A Survey on Futures Studies Methods

Conference Paper · March 2008

3 authors, including:

Mohamed Saleh
Cairo University
68 PUBLICATIONS **267** CITATIONS
SEE PROFILE

Hisham El-Shishiny
IBM
72 PUBLICATIONS **420** CITATIONS
SEE PROFILE

A Survey on Futures Studies Methods

Mohamed Saleh
Assistant Professor
Department of Decision Support
Cairo University
Giza, Egypt
Saleh@SalehSite.info

Nedaa Agami
Teaching Assistant
Department of Decision Support
Cairo University
Giza, Egypt
n.agami@fci-cu.edu.eg

Ahmed Omran
The Central Lab for Agriculture Expert Systems
Department of Knowledge Engineering and Expert System Building Tools
omran@claes.sci.eg

Hisham El-Shishiny
Advanced Technology and Center for Advanced Studies
IBM Cairo Technology Development Center
shishiny@eg.ibm.com

Abstract

Futures studies, or long-range perspective studies, are an indispensable source of help for sound planning and decision making in today's chaotic, complex and rapidly changing world. The accelerating pace of change, together with a multitude of accompanying uncertainties, make it all the more important to expand our time perspectives so as to include the future, i.e. to futurize our thinking. This can generally be done through utilizing a variety of futures studies methods. Such methods can be either qualitative, quantitative or both. In this paper, we aim at giving an overview of the futures studies paradigm, its purposes, principles and most commonly used key methods.

Keywords: Futures Studies, Long-Range Planning and Forecasting

1. Introduction

Whatever we do today will have an impact on our lives and the lives of our children tomorrow. If we want to take advantage of the fact that we shape our future by whatever we do at present, so as to increase the probability that such future will be agreeable, it becomes critically important to take the future into account in the decisions made today. This means that decisions should be made with adequate foresight of the probable consequences of current actions and events, of the likely outcomes which may emerge from significant trends and counter trends, and of anticipated changes in the technological, ecological, economic and political aspects of our world.

Futures studies paradigm is a multi-disciplinary research of change, trends, mega trends, driving forces, emerging counter forces and uncertainties in all major areas of life to find the interacting dynamics that are creating the future. The purpose of futures studies is to study potential change and systematically explore, create, and test both possible and desirable futures to improve long-term plans. It includes analysis of how those conditions might change as a result of the implementation of policies and actions, and the consequences of these policies and actions [7,18,19,32,41].

Based on the literature survey that we made [8,20,21,22,25,27,31,35,37,40,46], we postulate the following seven basic

INFOS2008, March 27-29, 2008 Cairo-Egypt

philosophical assumptions as the hard core of futures studies paradigm:

1. You cannot know the future, but a range of possible futures can be known.
2. The likelihood of a future event or condition can be changed by policy, and policy consequences can be forecasted.
3. Gradations of foreknowledge and probabilities can be made; we can be more certain about the sunrise than about the rise of the stock market.
4. Humans will have more influence on the future than they did before.
5. Forecasts will be inaccurate and incomplete. As Herman Khan – the founder of the scenarios method – puts it: "*The most surprising future is one which contains no surprises*".
6. No single method should be trusted; hence, cross referencing methods improves foresight.
7. Anticipation and planning must be dynamic and able to respond to new information and insights.

Incorporating the future in current planning and decision making processes is beneficial in many ways. New avenues may be opened for advancing towards our long-term goals, and early warnings may be issued of future problems which may obstruct or slow down such advance. People and leaders are also empowered to rediscover their resources and energies when they take a long-range and holistic view of the world. More importantly, taking the future into account enable people not only to prepare for the future by adapting to what might happen, but also to control their future and to make it better than it would otherwise be had they ignored the future, or just waited passively for it.

The rest of this paper is organized as follows: In section 2, we briefly discuss the history of the futures studies field. In section 3, we illustrate the different views in which the futures studies paradigm and futures research in general is considered important to decision makers. In section 4, we give an overview of the most commonly used futures studies methods. Finally, in sections 5 and 6, we discuss and summarize the paper.

2. History of the field

As a profession, however, futures studies is really a phenomenon which arose after World War II. In many ways, the US military needed to know things about the future that had never been known before. They also needed to understand the nature of the new technologies, because in planning long term military systems they had to understand not only what technologies were available today, but which ones would be available in the future. And that resulted in technological forecasting.

The RAND Corporation was a think tank created by the Defense Department to do that, and futurists then developed a lot of Future techniques in that environment and began to publish that in the open literature in the 1960s. Of course the 1960s were full of social change and social turmoil, and many people turned their eyes to the future. As a result, the World Future Society and the World Future Studies Federation were both formed in the late 1960s and early 70s [21].

3. Why Futures Studies?

The main task of a futures study is to explore alternative possibilities of the future, discover hidden potentialities, anticipate risks and constraints along alternative future paths, and forecast the probable consequences of present actions and events. The future is therefore studied in terms of alternatives, *i.e. alternative*

paths or scenarios. It is necessitated by the fact that the future is far from certain, and is fraught with many ambiguities and risks. In these circumstances, we could not deal with a single future path or scenario, because we are faced with a variety of futures, *i.e. alternative futures - not a single or unique future.* By examining alternative futures (even a limited number of conceivable futures), futures studies help us to demystify the future, provide a knowledge base for making informed choices, and-consequently-enhance our capacity to influence the future [15].

Perhaps, the most commonly understood reason for the use of futures studies is to: Help identify what you don't know but need to know to make more intelligent long-term decisions.

4. Futures Studies Methods

4.1 Qualitative Methods

Consciously or unconsciously, all of us use qualitative analysis all the time in our daily lives. As single individuals or organizations, we constantly filter a great many impressions from the world around us. The future does not suddenly arrive without warning on any given day; however, traces of the future already exist. The art in qualitative analysis is to spot these trends, their consequences and how they affect the system being investigated [10]. This can be done using one of the most popular (commonly used) qualitative futures studies methods summarized as follows:

4.1.1 Delphi Surveys

The Delphi method is based on a structured process for collecting and synthesizing knowledge from a group of experts by means of a series of questionnaires accompanied by controlled opinion feedback that is; a '*structured dialogue'* [2,4,16,17,30,34,47]. The technique is relatively simple. It consists of a series of questionnaires sent to a pre-selected group of experts. These questionnaires are designed to elicit and develop individual responses to the task specified and to enable the experts to refine their views as the group's work progresses in accordance with the assigned task. The rationale behind the Delphi method is to address and overcome the disadvantages of traditional forms of '*consultation by committee'*, particularly those related to group dynamics.

The method was designed to encourage a true debate, independent of personalities. Anonymity was required in the sense that no one knew who else was participating. Further, to eliminate the force of oratory and pedagogy, the reasons given for extreme opinions were synthesized by the researchers to give them all equal weight and then fed back to the group as a whole for further analysis. These aspects, anonymity and feedback, represent the two irreducible elements of the Delphi method.

However, other than the traditional Delphi method described above, there also exist other types of Delphi Surveys one of which is called 'Public Delphi' where the public can be involved to think about their future and how it may evolve through public media (newspapers, radios, etc. …). The other type which is considered the latest version of Delphi Surveys is Real Time (RT) Delphi [26] which essentially differs than traditional Delphi in being a continuous controlled debate on the internet [48,58,59].

4.1.2 Futures Wheel

The Futures Wheel is a method of identifying and packaging primary, secondary and tertiary consequences of trends and events [3,23,43]. It is a way of organizing thinking and questioning about

the future that is, a kind of structured brainstorming.

The name of a trend or event is written in the middle of a piece of paper, and then small spokes are drawn wheel like from the center. Primary impacts or consequences are written at the end of each spoke. Next, the secondary impacts of each primary impact form a second ring of the wheel. This ripple effect continues until a useful picture of the implications of the event or trend is clear.

Futures Wheel can generally be classified into three types: Basic Futures Wheel, Distinguishing between consequences and Creating forecasts with alternative scenarios.

4.1.3 Simulation and Games

A simulation is any activity that projects a different situation in time and/or place, usually extrapolating from the real/actual world to a hypothetical situation [1,9]. It is an attempt to take certain variables from reality in some area and create a computer model or game situation in which one can see how those variables might interact with each other over time. Computers or humans (as role players) or both can be involved. With computers, human can play *'what if'* games, where by making certain choices, they can then, see the consequences (in terms of policy) that follow from those choices.

Games are related to simulations in many ways [9]. Simulations can be foundations for games, and they often are. A game is any activity with an objective that places a player; whether that player is a device, a person, several individuals, a group, or several groups; into competition against other players or against standards. If achievement standards are posited (like, *'Let's see whether the task can be finished in x minutes...'*), then the simulations or several parallel ones also become games.

Games can be more useful than dry simulations to determine the adequacy of existing structures, policies, or procedures for future possibilities, to bring more effective communications, to enhance learning, and thus to prepare people for coping with events that may occur in the near future. Games can also help explore the reactions of people to scenarios, eliciting a wide range of creative ideas and a lot of data for improving the model and simulation which would otherwise not be available.

4.1.4 Agent Based Modeling (ABM)

Complex systems do not readily submit to reductionism analysis where an individual element is examined in isolation from other elements. This reductionism approach ignores the linkages that exist between system elements, and the fact that the linkages cannot be deduced from individual analysis. Complex systems exhibit a rich variety of behaviors, including many that are counter intuitive. To capture these effects, complex systems should be analyzed from a holistic rather than a reductionism point of view.

To analyze interdependent systems in a more holistic way, models utilizing an agent based approach have been developed. An agent is an autonomous, computational entity that can be viewed as perceiving and acting upon its environment and is autonomous in that its actions or behavior depend at least partially on its own experience. This simulation technology capitalizes on technological advances in evolutionary learning algorithms and massively parallel computing. Interactions among elements are modeled individually by intelligent software agents representative of real world decision makers. The agent based model provides a picture of systems that can be examined both computationally and analytically, offering new ways of

experimenting with and theorizing about the impact of perturbation or shocks [49,60].

Agent models have the capacity to replicate dynamic systems, which classically are described by sets of partial differential equations. They build the system from the bottom up rather than the top down. In models that employ agents that interact according to simple rules, complexity or chaos may emerge as a result of the simple rules that govern the individual agents, not from complex equations.

4.2 Quantitative Methods

Traditional quantitative analysis such as time series analysis and trend extrapolation are often criticized for their lack of creativity and consideration of future developments (that is, there is a tendency to project from the past to the future in a straight line and not consider less predictable possibilities). They assume that forces at work in the past will continue to work in the future and future events that can change past relationships or deflect the trends will not occur or have no appreciable effect. Nevertheless, quantitative analysis is an essential part of the Futures Research. They ought, though, to be used carefully and most of the times should not stand alone. This can be done using one of the most popular (commonly used) quantitative futures studies methods summarized as follows:

4.2.1 Traditional Forecasting Techniques

Traditional forecasting (Statistical Modeling) techniques assumes that information contained in historical data can be extracted, analyzed, and reduced to one or more equations that can be used to replicate historical patterns [55]. The techniques use the mathematics of statistics to deepen understanding of causality in complex systems.

An equation or set of equations can replicate the history timeline of a variable, for example, population. In this manner, when a prior date is used in an equation describing population, the answer generated is very close to the actual population existing at that time. To forecast *'future population'*, simply substitute a future date in the same equation. This method, however, carries some serious implications:

1. All information needed to forecast desired aspects of the future is contained in selective historical data.
2. The model structure validity replicates the real life structure of the system that gave rise to the historical data.
3. The ongoing structure of the system that gave rise to the historical data will be unchanging.
4. Surprise-free forecasts are useful.

These techniques are originally classified into two major types:

a. Time Series Analysis

Time series analysis refers to the mathematical methods used to fit trend data [14,44]. These methods can be simple or complex. The simpler ones involve plotting a curve through historical data. The plot can be a straight line or a curved line. Statistical processes are used to plot the line through data points. If the fit is good, the plot can be extended into the future to produce a forecast. The most common time series analysis methods are exponential smoothing and averaging methods including simple and double moving averages.

b. Explanatory (Causal) Analysis

Explanatory methods refer to a type of methods where the value of the dependent variable can be explained in terms of the

independent variables. The most common explanatory analysis methods are regression and autocorrelation analyses.

4.2.2 Trend Impact Analysis (TIA)

Trend Impact Analysis is a modified approach to forecasting in which a time series is modified to take into account experts' perceptions about how unprecedented future events may change extrapolations that would otherwise be surprise-free in such a way that it permits extrapolations of historical trends to be modified in view of different expectations about future events [26,50]. It permits an analyst, interested in tracking a particular trend, to include and systematically examine the effects of possible future events that are believed important. The events can span widely to include technological, political, social, economic and value-oriented changes.

Given a pre-determined set of future events, the probability of occurrence of each, the expected impact (steady-state and maximum impacts) on the base-forecast (surprise-free forecast) if this event was said to occur and the number of scenarios to be generated, a TIA program results in a fan of outcomes (possible alternative scenarios to the future) using Monte-Carlo simulation.

4.2.3 Cross Impact Analysis (CIA)

A basic limitation of many forecasting methods is that they produce only isolated forecasts that is; events and trends are projected one by one, without explicit reference to their possible influence on each other. Most events and developments however, are in some way connected to each other. Interdependencies between these events and developments can be taken into consideration for more consistent and accurate forecasts. Cross impact analysis addresses their lack of a mechanism for discovering mutually exclusive or conflicting outcomes. CIA addresses this problem directly by analyzing conditional probabilities: for example, the likelihood that inflation will be low if full employment is achieved. It examines the interactions of forecasted items.

Therefore, CIA is a highly quantitative technique that is used for the investigation of possible future events and their mutual impact on each other and attempts to reveal the conditional probability of an event given that various events have or have not occurred [5,13,33,51]. The time horizon for the technique is extremely flexible but is dependent, in much the same way as Delphi technique, on the ability of experts to provide meaningful estimates of event occurrence probability.

In applying CIA to a particular area, it is important to select for inclusion (usually using a Monte-Carlo simulation) those developments (events and trends) whose expected impact on the future of that area is judged to be relatively greatest. The initial occurrence probabilities of events, values of trends, and the magnitude of impacts between the variables (conditional probability) may be estimated by individual experts but more commonly estimated by groups containing experts from the various disciplines covered by the events.

Delphi questionnaires or interviews also can be used to collect these judgments. Afterwards, a cross impact matrix is being constructed and the event probabilities and trend values are adjusted accordingly. Then, new events should be again selected for inclusion and the process is repeated. Several runs at the end result in a different possible alternative scenarios to the future.

4.3 Methods that are both: Qualitative and Quantitative

The most popular futures studies method that works by either conducting quantitative or qualitative analysis or both

with the same body of assumptions is the *'Scenarios'* method.

Scenarios are alternative descriptions or stories of how the future might unfold [11,12,24,28,29,36,45]. They compile information about divergent trends and possibilities into internally consistent images of plausible alternative futures. They are designed to systematically explore future challenges and opportunities and aid in strategy development. In the process, they often provoke the imagination, raise fundamental questions, make explicit our deeply held values, and stretch our worldviews. Scenarios are not predictions of the future. Rather, they encourage people to think about how to navigate successfully across the different circumstances that might be encountered.

To foster creative thinking, scenarios should examine a truly broad range of possibilities, not just minor variations. A good set of scenarios will typically contain at least one or more '*negative'* images as well as a '*structurally different'* future that challenges current assumptions about what a successful future would be like.

Scenarios need not be elaborate or highly quantitative to be valuable. In fact, they are often used as an antidote to highly quantitative approaches to strategic planning that sometimes lose in imagination and adaptability what they gain in precision. That's why, the scenarios method is preferably quantified by integrating it with one of the quantitative methods discussed earlier. What is more valuable about scenarios is that they change the way people who use them think about the future.

Scenarios are often used by groups that had little to do with the scenario writing process. Sometimes these using groups want to make a change or two to the scenario content, but because the internal structure of the scenario; the causes and effects that link the scenario statements into a cohesive whole is obscure and therefore the effects of a single change are difficult to reflect in other scenario statements.

Recognizing this issue, the Millennium Project hoped to develop a method, namely '*Interactive Scenarios'*, which would permit people to interact with previously prepared scenarios in a way that permitted them to make change to essentially any statement in the scenario and have the remainder of the scenario adjusted in some way to reflect the change [52]. If this were possible, users of scenarios could modify their content one statement at a time to reflect their own views and observe the consequences that flowed from their changes.

The Interactive Scenarios method involves cross impact analysis where the events are replaced by scenarios statements. The cross impact information (impacts of statements on each other) is contained in an influence matrix. As a matter of bookkeeping, the diagonal entries in this matrix contain the probabilities that have been assumed for each statement.

There are no other techniques that can systematically permit a user to make changes to a narrative scenario and to have the scenario automatically self-adjust to the changes. Furthermore, the construction of the influences forces the analyst to examine the relationships among the statements of a scenario; how one affects the others. This examination can lead to internal self-consistency, a mark of excellence in any scenario.

5. Discussion

This paper aims at briefly discussing the most commonly used futures studies methods. The discussion was based on an extensive literature survey that we have conducted before writing the paper and accordingly, it can be considered an up to date survey paper.

The survey showed that, futures studies methods can be applied in all major areas of

life and already have been applied to various domains one of which is the tourism which is the main focus of the authors who work as a part of the "Data Mining for Improving Tourism Industry Revenue in Egypt" project. In 2007, the focus of the work in the project was to establish a solid theoretical foundation on the utilization of futures studies methods in the tourism domain. The authors therefore started the work with a comprehensive state of art review on the futures studies paradigm, its philosophy, and its methods. Moreover, the authors made another review which just focused on quantitative futures studies methods. These two reviews were followed by a detailed investigation of applications of qualitative and quantitative futures studies methods in Tourism. And this was the main motivation behind writing this paper.

6. Summary

Throughout the different sections of this paper, we gave a comprehensive overview of the Futures Studies paradigm and most commonly used Futures Studies Methods. We started in section 1 by giving an introduction of the paradigm and introducing the philosophical assumptions on which it is based. We then discussed in brief the history of the field and the ways in which it is beneficial to decision makers in sections 2 and 3 respectively. Finally, in section 4, we discussed the most commonly used qualitative Futures Studies methods including Delphi Surveys, Futures Wheel, Simulation and Games and Agent-Based Modeling followed by the most commonly used quantitative methods summarized in Traditional Forecasting Techniques, Trend Impact Analysis and Cross Impact Analysis. At last, we discussed the Scenarios method -- the method which is considered as both qualitative and quantitative.

Acknowledgment

This work is part of the Data Mining for Improving Tourism Revenue in Egypt research project within the Egyptian Data Mining and Computer Modeling Center of Excellence.

References

[1] Banks J., ed. “Handbook of Simulation, Principles, Methodology, Advances, Applications, and Practice”, J.Wiley & Sons, Inc., 1998.
[2] B. Ludwig, "Predicting the future: Have you considered using the Delphi methodology," Journal of Extension, vol. 35, iss. 5, pp. 1— 4, 1997.
[3] C. Styles and J. Goddard, "Spinning the Wheel of Strategic Innovation," Business Strategy Review, vol. 15, iss. 2, pp. 63— 72, 2004.
[4] C. Buckley, "Delphi: a methodology for preferences more than predictions," Library Management, vol. 16, iss. 7, pp. 16— 19, 1995.
[5] Dalkey, Norman, “An Elementary Cross Impact Model”, Technological Forecasting and Social Change, Vol.3, No.3, 341-351, 1972.
[6] D. E. Weingand, I. Council, and G. Conference, "Futures research methodologies: linking today's decisions with tomorrow's possibilities," 1995.
[7] D. List, "Action research cycles for multiple futures perspectives," Futures, vol. 38, iss. 6, pp. 673— 684, 2006.
[8] Edward Cornish “Futuring: The Exploration of the future”, World Future Society, USA, 2005.
[9] Erwin Rausch, “Simulation and Games in Futuring and Other Uses”, CD ROM, the Millennium Project, American Council for the United Nations University, 2003.
[10] E. Gummesson, Qualitative Methods in Management Research. Sage Publications, 2000.
[11] F. Berkhout and JHertin, "Foresight Futures Scenarios: Developing and Applying a Participative Strategic Planning Tool", GMI newsletter, 2002.
[12] G. Ringland, Scenario Planning: Managing for the Future (Chichester, John Wiley), 1998.
[13] Gordon, Theodore and John Stover, “Cross Impact Analysis”, Handbook of Futures Research, Jib Fowles, Greenwood Press, 1978.
[14] G. Box and G. Jenkins, “Time Series Analysis, Forecasting and Control”, Holden-Day Inc., 1976.
[15] G. Coyle, "The nature and value of futures studies or do futures have a future?," Futures, vol. 29, iss. 1, pp. 77— 93, 1997.
[16] G .Rowe and G. Wright, "The Delphi technique as a forecasting tool: issues and analysis," International Journal of Forecasting, vol. 15, iss. 4, pp. 353— 375, 1999.
[17] H. A. Linstone and M. Turoff, "The Delphi method: Techniques and applications", in: Massachustts.
[18] Helmer, O., “Looking Forward: A Guide to Futures Research”, 1983.

[19] Ibrahim El-Issawy, “Future Studies and Project Egypt 2020”, Dec. 2004
[20] J. Dator, "Futures studies as applied knowledge," New Thinking for a New Millennium, 1996.
[21] J. Glenn, T. Gordon “Futures Research Methodology V2”, CD ROM, the Millennium Project, American Council for the United Nations University, 2003.
[22] J. Ramos “Action research and futures studies”, Futures, Volume 38, Issue 6, Pages 639-641, 2006.
[23] Jerome C. Glenn, “The Futures Wheel”, CD ROM, the Millennium Project, American Council for the United Nations University, 2003.
[24] Jerome C. Glenn, The Futures Group International, “Scenarios”, CD ROM, the Millennium Project, American Council for the United Nations University, 2003.
[25] L. Lefkowits and K. Miller, "Preparing for an Uncertain Future," PHI DELTA KAPPAN, vol. 88, iss. 5, p. 399, 2007.
[26] Lyn Firminger, “Trend Analysis: Methods and Problems”, Strategic Planning Services, Swinburne University of Technology, TAFE Division, March 2003.
[27] M. Godet "From Anticipation to Action”, A Handbook of Strategic Prospective", UNESCO, 1994.
[28] M. Godet, “Scenarios and Strategic Management”, London: Butterworth, 1987.
[29] M. Godet, "The art of scenarios and strategic planning: tools and pitfalls," Technological Forecasting and Social Change, vol. 65, iss. 1, pp. 3— 22, 2000.
[30] M. I. Yousuf, "Using Experts Opinions Through Delphi Technique," Practical Assessment, Research Evaluation, vol. 12, iss. 4, p. 2.
[31] McHale, J. and McHale, M.C., “Futures Studies: An International Survey”, New York: United Nations Institute for Training and Research, 1975.
[32] M. Bussey, "From change to progress: critical spirituality and the futures of futures studies," Futures, vol. 34, iss. 3-4, pp. 303— 315, 2002.
[33] M. TUROFF, "VC An Alternative Approach to Cross Impact Analysis," Downloaded October, vol. 27, p. 2005, 2002.
[34] Okoli, C., S.D. Pawlowski, “The Delphi method as a research tool: an example, design considerations and applications”, Information & Management, p. 15 – 29, 2004.
[35] P. Schwartz “The Art of the Long View: Planning for the Future in an Uncertain World”, Currency, 1996.
[36] P. Bishop, A. Hines, and T. Collins, "The current state of scenario development: an overview of techniques," foresight, vol. 9, iss. 1, pp. 5— 25, 2007.
[37] P. Balabhaskaran, "Futurology: In Perspective," 2006.
[38] R. A. Slaughter, "Integral Futures—A new Model for futures Inquiry and practice," Australian Foresight Institute, Melbourne, 2003.
[39] R. A. Slaughter, "Knowledge creation, futures methodologies and the integral agenda," Foresight, vol. 3, iss. 5, pp. 407— 418, 2002.
[40] R. A. Slaughter, “Knowledge Base of Futures Studies”, The Futures Study Centre, Australia, 1996.
[41] S. Cole, "Dare to Dream: Bringing Futures into Planning," Journal of the American Planning Association, vol. 67, iss. 4, pp. 372— 383, 2001.
[42] S. Inayatullah, "Methods and Epistemologies in Futures Studies," Knowledge base of futures studies. Rick Slaughter, Ed. Futures Study Centre, Victoria, pp. 113— 127, 1996.
[43] Snyder, David Pearce. Monograph: "The Futures Wheel: A Strategic Thinking Exercise", The Snyder Family Enterprise, Bethesda, Maryland, 1993.
[44] S. Makridakis, S. C. Wheelwright, and R. J. Hyndman, “Forecasting: Methods and Applications”, 3rd Edition, Wiley, 1998.
[45] T. Collins, "The current state of scenario development: an overview of techniques, Washington, DC, USA.," foresight, vol. 9, iss. 1, pp. 5— 25, 2007.
[46] T. Gordon, J. Glenn, A. Jakil “Frontiers of futures research: What’s next? ”, Technological Forecasting and Social Change, Volume 72, Issue 9, Pages 1064-1069, 2005.
[47] T. Gordon, “The Delphi Method”, CD ROM, the Millennium Project, American Council for the United Nations University, 2003.
[48] T. Gordon and A. Pease “RT Delphi: An Efficient, “Round-less” Almost Real Time Delphi Method”. Technological Forecasting and Social Change, Volume 73, Issue 4, Pages 321-333, 2006.
[49] T. Gordon, “Agent Modeling”, CD ROM, the Millennium Project, American Council for the United Nations University, 2003.
[50] T. Gordon, “Trend Impact Analysis”, CD ROM, the Millennium Project, American Council for the United Nations University, 2003.
[51] T. Gordon, “Cross-Impact Analysis”, CD ROM, the Millennium Project, American Council for the United Nations University, 2003.
[52] T. Gordon, “Interactive Scenarios”, CD ROM, the Millennium Project, American Council for the United Nations University, 2003.
[53] T. Gordon, The Current Methods of Futures Research. Institute for the Future, 1971.
[54] T. Gordon, "The Methods of Futures Research," Annals of the American Academy of Political and Social Science, vol. 522, pp. 25— 35, 1992.
[55] The Futures Group International, “Statistical Modeling: From Time Series to Simulation”, CD ROM, the Millennium Project, American Council for the United Nations University, 2003.
[56] www.crab.rutgers.edu/~goertzel/futuristmeth ods.htm
[57] www.human-evolution.org/future_studies_introduction.php
[58] www.realtimedelphi.com/STUDIES/education/kedu.php
[59] www.realtimedelphi.com/STUDIES/matrix/SOFI.php
[60]www.cs.sandia.gov/capabilities/AgentBased Modeling/index.html