Shiraz E-Med J. 2019 August; 20(8):e85517. doi: 10.5812/semj.85517.

Published online 2019 June 25. **Research Article**

A Problem Oriented Foresight Model for Population

Maryam Ardebili [1, 2, *], Amir Nazemi [1], Mohammad Jalal Abbasi Shavazi [3] and Ali Asghar Pourezzat [4]

[1] National Research Institute for Sciences Policy, Tehran, Iran
[2] Health Policy Research Center, Institute of Health, Shiraz University of Medical Sciences, Shiraz, Iran
[3] National Population Studies and Comprehensive Management Institute, Tehran, Iran
[4] Faculty of Management, University of Tehran, Tehran, Iran

[*] *Corresponding author*: National Research Institute for Science Policy, Tehran, Iran. Email: maryam.ardebili@gmail.com

Received 2018 October 18; **Revised** 2018 November 19; **Accepted** 2018 November 20.

Abstract

Background: The choice of methods for shaping the effective foresight model has always been challenging. Future studies are supposed to re-integrate and re-frame issues in order to provide novel solutions. It is very difficult to choose from a large number of (about 100) methods from various disciplines and different paradigmatic and methodological roots while avoiding stereotypes.
Methods: Involving both the experts of the field and the future researchers, a new approach for selection of method in forward-looking policy is presented, and based on policy challenges, future researchers were asked to prioritize methods to improve population policy by attractiveness and capability criteria.
Results: As the final result, four methods were chosen considering the main aspects of attractiveness and capability of each method to improve each specific policy issue. Priorities were determined by calculating the total number of choices by capability of method, multiplied by the attractiveness of methods through the questionnaire to form the foresight model: casual layered analysis (CLA) with 2250 points, scenario with 1596 points, expert panels with 1560 points, and interviews with 1232 points, which were the top four methods, respectively.
Conclusions: The path and logic used in this research to select the model of population foresight can be generalized to other public policy areas and can be a methodological basis for other applied interdisciplinary studies.

Keywords: Population Policy, Foresight Model, Future Methodology, Forward-Looking Policy Making

1. Background

During the recent years, in the context of economic, social, cultural, and political development, various dimensions of population dynamics have been subjected to massive changes in Iran and throughout the world. Population and its various dimensions, including growth rate, age structure, fertility, mortality, and migration, have a high impact on the whole environment. Therefore, it is no wonder that demographic policy has globally become one of the pivotal and most basic areas of public policy over the past few decades. Although many of these changes have occurred align with globalization and as a consequence of development trends, after the first transition of the population, Iranian community faces its own emerging issues of population (1).

Global policy experiences indicate that according to demographic transition theory, the window period requires appropriate policies as it is a critical and effective time for policy making. Transforming demographic opportunity to demographic blessing requires efficient policies, proper planning, and strong implementation; otherwise, it may create problems for the country. For Iran, in the middle of the population transition spectrum of the world, there is a chance to take the experiences of pioneer countries into account, considering the native policy requirements and features (2).

In the face of changes and emerging issues, relying on routine planning methods cannot meet the requirements of public policy makers in countries. The uncertainties and the emergence of discontinuous events make it very difficult to predict the future and plan for it. Obviously, the demographic policy is a basic area of public policy. Population policy, in terms of the subject and its impact on other domains, is closely linked with futures studies. Comprehensive management in this field will not be achieved without "foresight" as the most important tool for planning and managing strategic change (3).

Considering the problems of past demographic policy and its consequences on the population, this study was designed to introduce a foresight model to improve policy-making in this field.

1.1. Choosing a Foresight Mixed Method Model; A New Approach

Obviously, it is necessary to obtain a clear logic for selection of methods while designing a research in all fields of science. Considering multiple possibilities of choices, the optimal mixture of methods that is appropriate to the subject and research context and methodology is still a controversial challenge (4). There are two more prominent approaches:

First, approaches that choose methods based on internal attribute: The nature of the method (qualitative, quantitative, and qualitative-quantitative) and its capabilities (the ability to compile and process data from various sources, such as experts, evidence, interaction, and creativity) (5) were considered.

Second, approaches that select methods based on a type of external attribute: This selection is due to the infrastructure components and the conditions that influence the process of foresight. A future research requires a subject and it is necessary to adapt the methods, accordingly.

2. Objectives

In future studies, there are discussions about the process, design, challenges, categories, and styles of foresight. In this study, the researchers tried to consider the main approaches.

3. Methods

This study was a mixed quantitative-qualitative research with practical and developmental orientation, originated in the interdisciplinary field of future studies. The aim was to apply foresight methods into population policy, addressing the challenges of the previous public policy trend. The list of challenges used in the study (Table 1) was derived from a previous study; named: "population policy challenges in Iran; a qualitative content analysis of interviews with key experts" (the same authors of this article).

Based on the challenge list; extracted from the literature and expert's views, a questionnaire was designed. The first question was about the priority of every policy indicators, followed by 2 phase questions on the appropriate methods to improve it. The questions were organized in a web-based questionnaire (Google form). In order to avoid the method selection cliché by the responders, this 2-phase approach was formulated after comparing different types of categorization models and based on the Magruk's categorization model (Table 2). This category involves all of the futures known methods (6).

Literature study showed that several categories have been used so far. Glenn and Gordon introduced their classification in 2004 based on exploratory and normative, quantitative and qualitative, and published it in the Millennium book (3). Miles and Keenan model was based on 13 methods and four categories: Identification of the subject, exploration approaches, creative approach, and prioritization (6). A different kind of category was provided in the EUFORIA project:

(1) Based on the virtual environment, (2) based on the real environment, (3) soft (qualitative), (4) hard (quantitative), (5) based on expert judgment, (6) analytical, (7) bottom-up, and (8) top-down (7).

Furthermore, UNIDO also has presented a category including 40 methods and the following three categories: forecast, management, and creativity (8). In 2006, Aaltonen and Irene Sanders, offered a new typology with 29 methods and four categories: math, social, engineering and system (3). Saritas classified 32 methods in five groups, based on which key phases of foresight were attributed: understanding, synthesis and model, analysis and selection, and transformation (7). Popper's typology is also well-known as the assignment to various stages of foresight: pre-foresight, recruitment, generation, action, and renewal (5). Fifteen categories of Porter used a combined way to classify the methods (9) and Voros defined two great categories (evolutionary and revolutionary) (10).

Among all of the above categorizations, Magruk typology was chosen for the current study due to four main reasons (11, 12).

1- It covered all the methods of futures studies (100 methods).

2- There was no interference and overlap in the categories and the logic of the conditional structure of the questionnaire.

3- The category that has been rarely used in the country and therefore may partly prevent responders from the stereotypes of the method.

4- It is almost comprehensive of all pre-existing typologies.

Reliability and validity of the questionnaire: In this study, the five-point Likert spectrum was employed for the questionnaire. The Cronbach's alpha coefficient for the research questionnaire was 0.844, which is larger than 0.7 and it could be concluded that the entire questionnaire is reliable. Using "Lowsheh" questions test, 20 experts were asked to determine whether the test questions measure the index and cover the entire content of the test. They were asked to classify each of the questions based on the three-point Likert scale (essential, useful but unnecessary, and unnecessary). According to the Standard table, questions with a numeric value of less than 42 were below the proportion of validity and should be eliminated. The content of all questions was higher than the minimum and finally, the validity of the questionnaire was confirmed.

Table 1. The Main Challenges of the Past Demographic Policy

N	Indicators	Category	Nature
1	Attracting experts' participation	Process	WHO
2	paying attention to the tacit knowledge of experts and managers	Process	WHO
3	Collective intelligence by a method	Process	WHO
4	Reducing divergence in the literature of experts and managers	Process	WHO
5	Stakeholders identification	Process	WHO
6	Not satisfying with pure elitism	Process	WHO
7	Considering the activism of human beings	Process	WHO
8	Institutionalization and organization	Structure	WHERE
9	concentration and convergence of the centers and decision-making authorities	Structure	WHERE
10	paying attention to the topic's specialty	Process	WHAT
11	paying attention to the interdisciplinary nature	Process	WHAT
12	paying attention to the complexity	Process	WHAT
13	Considering timing and proper timeline	Process	WHAT
14	paying attention to native values and norms	Process	WHAT
15	paying attention to the past, present, and future (being historic)	Process	WHAT
16	Comprehensive view and avoidance of partial consideration	Process	WHAT
17	Open and flexible vision	Process	WHAT
18	Considering the dynamism and dynamics of policymaking?	Process	WHAT
19	Go over linear and simple approaches	Quality	HOW
20	Adopt an active approach rather than passive	Quality	HOW
21	Attention to the futures	Quality	HOW
22	Regarding the requirements of policy learning and policy transfer	Quality	HOW
23	Transparency, clarity, and resolution of ambiguity	Quality	HOW
24	Paying attention to the broad principles and spirit of macro policies and understanding the conceptual model of policymaking	Quality	HOW
25	Avoid the technocracy and engineering approach	Quality	HOW
26	systematic, timely and effective continuous evaluation and feedback	Quality	HOW
27	Avoiding politicization and preferring specialized considerations to political	Politics	HOW
28	Prioritization based on evidence rather than subjectivity	Quality	HOW
29	Promoting creativity and innovation	Quality	HOW
30	Considering critical thinking	Quality	HOW
31	Overcoming the fear and resistance of managers and administrators to change	Politics	HOW
32	Resilience and robustness to changes (governments and…)	Politics	HOW
33	Policy intelligence	Quality	HOW
34	In terms of external environment changes	Quality	HOW
35	Attention to group work in policy making and not being individualized	Quality	HOW
36	Theoretical support and paradigm fit	Quality	HOW
37	Promotion of social capital and national determination	Politics	HOW

4. Results

The questionnaire was created online and was shared in some future studies social networks and the link was sent to the experts by Email. It was reminded approximately three to four times to responders until 24 complete questionnaires were gathered. It was filled by the futurists

Table 2. Magruk Future Methods Classification

Methods	Description
Consultative	Voting, polling, survey, interviews, expert panels, essays, conferences, workshops, citizen panels, brainstorming
Creative	Wild cards, weak signals, mindmap, lateral thinking, futures wheel, role play, business wargaming, synectics, speculative writing, visualization, metaphors, assumption reversal
Prescriptive	Relevance trees, morphological analysis, rich pictures, divergence mapping, Coates and Jarratt, future mapping, backcasting, SRI matrix, science fiction analysis, incasting, genius forecasting, futures biographies, TRIZ, future history, alternative history
Multicriterial	Key technologies, source data analysis, migration analysis, shift-share analysis, DEA, factor analysis, correspondence analysis, cluster analysis, sensitivity analysis, AHP, input-output analysis, prioritization, smart, prime, MCDM radar scientometrics, webometrics, patent analysis, bibliometrics, technological substitution, S-Curve anal technology mapping, analogies
Radar	Scientometrics, webometrics, patent analysis, bibliometrics, technological substitution, S-curve anal technology mapping, analogies
Simulation	Probability trees, trend extrapolation, long wave analysis, indicators, stochastic forecast, classification trees, modeling and simulation, system dynamics, agent modeling
Diagnostic	Object simulation, force field analysis, word diamond, SWOT, STEEPVL, institutional analysis, DEGEST, trial and error, requirement analysis, theory of constraint, issue management, ANKOT
Analytical	SOFI, stakeholder analysis, cross-impact analysis, trend impact analysis, structural analysis, megatrend analysis, critical influence analysis, technology barometer, cost-benefit analysis, technology scouting, technology watch, sustainability analysis, environmental scanning, content analysis, FMEA, risk analysis, benchmarking
Survey	Web research, desk research, technology assessment, social network analysis, literature review, retrospective analysis, macrohistory, back-view mirror anal
Strategic	Technology roadmapping, technology positioning, Delphi, scenarios, social impact assessment, RPM, technological scanning, multiple perspectives

and the output was entered in the SPSS software for analysis.

Of the 24 futurists, who completed the questionnaire; five were female and the rest were male. In terms of education, only Ph.D. graduates or Ph.D. students in futures studies were included in the study.

Indicators were prioritized according to their importance in the Table 3.

In the next step, the priority of the ten categories of the method was selected for each improving indicator (Table 4). The results revealed that Strategic and Consultative group of methods were the most favorite among the experts to solve the policy problems.

In the next step, responders were asked to specify appropriate methods for improving policy indicators inside the selected group of methods. The priority of the attractiveness of selected methods is indicated in the Table 5.

Finally, four methods were the most commonly selected: casual layered analysis (CLA) with 2250 points, scenario with 1596 points, expert panels with 1560 points, and Interviews with 1232 points. Two of them were strategic (98 points) and two others were in the consultative group (90 points), which were the most widely chosen method in the categorization. After these four methods, the other selected methods were as follows: citizens panel with 1120 points, brainstorm with 1044 points, workshop with 828 points, the system dynamic with 672 points, conference with 589 points, Factors analysis with 576 points and voting with 550 points.

At the beginning of the questionnaire and regardless to the challenges list, responders were asked to suggest methods to improve the population policy. The frequent responses were: scenario (20%), trend impact analysis (17.5%), Delphi (12.5%), casual layered analysis (10%), visioning (5%), trend extrapolation (5%), simulation (5%), and experts panel (2.5).

4.1. Limitations and Challenges

One of the challenges was the difficulty and time-consuming completion of the questionnaire, due to the inclusion of 100 methods in ten categories. To eliminate this problem, some of the methods could be removed from the questionnaire. The limited number of graduates of future studies, lack of think tanks, dispersion of future scholars with diverse backgrounds and systematic discipline, limited opportunities for postgraduate studies and practicing futuristic methods also may contribute to the cause.

5. Discussion

Global experiences indicated the creation of interdisciplinary dialogue between futurists and policymakers and the demographic contributes to the scientific growth and improvement of the three areas and achievement of a consensual ideal. Meanwhile, the author's expectations must be realistic. Designing a policy that is completely in line with the goals may remain a challenge for decades. Future approach can be helpful, yet it cannot completely eliminate uncertainties. In conjunction with other analysis

Table 3. Importance of the Policy Improvement Indicators

	Policy Improvement Indicators	Importance
1	Methodological use of collective wisdom	69
2	paying attention to the tacit knowledge of experts and managers	68
3	Identifying affecting and affected stakeholders	68
4	Attracting experts' participation	67
5	Not satisfying with mere elitism	64
6	Concentration and convergence of the centers and decision-making authorities	64
7	Reducing divergence in the literature of experts and managers	59
8	Considering the activism of human beings	58
9	Paying attention to the complexity	54
10	Paying attention to the interdisciplinary nature	53
11	Comprehensive view and avoidance of partial consideration	53
12	Attention to the futures	53
13	Institutionalization and organization	52
14	Considering timing and proper timeline	52
15	paying attention to native values and norms	50
16	paying attention to the past, present, and future (being historic)	50
17	Considering the dynamism and dynamics of policymaking	50
18	systematic, timely and effective continuous evaluation and feedback	47
19	Promotion of social capital and National determination	47
20	Open and Flexible vision	44
21	Go over linear and simple approaches	44
22	Regarding the requirements of policy learning and policy transfer	44
23	In terms of external environment changes	44
24	Adopt an active approach rather than passive	43
25	Considering critical thinking	43
26	Attention to group work in policy making and not being individualized	43
27	paying attention to the topic's specialty	42
28	Resilience and robustness to changes (governments and…)	42
29	Avoiding politicization and preferring specialized considerations to political	41
30	Prioritization based on evidence rather than subjectivity	40
31	Promoting creativity and innovation	39
32	Overcoming the fear and resistance of managers and administrators to change	39
33	Transparency, clarity, and resolution of ambiguity	38
34	Policy intelligence	38
35	Avoid the technocracy and engineering approach	34
36	Theoretical support and paradigm fit	34
37	Paying attention to the broad principles and spirit of macro policies and understanding the conceptual model of policymaking	29

tools, it is possible to produce flexible and resilience policies. The futuristic approach will create a structure to realize uncertainties, and meanwhile, alternative perspectives on policy challenges. This expanded horizon will allow accurate measurement of the policy and may reduce the risk of unintended consequences. Future studies can be used

Table 4. Priority of the Ten Categories of the Methods

Category	Score
Consultative	90
Creative	44
Prescriptive	43
Multicriterial	44
Radar	5
Simulation	41
Diagnostic	29
Analytical	55
Survey	24
Strategic	98

Table 5. The Results of the Attractiveness-Capability Priority

In Terms of Capability, the Following Method Was Also Obtained: Methods	Attractiveness-Capability
Causal layered analysis	2250
Scenarios	1596
Expert panels	1560
Interviews	1232
Citizen panels	1120
Brainstorming	1044
Workshops	828
System dynamics	672
Conferences	589
Factor analysis	576
Polling	550
Delphi	550
AHP	486
Survey	450
Environmental scanning	432
Stakeholder analysis	420
Modeling and Simulation	418
Structural analysis	414
Wild cards	399

throughout the entire cycle of policymaking.

Meantime, a main concern of future studies has always been the choice of methods. An appropriate combination of methods will lead to the optimal function of foresight in solving the main problems of policymaking. Otherwise, it can impose new limitations and problems on this interdisciplinary arena.

Overall, 2000 study of the world's futures researches showed that futurists in each area are somehow clichéd in selection and application of methods (9). In this sense, most students often use their own ancestors chosen methods. This stereotype is also seen in other areas of knowledge, yet it could be fatal for the innovative nature of future studies. Therefore, the researchers are going to bypass the clichés according to new prioritization logic.

The main challenges of the population policy were introduced to future toolbox through a questionnaire, which was responded by futurists. Four methods were selected in this study as components of population policy-making improvement model: scenario, CLA, experts panel, and interview. A three-dimensional model was suggested by the scope and capacity of each selected method. The panel is suggested as the framework for implementing the model. Expert meeting in three steps is recommended to improve population policy with foresight approach. The first step with a forward-looking approach is adopted by the scenario method, in the second step, the deepening approach is applied by the CLA method and the third step with a practical approach will make a framework towards scenario planning.

It is observed in the figure that selected methods have also covered all four fundamental dimensions of popper's future diamond (Figure 1). Also considering foresight steps, they are all represented in this model. After implementing this rough model, it is preferred to be assessed concerning fulfillment of its main goal, which was supposed to improve population policy. According to Magruk category, this study cleared that the main challenges of population policy and their solutions were aggregated in two of ten categories (of Magruk), including consultative and strategic methods; this result may be applied to most of the public policy issues in the country, which is researchable through further studies.

The path and logic used in this research to select the model of population foresight, considering constraints and challenges, can be generalized to other public policy areas and can be a scientific and methodological basis for applied interdisciplinary studies (Figure 2).

Footnotes

Authors' Contribution: Maryam Ardebili developed the original idea and study concept and design, acquisition of data, analysis, and interpretation of data, drafting of the manuscript, critical revision of the manuscript for important intellectual content and statistical analysis. Amir Nazemi, Mohammad Jalal Abbasi Shavazi and Ali Asghar Pourezzat contributed to the administrative, technical, and material support and study supervision.

Conflict of Interests: It is not declared by the authors.

Figure 1. Placing selected methods in popper foresight diamond

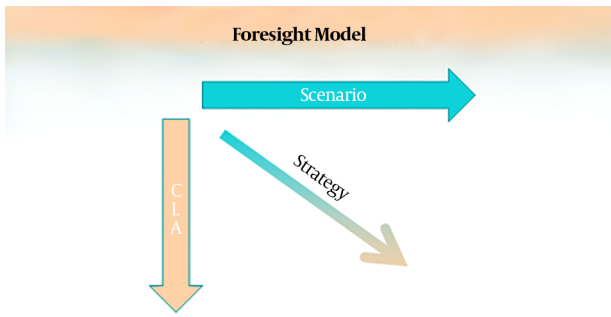

Figure 2. 3-D foresight model (depth, futures and practice)

Ethical Approval: This research has been approved by the National Research Institute for Science Policy committee of ethics

Financial Disclosure: The authors had no financial interests related to the material in the manuscript.

Funding/Support: This study was supported in part by grant from the National Research Institute for Science Policy and National Institute of research and Comprehensive Management of Population.

References

1. Jalal Abbasi-Shavazi M, McDonald P. Fertility decline in the Islamic Republic of Iran: 1972–2000. *Asian Popul Stud*. 2006;**2**(3):217–37. doi: 10.1080/17441730601073789.
2. Gauthier AH. The impact of family policies on fertility in industrialized countries: A review of the literature. *Popul Res Policy Rev*. 2007;**26**(3):323–46. doi: 10.1007/s11113-007-9033-x.
3. Aaltonen M, Irene Sanders T. Identifying systems' new initial conditions as influence points for the future. *Foresight*. 2006;**8**(3):28–35. doi: 10.1108/14636680610668054.
4. Saritas O, Anim DA. *The last and next 10 years of foresight*. 2017. Contract No.: 1556-5068.
5. Magruk A. The process of selection of the main research methods in foresight from different perspectives. *Bus Manag Educ*. 2015;**13**(2):234–48. doi: 10.3846/bme.2015.281.
6. Magruk A. Innovative classification of technology foresight methods. *Technol Econ Dev Econ*. 2012;**17**(4):700–15. doi: 10.3846/20294913.2011.649912.
7. Popper R, Butter M. How are foresight methods selected? *Foresight*. 2008;**10**(6):62–89. doi: 10.1108/14636680810918586.
8. Porter AL. Technology foresight: Types and methods. *Int J Foresight Innov Policy*. 2010;**6**(1/2/3):36. doi: 10.1504/ijfip.2010.032664.
9. Miles I. *Keenan M. A practical guide to regional foresight in the United Kingdom*. Luxembourg: European Commission, EUR 20478; 2001.
10. Voros J. Introducing a classification framework for prospective methods. *Foresight*. 2006;**8**(2):43–56. doi: 10.1108/14636680610656174.
11. Glenn J, Gordon T. *Futures research methodology, the millennium project*. Washington, DC: American Council for the United Nations; 1999.
12. Jemala M. Evolution of foresight in the global historical context. *Foresight*. 2010;**12**(4):65–81. doi: 10.1108/14636681011063004.