did the same, asking users to both submit and discuss drivers and forces in change in various ways. All of this activity was focused on building early-state data and interpretation necessary for draft scenario creation.

The WikiStrat platform offered an interesting contrast, however, in that it engaged teams of users throughout the entire process to produce content at every stage. While the final output was not narrative scenarios per se, they were geopolitical forecasts of different regions and countries. This focus on “end-to-end” full text submission is distinct from the other cases and examples

reviewed here, but does not distract from the majority emphasis on early stage data generation and analysis.

How did the use of these tools as data generation platforms compare to the base case?

From a purely numerical standpoint, the base case generated 17 major drivers from in-depth interviews, divided into three categories (Political, Economic and Social). The process took between 80 - 90 working hours to conduct and analyze, including the logistics associated with arranging and conducting interviews (but not counting travel time to and from the client's location or time spent developing the final presentation documents). This amounts to an average of approximately five hours per driver. In the workshop, an additional 90 drivers were also identified, which took approximately 120 minutes to brainstorm and cluster into a final set of three to four "critical uncertainties".

In comparison, Case 1 brought this time down to approximately 15 minutes per variable, while Case 2 brought this down to less than 10 minutes. The IFTF's Foresight Engine generated over 900 drivers in less than 24 hours, which equates to approximately 90 seconds per driver. Although imprecise (the definition of "driver" varied between cases), this data suggests the potential for a massive reduction in the time taken to generate initial drivers and forces of change.

The second area where the systems may have added value was in the clustering and synthesis of these trends and drivers. Because this was done in a single afternoon for the Base Case, comparison along temporal dimensions is less appropriate. However, one of the main criticisms of a workshop-based approach is that the amount of time devoted to exploration of these trends and their interactions is often *insufficient* in a 2 - 3 hour workshop session. One expert interviewed suggested that, "you often spend all your time in the build-up, just synchronizing vocabulary and ideas. Then the critical discussions about uncertainties and their interaction is jammed into a quick afternoon, when everyone is rushing to get back to their real lives."

The key dimensions of comparison then may be whether or not the systems explored offered either greater processing time for the analysis of variables and their interactions, or new mechanisms for analysis and exploration that helped to more effectively leverage the existing time available.

Compared to these dimensions, Case 1 fell primarily under the latter category. By allowing users to specify the relationships between drivers with folksonomic subject tags, the platform divided the burden of analysing complex systemic relationships into a variety of micro-tasks, performed in real time by each user at the point of data entry. Participants thus entered a trend or driver *and* contributed to building an understanding of how it might relate at the same time. This enabled rapid summary and analysis of drivers and trends, vis-a-vis their systemic relationships, in a way that provides greater analytical depth than would be possible in an unaided workshop session.

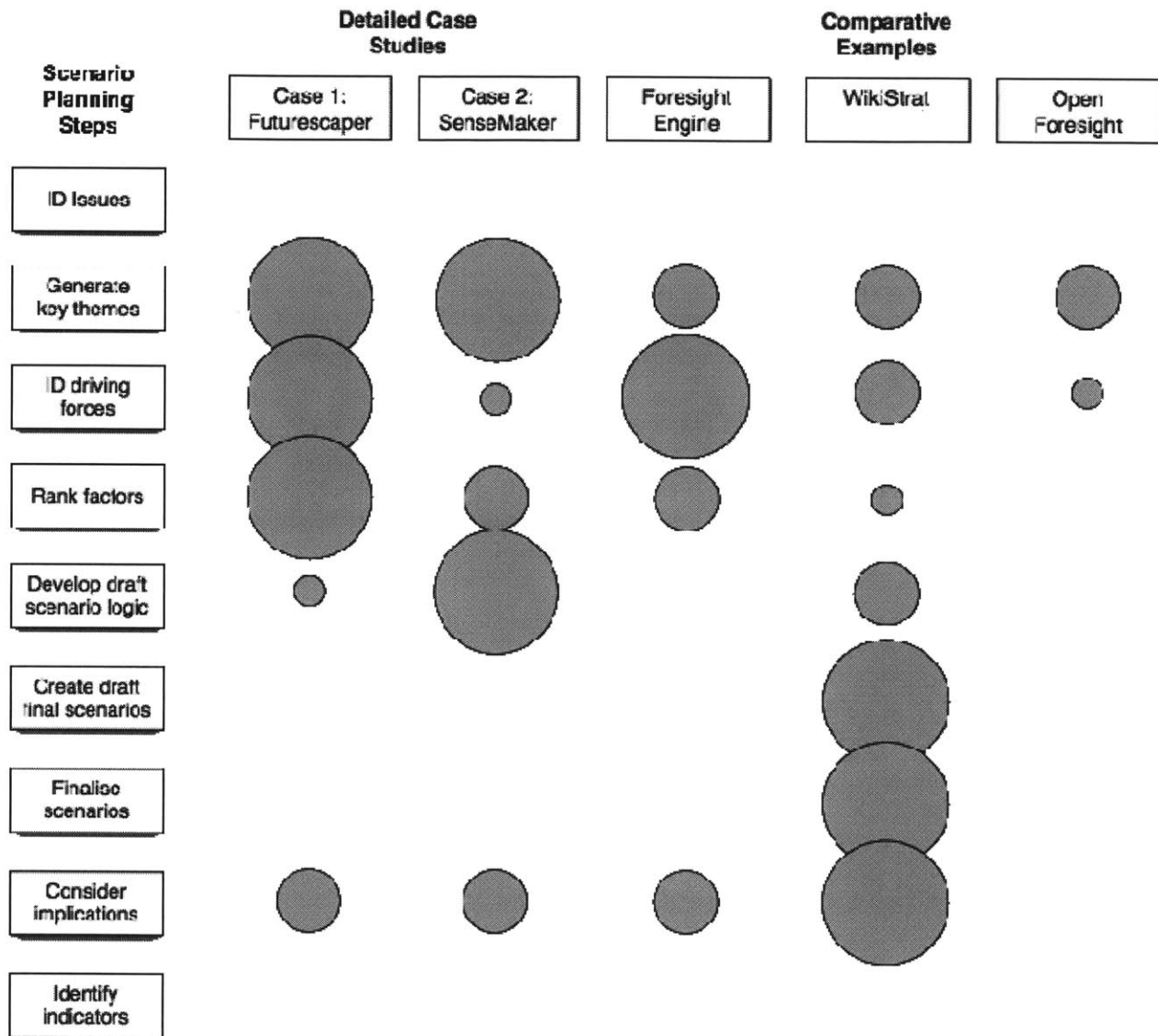
Case 2 followed a related approach to distributed, user-based analysis. Users coded their stories relative to subject-tags and a series of pre-determined archetypical values. These were then auto-aggregated for easier clustering and synthesis through a variety of means. Although the mechanism of clustering was quite different from Case 1, the same principle of dividing analytical tasks into small units and shifting it to the user was still quite successful. Both of these approaches illustrate ways that online tools can help automate or distribute basic analytical tasks amongst many users, allowing for more complex analysis of their interaction in a shorter period of time.

However, this approach was different than that used in the three comparative examples. While the IFTF example distributed the generation of drivers amongst a crowd of participants, it had no mechanisms for auto-aggregating or clustering these drivers; neither did OpenForesight's "Future of Facebook" project, a fact which its creators noted in an interview when they said, "none of us had any idea it would take this long to complete." This combination of enhanced data generation and lack of mechanisms for sorting and analyzing data creates a challenging paradox. In

these cases, adding more data and more participation actually *increases* the analytical burden on the consulting team, thereby making it potentially *more* time consuming and *more* difficult to sort, analyze, and cluster drivers into useful categories for scenario building. The provision of equally powerful sorting and clustering tools is therefore an essential component if such platforms are to be useful to the scenario creation process.

Figure 8.1 illustrates the main areas of influence of each system on the traditional eight-step scenario planning process. It can be seen that Cases 1 and 2 have the greatest subjective utility at the early stages of the process; notably in generating key themes, identifying drivers, ranking forces and (to a larger extent in Case 2 than Case 1) helping develop draft scenario logics. A similar pattern of utility was found in IFTF's Foresight Engine and the Future of Facebook examples. By comparison, WikiStrat focused on engaging users primarily in the write-up of more traditional "essay-like" contributions. While this was relevant and applicable in the early stages, it also had more perceived utility in later stages traditionally more conducive to long-form narrative composition.

Figure 8.1 Relative Influence on Different Parts of the Scenario Planning Process



This focus on early stage driver identification and analysis has several advantages. It increases the likelihood that a wide variety of forces and factors will be included. This is further enhanced when combined with the increased geographic, professional, and numerical participation explored above. Diversity is a critical component of the scenario planning process, and such a wide approach to collecting input from diverse sources appears to meet this goal. Expanding the scope of participation beyond those familiar to the client or consultant helps increase the probability that

diverse viewpoints will be heard, as well as suggests that a more robust set of drivers will be captured.

This increased participation and diversity also implies that individual and group biases may be less dominant at the early drivers exploration stage. One of the phenomena observed in the Base Case (and in many other studies of group interaction) is that a few dominant personalities often have disproportionate influence on the direction and tone of the discussion, potentially biasing scenario outcomes. While using the “open outcry” method to generate a list of drivers helps offset these biases, this challenge reemerges and becomes more pronounced in the driver clustering and synthesis phase. The Base Case spent less than two hours in total exploring the connections between factors and clustering them into meaningful categories. The initial round of clustering, highly influential in steering the overall process, was done entirely by the facilitators in private while participants were at lunch. Although this clustering was done based on the number of votes received for similar drivers, there was nonetheless very little time nor inclination to modify them after participants had returned and substantive debate had begun. Furthermore, the debate was characterized by quite detailed argument over specific phrases and their meaning, perhaps converging too rapidly on “local minima or maxima” and thereby missing important other discussions or possibilities.

The use of computer-aided or semi-automated clustering techniques in Case 1, and the more robust discussion and commenting mechanisms in the IFTF, Future of Facebook and WikiStrat examples, suggest that these platforms offer both more sophisticated tools for analysing drivers and their interactions, as well as more transparent mechanisms for discussing and deciding on which ones to include in later scenario-building stages. Case 1 allowed for the exploration of second- and third-order effects quite easily, while the other examples allowed for robust discussion of variables and their implications through interactive reflection or transparent debate and dialogue. The second

area where these systems seem to be of value is therefore in adding *transparency* and *depth* to the driver clustering and analysis process.

### **8.1.3 More Structure, Easier Analysis; Less Structure, Easier Submission**

The use of such systems illuminates a tension between the level of structure involved in the submission and analysis process, and the ability for participants to submit and interact with material as they like. On the one hand, this expressed itself in a tension between the user interface of Cases 1 and 2. Case 1 was designed to facilitate subsequent analysis and therefore used a highly structured user interface with little room for deviation. This aided later phases as explained below, but was also somewhat ungainly and counter-intuitive. It is likely that few participants would have chosen to spend time using the system if they had not been paid to do so as part of their project responsibilities. Case 2, on the other hand, was designed to allow for more open-ended data entry and free-form contribution. The open-ended narrative structure in this case allowed for a range of user contributions as each participant saw fit. Input ranged from observations that, “there are more potholes on my street” to more reflective, in-depth, and reference-heavy analysis of the trends and issues concerning them. This open-endedness is likely to have facilitated easier participation and also allowed for a range of response types to be captured.

One challenge to this approach, however, was that it required a much more constrained sorting mechanism to be used in the analysis phase. The three narrative archetypes that were used as a forcing mechanism successfully allowed for the rapid distillation of diverse content into representative examples, but were essentially predetermined axes. This highlights the crucial influence of design on what these archetypes were and how they were expressed. It also suggests that forcing data into pre-determined buckets could miss important, idiosyncratic, non-archetypical scenario structures that might later become “Black Swan”-like events. As a result, Case 1’s input



was more structured but its analysis more open, while Case 2's input was more open, but its analysis more restricted.

This relationship also appeared as a trade off between ease of use and degree of participation. The IFTF's Foresight Engine offered perhaps the best example of a fun, intuitive, easy to use process, with a shallow learning curve and fairly open-ended possibilities for interaction. But this very same ease of use comes at the expense of analytical tools that help synthesize, cluster and rank important themes and issues. WikiStat, on the other hand, used a more complex format of administrator-led challenges and responses, whereby participant teams were required to submit essay-length analyses of complex geopolitical forces. This set a higher bar for user submission that potentially reduced total participation, but increased quality of submission and analysis.

On balance, a mix of task structure and open-endedness is probably desirable, depending on the nature of the data collected and the stakeholder community engaged. "Open mics are useless," argued one public engagement facilitator, for example. "You need to give people semi-structured activities that help guide them into making a useful contribution." "People enter these activities with little background experience, usually. *Part of your job is to help model the thinking process that they should undergo,*" observed another. Striking a balance between levels of structure and levels of use is a key consideration for such systems if they are to avoid either overly constrained processes that produce generic outcomes or under constrained processes that produce analytical challenges and data overload.

#### **8.1.4 The Role of Visuals and Multimedia**

A related theme is the way that thematic relationships and interactions were visualized and presented. Several participants and experts interviewed felt that the visualization abilities of Case 1 in particular were of notable value. These visualizations, particularly the automated causal-loop

diagramming, allowed for rapid exploration of second- and third-order relationships in a way which enabled analysts to quickly identify potential pivot points within a storyline. This also appeared to capture more of the real-world complexity in participants' understanding of the system dynamics, thereby facilitating the kinds of "strategic surprise" most sought after in scenario workshops.

"Having a common diagram like that can be tremendously useful to help synchronize people's understanding of what they are talking about," commented one Australian scenario expert. "One of the key dynamics of these systems going forward is that it changes our ability to have great visibility of these trends and conversations, of what people are thinking. This will become a critical tool in the future." "It is also important to use visualization to see what are the most interesting and important stories," suggested another scenarios expert. "Part of the unique value of a central database is that diverse users can see what everyone else is thinking and build a common language for dialogue. This fits perfectly with the goals of scenario planning and may be one of online [platforms'] greatest strengths." Another respondent argued that scenario engagement techniques are "ultimately about stretching people's minds. A futurist [process] helps people think."

Respondents emphasized that visualization techniques and common reference points (often through shared images, videos or lists) may be one way to achieve this goal.

Although the Base Case did not explicitly engage in a systems mapping exercise, such an approach is not uncommon in other face-to-face scenario processes. The use of visualization tools like those employed in Case 1 may therefore be one of the more unique contributions to the process of scenario planning. By reducing the time and effort involved in creating such maps, and by allowing users to interact and explore them in more detail, they may help to synchronize opinions and attitudes about how a complex system works and how it might change over time. More interactive and dynamic functions would only serve to enhance this potential.

Although no other cases or examples used visualization in this particular way, the IFTF and Future of Facebook examples used extensive video and multi-media enhancements to facilitate their process. The IFTF example in particular presented a range of complex ideas and issues in a short, easily accessible video at the beginning of the user experience. The video presented a summary of the major themes and issues influencing the topic of the smart grid, in the form of a narrative news broadcast from the future. This was derived from research conducted by the IFTF team in advance and served to add content, excitement and focus to the game itself. The video was viewed over 2,500 times, helping to achieve the pedagogical goals of educating a user community, as well as the practical one of synchronizing a group of participants in the scenario planning process. The Future of Facebook project used a similar technique, producing curated clips of key themes and issues from the interview process online on a custom YouTube channel, which received over 18,000 views. This was a particularly effective way of presenting both raw concepts as well as more synthetic, analysed themes and higher-level issues. It served to differentiate the process from other, more traditional means and engage a range of users in creative ways that helped make often abstract ideas come alive.

The combination of enhanced participation, various clustering mechanisms, and more robust visualization tools suggests that online approaches such as these may offer enhanced transparency in the scenario building process for urban planning. One of the core critiques of scenario planning is its lack of standards, professional guidelines, and objective evaluation metrics. The Base Case clearly demonstrated areas where time, process, or facilitator constraints introduced bias and influence on the process; particularly in the clustering and analysis of drivers and the creation of draft scenario frameworks. Although none of these systems set out to address these core concerns directly, their explicit focus on enhanced participation and decision transparency was identified by several experts as a highly desirable potential impact. “No one will ever do it the same way (thankfully)”, commented one expert informant, “but the more clarity and transparency you add to the way you

do, and the why decisions are made, the better.” This helps further reduce individual, group, and facilitator bias in the process and, it is hoped, enhances the quality of both process and outcomes. The addition of more user-focused features such as voting and commenting (explored below) can only increase this advantage. Taken together, data visualization, multi-media, and enhanced user activity is another clear area of value for the scenario process.

### **8.1.5 The Social Experience of Online Scenario Building**

One of the most marked differences between the Base Case and the online cases and examples was the *role and type of socialization involved*. Although several of the Cases and examples may offer improvements or augmentation to the core functions of the scenario planning process, the Base Case provided clear advantages in the social dimension of the scenario process. One of the implicit goals of scenario planning is to build relationships between organizational and stakeholder “silos”, thereby helping to build trust and social capital along the way. Another goal, to help influence decision-makers through visceral, emotional, and creative means, is partly achieved through the social experience itself. One UK-based academic noted that, “scenario workshops are most effective when they help people play through their emotional experiences of uncomfortable ideas and new issues. If you can tap into this process online, you will be more likely to achieve your goals.”

This insight illustrates the emotional and psychological dimensions of scenario workshops. One South African scenario expert observed that, “Scenarios themselves are often just transitional objects - they let people try out different conditions in which their plans must live. This helps them get comfortable with conditions they may have to face that they would otherwise prefer to ignore.” Providing opportunities, or even requiring participants to interact with each other and with novel

ideas is one of the ways that face-to-face scenario workshops help ‘stretch’ participants’ thinking and comfort levels.

Although more people participated in the online cases, that participation was almost entirely one-to-many, meaning that individuals sat alone at their computers, interacting with the system or with other users remotely. The WikiStrat example alone was the sole example in which participants came together as teams. While both the IFTF and the Future of Facebook allowed users to interact with each other during the scenario process, only the Future of Facebook did so in an explicitly social context, i.e., using participant’s real names, real roles and real social contacts (or at least those shared on social networking sights such as Facebook). This is not to say that the experience of participation in these systems was not emotional, particularly the IFTF’s game-like platform and WikiStrat’s collaborative competitive platform, but simply that the amount of social engagement was far less than that in the Base Case and other similar scenario exercises.

This may be particularly true with Case 1 and Case 2, which provided little in the way of either user feedback or social interaction. It was observed in both cases that participants felt that the “one way nature” of the experience was both unfulfilling and “mysterious”. Although the use of user generated content was clearly spelled out at the beginning of the process, there was no readily available way for participants to see the results of their efforts, nor those of others, nor interact with them in any way.

This posed a major disadvantage when compared to the Base Case. One researcher suggested that, “people need feedback in order to stay involved. You can provide automated feedback, but other people are the best kind of feedback you can possibly ask for.” Several practitioners cited this phenomena as one of the main reasons that face-to-face scenario workshops were so popular; they gave the participants a chance to contribute to a group process and immediately get feedback from others on their contributions. Greater user involvement may go a

long way towards addressing these concerns, particularly through more evocative use of multimedia and game-like interactions such as those used by the IFTF, WikiStrat and the Future of Facebook project. But one thing is clear from these findings: the online systems explored here fall short of engaging many of the “softer aspects” that make scenario planning workshops at their best so socially engaging.

However, a secondary aspect of socialization which bears discussion is the potential for different stakeholders to play different roles in the management and curation of online scenario platforms. Both the IFTF and WikiStrat examples suggest how greater participant involvement can both enhance socialization and the process of data generation and analysis. Each used variations of moderators, super-users or reputation systems to create incentives for participation and mechanisms of enhanced involvement. The IFTF’s SmartGrid 2025 game, for example, had several IFTF staff and volunteers monitoring the flow of data generation and discussion. They facilitated particular lines of inquiry through system-wide prompt questions, which both helped keep the pace of participation flowing and also guided conversation towards under-explored areas. These administrators also awarded various “power-ups” and status markers in the form of reputational prizes and awards to highly involved users. Of the 4,700 submissions made, for example, 174 were marked “super interesting” by system moderators, which provided both a boost in that author’s score as well as focusing attention on interesting discussions and debate. Various other awards were given that helped to differentiate very active or particularly high-quality participants. WikiStrat took this principle several levels further, giving participants explicit “ranks” based on their past performance, years of experience, level of education and other criteria. This both recognizes varying levels of expertise, but also provides additional roles and responsibilities for higher-ranking participants. High-ranking participants were also entitled to greater financial returns on their analysis, should it be deemed useful by paying clients or expert judges.

The segmentation of users into various roles suggests one mechanism for dealing with the increased amount of data generated by such systems. By effectively “deputizing” users who have demonstrated high levels of insight, such users can help to filter and moderate the process of data generation and analysis, as well as facilitate the ongoing community of invested stakeholders. This may only be relevant in the context of long-term, on-going engagements such as WikiStrat, but offers interesting potential for increasing levels of social engagement in shorter exercises as well.

## **8.2 Larger Implications and Considerations**

Evidence from the Case Studies and comparative examples also raised intriguing questions for which data was unavailable, ambiguous, or only suggestive. This section identifies some of these issues and begins to outline the contours of their discussion. It focuses on the impact of such systems on core scenario outcomes (i.e., quality), their impact on professional standards and tradecraft, their implication for the academic use and study of such systems, and a discussion of how such platforms may evolve in the future.

### **8.2.1 Impact on the Process; Better Scenarios, Better Workshops?**

Given the lack of objective metrics for evaluating scenario quality or outcomes, it is challenging to speculate on the impact that these platforms may have on the outcome of scenario process itself. Chermack’s theory of scenario planning (2003) posits that scenarios can help organizations learn about environmental change by increasing their awareness of external forces and factors. This in turn is meant to produce more accurate “mental models”, which lead to better decision making and better performance, and addresses the notion that the process of identifying environmental unknowns and critical uncertainties helps overcome individual and group decision-biases.

This definition fits well with the corporate and military roots of mainstream scenario planning, whereby a small, centralized group of leaders with decision-making authority can directly influence the actions of a large body of others (a firm, an army, etc.). It may be less appropriate for multi-stakeholder public policy issues, however, where decision-making ability is split amongst many different parties, and goals are often contested and open to review.

The multi-polar nature of public policy debate, therefore, suggests that scenarios may have to “work harder” in the public planning context. More parties need to be consulted, more data and perspectives need to be considered, and more differences need to be bridged in order to reach consensus on key forces and factors affecting a community’s future. It is therefore likely that the emphasis of public scenario planning work may fall more heavily on the first and second steps of Chermarck’s model, notably “learning” and “influencing mental models”. If this is true, how might such platforms impact the public participation process in urban planning and decision-making?

Based on the findings of this research, it is logical that these platforms’ ability to integrate significantly larger number of participants in the process, combined with their ability to integrate significantly different opinions and attitudes at relatively low cost and effort, makes them particularly well suited to public engagement with urban planning issues. This suggests that public authorities, non-profits and their consultants may successfully employ them at a fraction of the cost of full-scale consultation efforts, thereby helping bridge the gap between the learning process and mental models of more diverse stakeholder groups.

But to what end? Do these systems produce the kind of strategic insight and emotional urgency that, “makes the ordinary seem strange and the strange, ordinary”, as quoted by Schwartz (1997)? Are they effective tools for not only bridging people’s understanding of uncertainty but also bringing these issues to life and motivating them to take action? Based on the findings of this research alone, it is impossible to tell. It is also questionable as to whether or not the Base Case



produced this impact as claimed. Said another way, in the words of one UK-based academic and experienced scenario practitioner, “Is more participation better?”

Not all experts interviewed were convinced of the value of broader and more diverse participation. One experienced practitioner and academic from the UK asked the question, “why do you need large groups to do futures research? Do you need them? I think not.” When this question was posed to a French consultant and futures researcher specializing in urban policy, he replied, “Do you need large groups? No, definitely not. But do they add something? Definitely—especially in the public policy context. If you can figure out a way to involve more people in the process, it might not help the actual process but will certainly improve the acceptance of its results.” This sentiment was echoed by another respondent who observed that, “sometimes all you need is five bright people spending a week together to change the world. Compare this to a year of 20,000 people all contributing banal and useless ideas. Which is better? You tell me.”

Others were more optimistic about the value of increased participation as a way to add content value, not just contextual acceptance. A South African academic and well-respected practitioner observed that, “these workshops often involve the great and the good, but no one even knows the marginal or fringe perspectives that could still be important in the future. Providing a means to involve these players and ideas should only improve the output, if done well.” Others explicitly acknowledged that environmental complexity was so challenging and dynamic that the only way to effectively understand the world was through as many diverse perspectives as possible.

Experts were therefore divided about the value of increased participation, usually acknowledging that more engagement was often necessary as a consensus-building process in multi-stakeholder environments but that more participants may lead to diminishing returns in quality.

The evidence from this dissertation suggests that use of such systems *on their own* will *not* produce the desired outcomes of the scenario process. Case 1 effectively leveraged diverse expert

opinions to produce a common systems map, but this alone was merely one part of the larger process. Case 2 effectively produced compelling scenario logics that in retrospect have surprising emotional resonance and accuracy. But the unidirectional, “black box” nature of both cases suggests that they did not produce the kinds of emotional and social experiences sought in the most effective scenario exercises. The same may be true of the WikiStrat case, although the more prolonged engagement of its participants and the promise of financial reward and public recognition may have increased its effectiveness. In contrast, the IFTF and OpenForesight examples used more active and visceral methods of social engagement (particularly the game-like dynamics of the IFTF’s Foresight Engine) that, when combined with the creative use of video and multi-media, may offer a potentially viable alternative. On the whole, however, it must be acknowledged that these systems did not on their own produce sufficient emotional or analytical impact to replace the best examples of face-to-face scenario planning.

That said, each system did effectively demonstrate the ability to significantly *enhance* the face-to-face process in various ways. The use of Case 1’s automated systems visualization tools and clustering approach, as well as Case 2’s qualitative and emotional narrative capture techniques, clearly demonstrate ways that early stage scenario processes can be enhanced and improved. Both demonstrate the prospect for enhanced transparency, speed and efficiency in the driver identification, ranking, clustering, and draft scenario creation phases. The comparative examples also demonstrate different methods of engaging larger groups in dialogue and debate around key issues, such as exploring key implications and developing scenario content and ideas. This suggests that with proper design and attention, a hybrid form of online and face-to-face engagement could leverage the benefits of both virtual and in-person collaboration. Future systems are likely to explore this combination, developing various approaches to rapid-prototyping futures online, then

testing and exploring them in more depth in person. This suggests both new avenues for future research as well as new innovations in scenario practice and delivery.

### **8.2.2 Impacts on Professional Standards**

Another important implication of the development of such systems is their potential impact on the field's future, as well as on the larger topic of public participation in general. Pang (2010) suggests that, "the futures profession is decentralized, eclectic and intellectually varied: there are no schools that train its elite, few barriers to entry, no certification or regulatory body."

Just as Amazon, eBay, and other online sites have reputation mechanisms that differentiate experienced, trust-worthy participants from others, so too could professional futurists and scenario planners gain evidence-based reputations based on their performance in public scenario processes. Several experts interviewed suggest that the large-scale deployment of such systems would have a fundamental levelling effect on the industry, which is currently characterized by a wide variety of speciality practitioners employing various methodologies. Should such systems enable more transparent reputation tracking, both amateur and professional participants could be evaluated more effectively by their scores over time. This would help prevent the "hedgehog effect" (Tetlock, 2006), by which loud, overly confident forecasters and pundits attract short-term media attention, regardless of their past record of performance.

Indeed, "The Good Judgement Project" at the University of Pennsylvania and University of California, Berkeley is seeking to do just that. Led by Phil Tetlock and others, sponsored by DARPA, this project is attempting to create a national database of forecasters who would be tested against various metrics of predictive accuracy and correctness. It is conceived that apart from straight accuracy, other measures related to the "softer" aspects of scenario planning could also be developed. These include those related to imaginative stretch, emotional engagement, effective

reframing of issues and dilemmas, and the effective translation of future possibilities into present day strategic options. Such a common set of transparent standards could significantly improve the professional quality of the scenarios and foresight industry, which is heavily influenced by attention-seeking media impresarios who operate without verification, accountability, or professional validation.

In contrast, however, the use of widely available and economically affordable participatory futures systems could significantly polarize the professional scenario planning market. To date, the practice of qualitative scenario planning relies partially on the mystique of past glories (vis-a-vis Pierre Wack, the success of Shell, and the early days of scenario planning consultancy GBN) and partly on the lack of general understanding as to how it is performed. This allows practitioners to command very high fees for the practice of scenario planning, with very little accountability or standards for follow-up. If such online platforms become competitive alternatives, producing robustly similar results at a fraction of the price, it is conceivable that much of the basic scenario planning market could be commoditized in a way now common to basic accountancy, project management, or HR functions. This could have the paradoxical effect of levelling the playing field of most practitioners (thereby lowering their fees and prestige), but also creating a smaller, more exclusive niche market for the true scenario “stars” (who may even reject the use of such tools on principle and trade on their reputation alone).

On the other hand, larger management consultancies such as those which offer scenario planning as an integrated part of their professional services may be likely to use such systems to lower their cost of scenario planning operations, but without lowering fees. Thus the cost savings associated with the automation of many of these tasks could provide a valuable competitive advantage in the near- to medium-term, when such systems improve their effectiveness and sophistication, but before they become widespread.

It is likely that in either case, the continued development of these tools will produce a significant impact on the scenario planning profession and market, especially when they achieve greater operational sophistication and after the various issues and uncertainties presented in this research are more fully understood. As they develop and are tested in different policy environments, as well, they will likely further differentiate themselves from the standard business consulting model used by many scenario planning consultancies. In particular, their use as dialogic and influence tools in multi-stakeholder environments will likely make them more useful in urban planning and advocacy cases, although with possible unintended consequences. This difference between business and planning contexts is discussed in more detail below, where these findings are linked back to the planning literature discussed in Chapter Two.

### **8.2.3 Connection to Urban Planning Theory**

Chapter Two introduced four main traditions in the urban planning literature; social reform, policy analysis, social learning and social mobilization. How do the themes and findings of this dissertation relate back to these schools?

One of the main findings of this research is that although these systems are far from robust, they do suggest that certain aspects of them could be more easily automated or done more cost effectively. This has different implications if read through different lenses of planning theory. From a policy analysis tradition, the technical potential of these systems could be seen as a positive development towards more comprehensive understanding of diverse stakeholder goals and values, as well as a mechanism for more comprehensive monitoring and sampling of diverse inputs for analysis. This, combined with the potential speed and efficiency gains resulting from the parallel processing of this data via distributed, crowd-sourced analysis, suggests that such large scale participatory systems could help address one of the main challenges of the policy analysis school, as

highlighted by Scott (1998) and others. Namely, that such formal rational approaches often fail because they lack adequate measures of stake holder values and goals, a model for relating these values to an objective set of choices, mechanisms for evaluating these choices, and means of coordinating decision to enact these choices. While collective intelligence-based scenario systems cannot address all of these concerns, they can assist with the solicitation of values and objectives in a more rapid way, as well as the processing and synthesis of them in policy-relevant ways.

But the real potential of these systems relates more to the goals of the social learning and social mobilization traditions than the policy analysis tradition. The stated purpose of qualitative scenario planning is not to produce better predictions of the future, or even to minimize uncertainty in the operating environment. Instead, the purpose is to facilitate collective learning in a way which relates explicitly from the main traditions of the social learning school (Argyris and Schon, 1974; Rein and Schon, 1993). The purpose of scenario planning is to facilitate enhanced learning and awareness, a need which translates well to the public policy sphere. Quoting Mintzenberg (1994), Healey (2007) observes that, “strategic thinking involves a way of thought, in which events, episodes and possibilities are continuously interpreted in terms of their significance for an enterprise as it evolves over time in a specific and dynamic context” (p.30). The fragmented nature of urban public politics suggests that different actors will perceive different parts of reality unfolding differently, and that their interpretation of these events may vary significantly as well. The utility of large scale platforms for helping stakeholders articulate these interpretations, discuss them and make them visible to each other should not be underestimated.

While the traditional public engagement process is often episodic and theme- or event-specific, online platforms offer the potential for continuous, rolling exploration of these issues which has never before been possible. This relates powerfully to another strand of work within the social learning school, that of the political power of frames and framing. A frame provides

“conceptual coherence, a direction for action, a basis for persuasion, and a framework for the collection and analysis of data” (Rein and Schon 1993, p. 153). Frames are thus social sensemaking devices which can have powerful influence over the data collected, interpretations offered and decisions taken around complex, uncertain events. Healey notes that, “in the context of collective action for the development of urban areas, strategic thinking involves selecting and focusing on key interventions in these relations that could make a difference through time” (p. 30). The narrative aspect of scenarios, with their explicit focus on framing mental models of change in the world, offer a particularly applicable compliment to the traditional framing work done by urban public decision-makers. de Roo notes that, “imagining cities is about articulating the linkages of policy frameworks, developing a shared awareness of the space-time dynamics of the relationships weaving through and across an area” (p. 37). Scenarios do just this, acting as an exercise to focus attention, to articulating and modifying frames for events that may not yet have occurred. Quoting Healey again, she observes:

Strategic mobilisation involves a process of coalescence of intellectual and political forces through which strategies are ‘recognised’, given names and positioned in specific institutional contexts. Such mobilisations exploits moments of opportunity, where having a strategy responds to some felt need among key actors. Skilled strategic work involves understanding the nature of such moments and the opportunities to ‘capture’ them in particular directions (p. 195).

Scenarios, particularly in the public context, offer a mechanism for helping stakeholders recognize these moments of opportunity and change, thereby offering the potential to help synchronize perceptions in a way which can, in theory, help “coalesce” understanding into shared frames for action. This could help generate new frames for the response to surprises, perhaps even exploring how such events might occur beforehand and generating strategies that could help avoid negative aspects of political gamesmanship and stakeholder fragmentation that often occurs during

times of crisis. They also offer the potential to help envision positive futures and frames, around which stakeholder groups could coalesce for mutual benefit.

This possibility suggests an important unintended consequence of such systems, however, which relates more to the social mobilization tradition of planning thought. If such systems “democratize” the process of scenario creation to a sufficient degree, they could actually *increase* fragmentation and political discord in urban environments, as opposed to decreasing it in the way explored above. Given that the social mobilization tradition places planning in the context of contested resources and decisions, it is far closer to the zero-sum competitive environments of scenario planning’s origins in business and warfare. If scenarios can be used as effective political framing devices, this implies that they could also be used as “weapons” to further disrupt the planning process. If each advocacy group or citizen committee is able to contest planning decisions with a range of plausible alternative scenarios, then such tools exhibit a disruptive potential unintended by their original creators. In these situations, the rhetorical power of scenarios as an influence tool would situate them within the wide range of other advocacy methods employed by political campaigners in the modern political system.

Scenarios, and the large-scale systems which could be used to create them, appear to have the contradictory power to both enhance the formal analytical approaches of the policy analysis school, augment the collective learning goals of social learning tradition and, paradoxically, serve as disruptive political devices within the social mobilization tradition. This suggests that the emergence of large-scale collective intelligence platforms for scenario generation is a far more complex undertaking than one of simple technical feasibility. While involving larger numbers of people should help improve the speed, transparency and diversity of scenarios themselves (all explicit goals of the scenario planning literature), as well as furthering the democratic goals of public participation in the planning process, their widespread application in public policy may paradoxically create a new



class of problems that they themselves are unlikely to be able to deal with. It is likely then, as these systems continue to develop, far more attention will need to be devoted to the social and political use of these systems if these issues are to be better understood. This, along with the technical and operational aspects explored in more depth in this dissertation, will likely be fertile ground for scholarly research in future versions of this research

#### **8.2.4 Differences Between Business and Public Sector Scenario Planning**

Although not the main focus of this dissertation, the findings of this work shed light on some of the important differences between the way scenario planning is used in a business context, which has relatively few stakeholders and relatively clear lines of command, and the public context, which has many conflicting stakeholders, ambiguous power structures and multiple competing values and objectives.

In fact, a variety of public decisions involve very similar conditions to private, corporate or military conditions, and vice-versa. Decision-making which involves a small number of experts to which the general public has delegated a reasonable degree of authority and expertise are often not reviewed in the context of full public meetings, citizen engagement exercises and the like. In this way they operate somewhat similarly to small group decision-making in the corporate board room. On the other hand, many large, multinational corporate decisions involve dozens if not hundreds of distributed division heads, regional directors, vice presidents and the like. While explicit command and control may exist on paper for these organizations, the process of decision-making and implementation is much closer to that of a public, multi-stakeholder process. The same is true for military exercises involving significant degrees of diplomacy or coalition building.

This implies that a binary distinction between business and public sectors may be less productive than thinking about them as a spectrum of decision contexts. Viewed in this light, we

may consider three dimensions of scenario building and application that could vary across each example. These dimensions are:

- Openness of decision context (i.e., degree of effective command and control and multi-party engagement)
- Openness of the scenario scoping process (i.e., what variables are deemed important to consider before the scenario exercise begins)
- Openness of the scenario selection process (i.e., who decides how many and which scenarios get integrated into a final set for decision-making).

Considering these three variables, we can see how several of the case studies and examples from this dissertation map across this space. Case 1, for example, involved a closed group of experts making decisions, but an open context of scenario scoping. Participants could, in theory, enter any data they felt like into the system and it would contribute towards scenario generation. The results of this, however, were taken into a closed scenario selection process in the end. Case 2 involved an open decision context, but a closed scoping context and a closed scenario selection process. In contrast, the Future of Facebook example involved an open decision context, an open scoping context and an open scenario selection context.

The key point is that the purpose and function of scenarios, and therefore the utility of the online systems explored here-in, will vary between these contexts. Where the stated purpose of business scenario planning is often to both sensitive a small group of decision-makers to external conditions they may not be aware of, as well as synchronize their mental models to how the world may work and what scenario sets may unfold, the purpose may be quite different in a more open decision-context involving open scoping or scenario selection. In these contexts, the point may not be to generate consensus, but instead to provide a safe political vessel within which stakeholders can “agree to disagree”. Said another way, scenarios can be used in the public environment to actually

surface and preserve disagreement in a politically productive way; one that enables political planning to continue without any of the more extreme positions represented in any given scenario from dominating or sabotaging the entire process. Thus while it is not strictly consensus building, it serves more as disagreement containment in a way which preserves political freedom to make future choices.

### **8.2.5 Methodological Considerations**

The use of such systems as data generation platforms also poses a variety of issues for their use and deployment as research instruments by urban planning academics. First, such platforms offer the potential for participants to become directly involved in aspects of the research process itself. This poses unique methodological challenges for study design and execution. Where most traditional research design follows a hypothesis testing, research-question driven framework wherein both are determined in advance, several unique features of user-driven collective intelligence platforms may challenge this.

First, the evolution of such systems is ongoing, self-reflective and emergent. Users in mature online communities are continually updating, refining and modifying system content through their interaction. This makes the challenge of “bounding” a research study quite difficult. Participants can influence and in some cases decide upon the framing of research questions to be asked; for example, the selection or definition of constructs and even the variables selected for measurement.

This effect is more pronounced when users become involved in both data analysis and generation. This suggests that their ability to structure and control the research process may be limited in critical ways when using these tools. Participants may spend time exploring only those issues and concerns which interest them most, thereby shifting cognitive resources away from the concerns of the researcher and towards their own agendas. As a result, although such systems can

be powerful analytical engines for processing the data they generate, they may also pose challenges to their guidance and could become less explicitly directive and reliable when compared to traditional data-generation exercises. A former practitioner suggested that, “moderators of an online process sometimes have the feeling that they’re barely holding on for dear life, because sometimes the carriage tries to run away without them.” This can be “tremendously frustrating” for researchers used to “well behaved conditions”, observed another practitioner, who suggested that the use of such tools could require more flexibility in research design and study administration than a less participatory, open approach. This raises important questions about how to curate a participant community in the context of an ongoing research project and how to interpret results that are emergent and self-reflective. One expert interviewed summarised this observation when she said, “What you put in is not what you get out of these systems. They tend to have a mind of their own.”

All of this suggests that it may be challenging, if not impossible, to predetermine which outcomes should be observed in advance when conducting prototypical experiments with such systems. If the research questions, constructs, and measurement devices are themselves subject to influence by the user, and the process of engagement can require participation by the researcher than, “there is often the necessity to reflect upon outcomes *post-hoc* in order to make sense of what was created and learned in the process.” Such post-hoc “sense-making”, as one expert researcher called it, suggests a novel form of data generation that is more “design oriented” and less “hypothesis testing” in the traditional sense. “You’re entering new territory,” observed one academic and expert in stakeholder engagement and scenario creation, “and the only way to figure out what matters most in such a case is to generate the data first, then reflect on what is important after.”

### 8.2.6 How Such Platforms May Evolve

As the nature and sophistication of these platforms develop, it is likely that they could evolve rapidly in different directions. Two directions in particular bear discussion here: their role as “personal futures systems”, and their use as real-time horizon-scanning, monitoring, and rapid-futures prototyping systems.

Personal futures is, at present, a niche sub-topic within the larger literature on qualitative scenario planning. Wheelwright (2009) defines personal futures as a process of using scenario planning methods at the scale of individual life decisions and pathways. This involves a combination of methods similar to those presented in this dissertation, adapted to various life stages and life events. The result is a series of short- to medium-term qualitative scenarios exploring different branching points facing an important life decision.

The combination of web-based, social-network driven mechanisms for generating future scenarios with a widespread desire to understand and comment on your and others’ lives could become a powerful planning tool, taking many forms, from the most banal to the most profound. On the trivial side, automated or semi-automated services could easily be imagined which provided real-time micro-scenario forecasts for your day, week, or month depending on information culled from your network and those of your friends. A more profound implementation could involve a combination of online scenario mechanisms (greatly simplified and popularized, of course) with face-to-face workshops with those you care about to produce a hybrid, “life-futures” workshop with great effect. Designer and artist Jessica Charlesworth has begun to explore this territory with her research into personal futures “Delphi Parties” and “microtrend diaries”. These speculative design fictions offer a compelling enactment of how such system might bridge qualitative scenario planning with the booming industry of self-help and life-coaching.

The second, perhaps more serious pathway of development could be through the combination of such systems with other forms of predictive trend monitoring, data mining, and algorithmic processing. Platforms such as Google Trends and sentiment analysis of Twitter have found that search term volume and positive/negative sentiment correlates quite well with near-term predictions of things such as movie sales, election standings, or flu outbreaks. Various defence and industry-related projects already attempt to combine human expertise at pattern matching with machine-aided clustering approaches. Software suites such as Palantir are in widespread use throughout the intelligence communities of the US and other governments, and data-mining is routine in nearly all large-scale corporate activities. It is therefore likely that, over time, a more sophisticated and large-scale version of the platforms explored in this dissertation may merge with such approaches to create extreme-scale, real-time monitoring and trend tracking systems.

This combination could offer three advantages. First, the massive sample size of hundreds of thousands, if not millions of participants would provide a much greater source of data and material for scenario building. Second, it would enable real-time monitoring of changes and trends, such that a common base of opinions and perspectives could be compared against rapid movements and surprising outcomes. Third, it would allow for more rapid (potentially real time) testing of solutions and scenario spaces.

Access to the mental processing power of millions of participants, combined with suitably sophisticated mechanisms for tracking and synthesizing the data they created, would enable a fundamentally different kind of foresight practice, based on “rolling, constantly updated images of the future” to quote Dave Snowden, a UK-based academic and practitioner. Such an ongoing process would go even further to overcome the limitations of individual, group and facilitator bias, helping to identify surprising events “as they emerged from the future” to quote Otto Scharmer (2009). This makes possible a new approach to corporate strategic planning and public sector

policy-making, one based on sensing and interacting with emerging trends, as opposed to trying to forecast and predict them over time. In such a scenario, government departments and actors would have access to shared databases of public opinion, emerging events, collective analysis, and mental simulations that could be brought to bear on both long- and short-term policy challenges. Parts of these databases would be publicly available as well, allowing individuals, groups, and corporations to both add to and take advantage of the social collective intelligence platform. While the social and competitive effects of such a vast, potentially powerful information resource are unknown, it is clear such systems are possible as the individual components, including those explored in this dissertation, continue to develop over time.

### **8.3 Conclusion**

This chapter discussed how the data generated in this dissertation might impact the core research questions of this work. It did so in two ways: first by asserting points which could be reasonably defended based on the evidence generated during this research and, second, by discussing more speculative themes and issues beyond the empirical claims of this study.

With regards to evidence-based claims associated with the research, this chapter suggested that online participatory futures systems can be highly effective at involving greater numbers of more diverse participants from different locations. It was also clear that this participation may be most influential at the early stages of the scenario process. It reflected on how the modest interaction of many users at the early stages helped build understanding of diverse drivers and inputs, but failed to produce the kinds of softer, “social” impacts sought after in scenario planning. It also discussed how task structure might influence the relationship between participation, data generation, and analysis.

The second section of this chapter discussed more speculative issues related to the work. It suggested that these tools help enable the desired outcomes of scenario planning, but are unlikely to provide the requisite value on their own. It also explored the potential impacts of widespread deployment of such platforms in a mature scenario planning industry, suggesting that they might be able to provide enhanced transparency and reputation mechanisms, as well as potentially commoditizing basic aspects of the scenario planning process. Finally, it discussed various methodological challenges involved in using and studying such systems for scholarly research, as well as the potential evolution of such systems in the near- to mid-term future.

The following chapter, Conclusions, presents a summary of the work, discusses its limitations, its contributions to the field, and areas for future research.



## **Chapter 9 Conclusion**

### **9.1 Chapter Introduction**

Previous chapters introduced the research, explored the study design, presented its findings and discussed their implications. This, the last chapter, presents a summary of the research effort, outlines its contribution to the field, discusses the limitations and suggests possible areas for future research.

### **9.2 Summary of the Work**

This dissertation explored the role that participatory, online scenario planning systems might play in urban planning research. Chapter One introduced the research topic and provided a brief summary of the problem statement and research goals. It argued that the concept of the future was an integral part of the urban planning discipline, but that the role of the future had shifted over time. Early optimism about the value of forecasting and prediction gave way to increasing frustration with the limits of foresight, which coincided with the political movement away from scientific rationality and towards greater community involvement and social deliberation. At the same time, however, globalization and continued technological process has increased the level of complexity, interconnectivity and volatility that planning and public policy-makers must contend with. Qualitative scenario planning is often considered a means of helping to deal with these increased uncertainties and rapid pace of change.

To date, the role of qualitative scenario research in urban planning research has been limited. I argued that this was partially due to specific methodological, logistical and financial constraints, particularly in the context of public, multi-stakeholder engagements. These constraints included logistical, financial and methodological ones, primarily related to the need for extensive face-to-face

involvement and expensive consultation. I then proposed that developments in online technologies may enable similar savings in time and scale for qualitative scenario planning that they have for other disciplines.

Chapter Two presented a detailed review of the literature. It began with a review of the role of the future in urban planning and public policy, tracing four key schools of thought over time; the social reform, policy analysis, social learning and social mobilization approaches. I suggested that the combination of these forces, in particular those of social learning and social mobilization, came together in the 1970's and 1980's to produce a demand for public participation in the planning process. This segued into a discussion of the role of public participation in urban planning, exploring how it met and fell short of its goals and aspirations in various ways. The role of Planning Support Systems (PSS), public participation GIS (PPGIS) and participatory agent-based models was also discussed, where I presented several different approaches from the literature that attempted to combine the desire for public participation in a more rigorous analytical frame. I explored how recent parallel developments in web-based platforms for user engagement have been used experimentally for public participation in urban planning, before providing a detailed review of the origins and history of qualitative scenario planning, as most often used in the business context.

I then discussed how qualitative scenario planning differed from simulation and modelling, in that it sought to make explicit areas of uncertainty through creative, narrative or visual means. The benefits of scenario planning were presented, notably increased appreciation for uncertainty, greater environmental awareness and stronger shared mental models. This was grounded in the theoretical literature on group learning, notably the constructivist and sensemaking traditions. The many disadvantages to how scenario planning is currently conducted were also discussed. Finally, the question as to the role that new web technologies could play in the adaptation of qualitative scenario methods to the needs of urban planning research was posed.

Chapter Three introduced the study design, research questions and methods. It presented two main research questions, namely: “Do web-based participatory approaches add value to the traditional scenario planning process, and if so, where and in what ways?” and; “If not, where do they fall short, in what ways, and why?” It also presented a number of secondary questions designed to explore various aspects of these larger ones in more depth. For the research design, a mixed-method qualitative approach was chosen. Two novel data generation platforms were created in order to generate data for these research questions. These platforms were applied on two different projects, which became the core, in-depth case studies for this research. These were then compared to a base case, representative of a popular form of face-to-face qualitative scenario planning. Key measurement dimensions were discussed, including the type and amount of participation, the demographics of who participated, the tasks they were asked to do, and what the analytical outcomes were. In addition to this primary data generation and analysis, three secondary examples were analysed and an extensive process of stakeholder interviews was conducted. These were analyzed in the context of the measurement constructs created to compare the main cases.

Chapters Four, Five and Six presented the results from the primary cases. Chapter Four presented and analyzed the base case; which was a face-to-face scenario project in Spain. It illustrated how a typical deductive scenario planning project is conducted, including the use of extensive in-depth interviews to collect perspectives on drivers and forces of future change, how such data was clustered and analyzed and its presentation and use in the workshop setting. It also explored how the scenario narratives were created. Finally, it discussed several of the major strengths and weaknesses of such an approach, emphasizing the value of face-to-face interaction as a mechanism to build social capital and connections across organizational or political boundaries.

Chapters Five and Six presented each data generation platform in sequence, beginning with the “Futurescaper” system followed by the “SenseMaker Suite” experimental platform. Each

chapter discussed what the research intention behind each system was, how it functioned and how it compared to the base case. Chapter Five, “Futurescaper”, discussed the first online platform created to generate data. It focused primarily on expert input in a simple web-form, which was then combined with network graph analytics to create dynamic systems maps of variables and their interaction. The strength of such a visual approach was discussed, as well as various user interface design considerations related to the simplicity (but relatively abstract) means of engagement. Chapter Six built on the lessons from the first platform to present the “Sensemaker Suite” approach, which focused on allowing users to submit narratives, stories and opinions in a more natural way. It also explored new ways of allowing users to code and signify the meaning of their contribution along key dimensions, which were later used to auto-aggregate into representative themes and stories. The benefits and disadvantages of this approach were discussed, primarily relating to the ability for users to engage more intuitively and for the system to capture rich, ethnographic descriptions in a way which could still be augmented by machine analysis for rapid summary. The lack of social engagement was also discussed for both cases, either in the form of user-to-user interaction or system-to-user interaction. This was clearly identified as a weakness of both primary case studies.

Chapter Seven presented the three comparative examples, including the Institute for the Future’s online futures game, “The Foresight Engine”, the collaboration geostrategy platform, “WikiStrat” and an independent project using social media tools to explore the “Future of Facebook”. I discussed how all three examples invested significantly in the public engagement mechanisms of their platform, which helped simplify and streamline the user experience. Unlike the primary cases, each also focused explicitly on the social aspects of the process; a fact already noted as absent in the primary cases. The Foresight Engine’s ability to attract, recruit and engage a large number of people in an enjoyable, targeted exercise was noted, and WikiStrat’s ability to convert this

into rich, analytically-robust data was also observed. The Future of Facebook was notably rich on the user of multi-media and mixed platforms for engagement, although all three suffered from a lack of automated or semi-automated content filtration, aggregation or clustering mechanisms.

Chapter Eight formed the bulk of the intellectual reflection on the findings from the previous chapters. The main insight discussed was the role that such tools might play in augmenting the traditional face-to-face process, where in the process they might fit and who might participate in what ways. In particular, I discussed how the current generation of tools appeared to be most useful at the early stages of the scenario process, and perhaps less so at the end. They were excellent at engaging diverse professional and geographic users in the process of scenario thinking, primarily in the form of early-stage driver creation, discussion and exploration. This ability allowed for greater transparency, the ability to argue more persuasively for or against a given scenario based on the data presented, and greatly expanded the number of people who may be involved in the process. They were unable, however, to match the base case's social experience, which involved in-depth discussion of sensitive topics amongst a group of participants who rarely, if ever, meet. I also discussed how at present, they were unable to make the leap to crowdsourced scenario "writing", as opposed to just analysis. While WikiStrat may be the sole example different from the others, it was nonetheless clear that at present, such online collaboration tools are most useful in the scenario process at the early stage.

## **9.2 Contribution to the Field**

The original research in this dissertation addressed several modest issues for urban planning research. First, it connects previously underexplored linkages between the urban planning, public participation and qualitative scenario planning literatures. It showed how the political and theoretical concerns of urban planning gave rise to the need for enhanced public involvement, and

how many of the current tools for large-scale public engagement around complex, uncertain issues only addressed partial solutions. In parallel, it traced the history and techniques of qualitative scenario planning, illustrating how it related and was distinct from various future-oriented techniques from urban simulation (most notably, Planning Support Systems and related approaches). This original contribution addressed the overlaps in these related, but previously underexplored literatures.

The primary contribution of this dissertation, however, was two-fold. First, in the creation and application of two unique online platforms for participatory scenario planning in urban planning and public policy, and second, in the creation of an intellectual framework for measuring and evaluating their role in the qualitative scenario planning process. While the former created original research instruments to generate data relative to the core research questions, the latter also broke new scholarly ground in proposing a framework for future evaluation and understanding.

These contributions represent several small steps towards greater understanding of how such systems work, the role they play in urban planning research and how they could be used to evaluate more detailed research questions in the future. As first generation prototypes, they intentionally varied key design and process parameters relative to the research questions. Because no other such systems existed at the beginning of this research, they represent an iterative, purposeful exploration of the design space of such data collection platforms. They focused primarily on data collection and analysis at the early stages of the qualitative scenario process, convincingly demonstrating their ability to successfully engage a large number of diverse professional experts, distributed in time and space, in analytically useful ways.

They explored two different methods of soliciting user input, first using more formal, abstract mechanisms (Case 1) and the using more open, unstructured mechanisms (Case 2). They also demonstrated two unique approaches to clustering and analyzing data generated from these

processes, producing rapid and subjectively useful systems maps of driver interaction and rapid, sketch-scenarios based on pre-defined archetypes. This combination served to generate substantially useful data that helped shed light on the participatory and analytic value of these prototypes, but also to illustrate their shortcomings and areas for future investigation. These insights were supplemented by original documentation of three comparative examples that, to date, had not been properly documented or reviewed in any scholarly fashion.

Aside from the direct contribution of these systems, and the reflection they enabled, the process of defining an intellectual and methodological framework for further evaluation was also a small contribution towards future efforts. While a variety of knowledge taxonomies exist for the classification of online collaborative systems, for scenario planning approaches and for public engagement techniques within urban planning, none of these were directly relevant to the question of how online scenario creation systems may impact the public participation process in urban planning. The methodological framework outlined here, and the data constructs used to generate and evaluate the data, may serve as a useful contribution to other scholars seeking to understand such systems moving forward.

In conclusion, this dissertation contributed original research to the field of urban planning, vis-a-vis the purposeful creation of novel online data generation and stakeholder engagement platforms for scenario planning in urban public policy. It helped outline the dimensions of this rapidly emerging research area, contributing original scholarship on key methodological issues related to its measurement and evaluation. It also generated original data that helped draw attention to the strengths and weaknesses of such prototype systems to date, thereby laying out clear opportunities for researchers to build on these modest findings in the future.

### 9.3 Limitations

The research had several limitations, related primarily to the emerging nature of the subject and the lack of standard methodological criteria for evaluation. This section explores those weaknesses in the research design overall, as well as of the particular approach to data collection and analysis taken here-in. While these weaknesses are significant, caution was taken in the presentation and discussion of the results, so that the tentative conclusions that were drawn would be robust to criticism within their limited domain of relevance. Despite these efforts, it is worth noting the limits of this research in more detail, as well as drawing attention to key areas that could be addressed in future work.

The primary limitation of this dissertation was the lack of experimental design and peer-reviewed framework for evaluation. Chapter Three, discussed how, in an ideal experimental design, I would have been able to isolate key outcome variables in advance, manipulate them relative to specific independent variables in a controlled process of randomized or semi-random testing. This would then allow standardized measurement of the relationship between key variables and their outcomes. Such an approach was infeasible for this research for three reasons, however: 1) the relevant categories and variables for measurement were unknown in advance; 2) there was little empirical evidence for, or agreement on, the key outcome variables of scenario planning and; 3) there whereas no standard measurement instruments or protocols that could be applied in their testing. As a result, both the dependent and independent variables were unknown and no standard method for comparison could be established.

As a result, a mixed-method, exploratory case study approach that was chosen, in which the two main cases were compared in serial against a common base case. This is open to several weaknesses. First, it is possible that the base case was not representative of a typical face-to-face scenario planning project. If this was true, using it as a benchmark for the two online cases would produce false comparisons. Any number of exogenous factors could account for unmeasured



variability in the base case that could suggest it was not typical. This includes the nature of those available to attend, the specific social and economic make-up of the participants, the political sensitivity around issues discussed, the unmeasured biases of the facilitators or any number of other factors.

Although it is impossible to empirically verify the representativity of the base case, several points suggest that it was a robust example to choose. First, it was completed by a large, well-known and well-respected scenario planning consultancy who has been historically influential in the creation and definition of Shell-style scenario planning method. Second, the client was an experienced consumer of scenario planning activities and had run similar workshops before in the region. Third, detailed debriefing of the experience from both the client and facilitator end uncovered specific strengths and weaknesses, but deemed the process a successful and generally representative example of the approach. Finally, as an experienced scenario practitioner familiar with dozens of different engagements of this type, it was my experience that the process and results were typical of a representative scenario planning process. This combination of factors suggests that the base case was indeed a reliable instance for comparison.

Another major weakness was the lack of a common evaluation framework that had been vetted by other scholars on a range of other projects. The validity and reliability of measurement constructs was therefore not fully established. A more reliable measurement approach would have used instrumentation that had been validated by others in a wide range of examples, subject to extensive peer-review. Two factors which prevented this. First, the lack of empirical agreement on what output variables mattered in the scenario planning process prevented any agreement on what variables could (or should) be reliably measured. Second, the relative novelty of the research area and lack of prior knowledge of what was important to measure further prevented the use of a pre-existing measurement framework. As a result, an exploratory approach was taken which

purposefully varied a range of variables along several dimensions simultaneously, thereby seeking to maximize difference between the cases. This was intended to help sketch the boundaries of the research design space, thereby laying the foundation for more rigorous research in the future. The proposition of basic, generic set of data constructs was intended to help explore the terrain of these issues, thereby seeking to capture a broad but not overly-wide sample of key variables.

This limitation, however, prevented the use of a more robust experimental design. Instead, an exploratory, descriptive approach was taken which relied on triangulation from multiple sources of varying scope and quality. This had several implications. First, the prototype systems were not designed in a way which eased cross-case comparison, even if a common evaluative framework was had. Second, the cases were explicitly dependent on each other, in that Case 2 learned from and incorporated lessons and features from Case 1, where appropriate. Third, resource constraints limited the ability to conduct more systematic variance of key system parameters, such as user interface design features. While these limitations do not invalidate the conclusions reached, they does place limits on the generalizability of the conclusions and confidence with which they can be asserted. In particular, no *causal* claims can be made resulting from this data.

Several specific limitations bear mention with regards to the individual cases. Both Case 1 and Case 2 suffered from a lack of controlled recruitment process, meaning that the number of perhaps even type of participants is likely to vary significantly if replicated in the future. The inability to control marketing and recruitment suggests that the numerical aspects of participation in particular should be taken with a degree of reserve. To partially address this, the comparative examples were introduced, all of which enjoyed larger participation and promotion rates than the detailed case studies. These provided another source of triangulation, although suffered from their own set of constraints. In particular, I had limited access to data beyond what was available through Skype and email interviews with their creators and active involvement as a participant. I also had no

control over their system design or variables collected, so was unable to more precisely match their process to the data constructs measured in the detailed case studies. Despite these limitations, however, the comparative examples chosen were purposefully selected to further maximize variance and cover gaps which the detailed case studies were unable to address. Although there is, to date, still a very limited pool of examples to draw from, they were nonetheless judiciously applied in Chapter Seven where they could offer reliable support.

Finally, there are general limitations to the use of in-depth expert interviews, which were applied both at the beginning, middle and end of this research process. Although a mix of respondents with scenario, public participation, planning and online skills were sought, the snowball method used to discover candidates and solicit their contribution may have missed important viewpoints and considerations. Several informants expressed notable criticisms of online approaches, but it is possible that more severe critiques were not heard due to the nature of the personal and professional networks employed. Although every effort was made to intentionally seek out diverse and contradictory opinions, it is nonetheless possible that important view points were missed.

#### **9.4 Areas for Future Research**

The project of designing online participatory scenario systems shed insight into the relevance of such platforms as data generation instruments for urban planning research. In this way, my hope is that this dissertation will help advance understanding about the diverse and emergent ways these systems may benefit urban planning research. If large scale scenario collective intelligence systems can grow to generate data in a manner that concretely illustrates issues and significant principles of measurement instrument design, then this dissertation has the potential to provide insight into the methods, contexts, fundamental issues and practices for such systems more broadly.

I propose several areas for future research that could fruitfully build upon the efforts of this dissertation. First, it will be important to continue to develop more rigorously empirical measurements of the outcomes of the scenario planning process. Although concepts such as “shared mental models” and “collective learning” are difficult, if not impossible to define, it may be possible that proxy descriptive measures or even in-depth, ethnographic studies could help elucidate the specific social and psychological mechanisms which occur.

One proposal towards this end could be the creation and refinement of a standard scenario evaluation questionnaire. Given that the literature on scenarios suggest that collective exploration of uncertainty helps minimize overconfidence and expand participants’ appreciation for alternative outcomes, it could be possible measure this effect through simple pre-test and post-test surveys. Questions could be developed that would ask participants to evaluate the subjective probability of various events occurring and rank their confidence in their answers. The same test could be administered after participation in a scenario process. If theories of cognitive bias and overconfidence hold true (Tetlock, 2006), participants would be expected to be overconfident in a narrow range of outcomes before, and less confident confidence across a greater range of outcomes after. This should be possible to measure, thereby gauging the specific impact of the scenario process on key metrics of probability assessment. Individual and intra-group scores could then be correlated to determine if the range of opinions converged towards shared mental models, thereby testing another aspect of scenario planning’s role. Although such scores would clearly address only a very narrow aspect of the scenario process, a study of this sort would be a significant contribution to the understanding of the basic social learning process involved in public, multi-stakeholder scenario planning engagements. Additional richness could be had through detailed ethnographic observation and participant interviews before and after, as well.

Once such baseline measures for the impact of scenario planning were achieved, it may then be possible to evaluate specific design features associated with online and offline engagement approaches. This would enable a wide range of design options to be tested. Several of the themes and issues raised in this work could be explored further, and used to hypothesise for specific testing exercises. Design variables could also be held constant, and various social factors could be explored, such as the effects of recruitment on participant engagement, the impact of various design strategies on attracting, engaging and retaining different demographics, and the role of various analytic or visualization techniques in the social learning process.

The last area of research of note is the role of active and interactive socialization in such systems. Each of the main case studies explored here had very little interactivity and almost no socialization between users. They were analytical robust nonetheless, producing valuable contributions to the scenario planning process in urban planning. Each of the comparative examples pursued a different approach, but focused more on user interaction than analysis (*per se*). This tension deserves more exploration, particularly how augmented analysis and augmented socialization online can be brought more actively into the face-to-face workshop process, where possible.

In addition to efforts to better isolate and understand specific scenario planning impacts, a series of additional methodological tests could be conducted that would help researchers understand and evaluate different aspects of the process in more detail. Once a more basic understanding of the core design and interaction issues of online scenario planning systems was understood, more attention could be paid to the fine scale interaction effects. Three ways of doing so are proposed: a) apply different systems across the same analytical topic to better understand the differences in *output* which different system *types* engendered; b) employ multiple versions of the same system type, applied to a single topic, but intentionally vary the *design*. By randomly assigning participants to

different versions of the implementation it would be possible to measure the impact of said design decisions on both participation and output; c) hold both system *type* and *design* constant, but vary *recruitment techniques* to evaluate the impact of recruitment strategy on participation and interaction; d) administer both an online and face-to-face process on the same subject to better understand their variance and differences; e) apply a uniform survey instrument across different system designs and types to evaluate the *scenario output* itself, focusing on either self-reported or expert evaluated factors such as plausibility, completeness, believability, strategic relevance, etc. While each of these would require a significant amount of testing and refinement to achieve robust research designs, it is hoped that the contribution of this dissertation can lay the basic groundwork for more rigorous exploration of different aspects of the scenario process in the future.

Finally, it is likely that new streams of research will open up as large scale data mining and real time trend monitoring become more widespread. These are largely divorced from the scenario planning and public engagement process at the moment, although research initiations such as the Good Judgment Project are taking tentative steps towards combining them. Significant synthetic work will likely be required to explore what such real-time systems offer the public scenario process, and vice-versa. While it may be that they remain separate and unrelated in practice, I believe that this intersection will bear exciting fruit in the next five to ten years.

## **9.5 Conclusion**

This chapter opened with a summary of the entire dissertation. It presented the key goals and objectives, an overview of the research problem, the research questions and study design. It briefly summarized the case studies, the comparative studies and discussed how they were used to generate findings. Highlights of the discussion of these results were noted, and then an extensive discussion of the limitations of this work was presented. Finally, the chapter closed with a forward-looking

discussion on the future opportunities which this topic suggests, making several specific recommendations for study designs that would continue to advance our understanding of this area of emerging research.

## Chapter 10 References

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