

# FORESIGHT IN TRANSITION: A REVIEW & WAY FORWARD

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## **Abstract**

This study examines the recent evolution of Foresight for long term policy and strategy making, and discusses the future directions the activity might take. Foresight has shaped the world, and its practice has been shaped by the changing global landscape. Trends in Foresight practice are discussed through case studies. Five leading countries in Foresight were selected for analysis including Finland, the UK, Germany, Japan and Russia. A set of indicators were designed for the purpose of benchmarking national Foresight activities, including: the contextual landscape, scope of the exercise, regularity of using Foresight for policy formulation, funding mechanisms, scale of participation as well as use and implementation of results. The study shows that Foresight activities have changed in content, context and process over the last ten years. First, Foresight has moved from large scale national activities and become narrower in scope with attempts to focus on specific grand challenges, sectors or technologies. Second, in the quest to provide a broader picture of the social environment for more resilient STI policy, Foresight exercises have become more inclusive with the participation of broader experts and social stakeholders. Moreover, development of Information and Communication Technologies (ICTs) have shortened the entire Foresight process, increased its evidence base with new sources of data, and provided more efficient mechanisms for dissemination and implementation of results. Recent Foresight literature lacks a comprehensive overview of the changing policy making landscape, motivations for using Foresight activities, and processes their implementation. The present study aims to fill this gap with a holistic analysis of the context, content and process of Foresight activities in the last decade, and discusses possible transformations through the next decade.

**Keywords:** Foresight, STI Policy, Transition

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## **Introduction**

Foresight has been used as an instrument associated to Science, Technology and Innovation (STI) policy making for several decades now. During this time various definitions have been suggested for Foresight emphasizing its long term orientation, participatory nature, priority setting characteristics and

orientation towards recommendations for the future of society and economy (Saritas, 2006). Miles and Keenan (2002) define Foresight as: “the application of systemic, participatory, future-intelligence-gathering and medium to long-term vision building process to informing present-day decisions and mobilizing joint actions” (p. XI). From the definition, firstly Foresight is not a technique but a process. The activities take place over an extended period of time which span months and mostly years (Miles et al., 2016). The process acts as an avenue which draws participants from a wide range of stakeholder groups (scientific community, NGOs, government, Industry etc.) to deliberate on important issues in the growing STI portfolio. The idea of creating the future must be systematic and captioned Foresight. Also, the medium to long term dimension of the definition means that, the exercise must have a longer-term time horizon, which goes beyond planning time spans to cover longer term uncertainty, across five or more years, depending on the scope and focus of the Foresight exercise. Foresight usually has a broad aim of selecting priorities to focus limited resources on through research and development (Martin and Johnston, 1999). A clear example of the use of Foresight to set priorities is earlier Japanese Delphi exercises, where Foresight methods were applied to identify priority areas for science and technology. Foresight is also used to reform as well as inform policy and strategy at all levels of governance (Gavigan et al., 2001). Began largely with a ‘one-size-fits-all approach’ to solving problems, over time Foresight activities have been more and more customized according to their contexts and contents (i.e. scope), and became increasingly evidence-based, creative and participatory. This has created an awareness and given Foresight a role in the design of customized policies at the supranational, national, regional, sectoral or local (Georghiou and Harper, 2011).

Governments around the world especially catching up countries are increasingly recognizing the need to incorporate Foresight into their national development plans in order to shape future developments (Magariños, 2005). The changing effects of grand challenges and uncertainty associated with global changes have propelled Foresight to the forefront of strategic planning tools of governments at the national and regional levels for establishing priorities for STI. Major challenges of society such as food security, soil and water conservation, natural resources, poverty, energy production, nuclear proliferation, climate change, etc. are overarching challenges that transcends the borders of individual countries and thus affect humanity as a whole. These challenges have created varying opportunities and damaging effects on countries leading to the adoption of different methods and approaches to tackling these problems.

Building on the recent trends on Foresight, the present study first provides an overview of the recent Foresight experience. Besides undertaking an overall discussion, five cases are presented selected Foresight the countries, which indicated a high level of commitment in recent decades. The analysis of selected countries indicate that their attitudes for Foresight have evolved across time in a fast changing, uncertain and sometimes unstable world. Although this uncertainty has made some countries be more reluctant in undertaking Foresight exercises with a short-term orientation, the others considered

that Foresight might open new horizons in crisis times. A benchmark of case studies will elaborate these different responses. The study will conclude with an overall discussion on the future of Foresight in the next decade to come.

### **A review of Foresight practice and cases analysis**

Up until the early 2000s, five generations of Foresight were observed (Georghiou, 2008). The first generation emerged from the mid-twentieth century out of technology forecasting activities driven mainly by internal technology dynamics. The second generation of Foresight, which was observed mainly during the 1980s, focused both on technologies and markets. These two drivers were closely related as technological developments were carried out as a result of the influences of the forces of demand and supply (markets) as well as its contribution. Coming to the 1990s, the third generation emerged with the need to consider social trends as well as alternative institutional arrangements in order to deal with the issues raised. During the late 1990s and early 2000s, Foresight programmes in the fourth generation were characterized by their distributed role in the innovation system. Foresight exercises were undertaken and sponsored by multiple organizations in accordance with their specific needs. Increasingly from the early 2000s up to the present, the fifth generation of Foresight has been characterized by a mix of Foresight programmes, which are spread across various sites and combined with strategic decision-making elements. From the 2010s, Systemic Foresight approaches have been introduced, based on the principles of systems thinking (Saritas, 2013).

Foresight activities continues to evolve with ever changing contexts, new and emerging areas of focus, and novel technologies, which offer new methodological possibilities through the use of computers and information technologies.

#### ***Last ten years of Foresight***

As Foresight contributes to the evolution of the world, it also needs to adapt itself to these changes. Technology Assessment, Technology Foresight, Long Range Planning, Technology Forecasting, Futures etc. have been among the list of interchangeably used terms for Foresight over years (Pouris and Raphasha, 2015). Although the terms have varied across time, Foresight represents the art and science of anticipating and designing the future (Loveridge, 2009). is based on the fact that the future is still under construction and can be influenced, discovered and created (Cuhls, 2003). In the last decade, Foresight adapted to the changes in a number of ways to allow governments and organizations construct visions, policies and strategies for the future.

Among the changes observed are the trajectory of Foresight as one of the main methods in the STI policy toolkit, are in recent years undergoing changes in methodology development. The changes have been influenced by the growth in technologies in information and communication and tools which are easily available online (Daheim and Hirsch, 2016). The demand for Foresight as an information tool for STI policy makers has increased rapidly in recent years and has been adopted in certain countries as “the

solution”, thereby propelling it to the center of discussion to address the most important challenges in STI policies.

According to Daheim and Hirsch (2016), changes that have taken place in the methods applied to Foresight can be attributed to the following drivers: Firstly, there have been changes in demand in the use of Foresight for science, technology and innovation policy. Secondly, the advent of technological innovations such as improvements made on information technology has ensured advancement in the area of text mining as well as clustering for conducting scanning exercises. These changes have been captured and discussed by various scholars under different labels such as “networked Foresight,” “experiential Foresight,” “5th generation Foresight,” “Foresight 2.0” (Hines and Gold, 2013; Prime Minister’s Office, 2014; Saritas and Burmaoglu, 2015); Van der Duin et. al., 2014). Issues raised by these scholars under these new labels and terminologies include: putting the “intelligence of the crowd” to use when coming up with insights for long-term research, thus scenarios sources from the crowd; Foresight supported IT tools; the use of design and visualization of fiction in “gamification” or “experiential Foresight” as novel means of generating knowledge and communicating results.

There has also been the introduction and use of new terminologies such as ‘open science’, ‘open Foresight’, ‘networked science’, and ‘citizen science’ which highlights further ambition for research and innovation (Daheim and Uerz, 2008; Dufva and Ahlqvist, 2015). One of the challenges of Foresight is ensuring the participation of a broad number of people with limited resources (Dufva and Ahlqvist, 2015). These new terminologies call for the broadening of the number of participants in Foresight and other decision making areas such as corporate Foresight. From the perspective of broader participation, policy-making moves beyond governance and takes into consideration of the joint impact of both the private and public decision-making on issues affecting society. This trend involves the practice in which a broad number of participants are allowed to collaborate and contribute to the generation of data and information, laboratory notes as well as other research processes for the Foresight study. This trend is driven by changing landscape of knowledge production. Knowledge production systems are becoming multidisciplinary, fusion of fields and heterogeneous, thereby emphasizing the need for communication, networking, partnership and collaboration among actors (European Commission, 2009).

There has been an increase in the use of different Foresight instruments to carry out these exercises. The proliferation of data of all sorts has led to the widespread introduction of advanced tools to help process, mine, compare, organize, search, display as well as interpret many forms of data (Ahlqvist, 2015; Geoghiou, et. al. 2008). This trend can be attributed to the multidisciplinary nature Foresight activities in S&T have taken. Data gathered from Japan’s Delphi surveys were used by various stakeholders from diverse policy making levels. However, the surveys only had ‘supply’ orientation, ignoring the demand side. This approach was criticized and new instruments have been adopted to broaden the entire approach (Kuniko et. al., 2012). This development has led to the production of large amounts of data which requires an increase in communication among stakeholders.

In 2013, the Finnish government launched a project to create a Foresight model which is aimed at building a national approach to Foresight in order to improve the country's competitive edge (Prime Minister's Office Reports, 2014). This is a trend in recent years and is driven by an increase need for cooperation and shared processes between actors, expedition of the implementation of Foresight results, expedition of information dissemination, from the strategy stage to the practice stage. Also, as a result of growing globalization in the midst of economic competition has made innovation and resource allocation in S&T important. Thus, there is a need to focus available national resources on more strategic options. Countries are developing and focusing their S&T Foresight efforts to tackle the S&T grand challenges (European Commission, 2009). Japan, for instance have conducted Foresight exercises that have focused on green innovation. This dimension of Foresight is directed to providing solutions to the S&T grand challenge of climate change and also foster research in the area renewable energy (Kuniko et al., 2012).

National Foresight activities to set S&T priorities have become more complex both in scope and design. The growing popularity of Foresight has seen the development of more rapid processes such as "Mini-Foresight" which can be conducted using simple and effective 24-hour scenario workshops. This development was driven by the need to learn and gain better understanding of the dynamics of Foresight in addition to the growing confidence in the use of Foresight frameworks and methodology (Miles et al., 2008). The effect of such development was that Foresight was overloaded with many objectives leading to the collapse of many National Foresight activities as a result of the weight of the different expectations. This is exemplified in the previous UK and German Foresight activities.

Recently, Saritas et al. (2017) have suggested a "dynamic and adaptive Foresight" and demonstrated this concept with the use of scenarios. The idea of growing complexity, rapid changing environments and as a result increasing uncertainty require more contingent pathways towards the scenarios of the future.

### ***The way forward with Foresight***

To explore the way forward in Foresight, it is important to understand how the contexts, contents and processes of organizing and implementing Foresight have been changing. An analysis of context, content and process, and how these affect the Foresight activity has been demonstrated by Saritas et al. (2007) both theoretically and with a case study. The current analysis builds on this logic of 'contextual analysis'. For this purpose, first, the factors, which are likely to shape the future of Foresight are discussed in the next section.

Global changes also known as "mega trends<sup>1</sup>" are having strong impact on Society, Technology, Economy, Environment, Politics, and Values (STEEPV). Such a STEEPV framework is useful to capture and understand the broad range of interacting and interconnected systems. These large scale global

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<sup>1</sup> Mega trends are large-scale trends that are slow to form but tend to have lasting influence on humanity. They come in the form of social, economic, political environmental as well as technological changes (OECD, 2016).

changes allow us to put into perspective some elements of the likely medium-to-long term future with implications for Foresight in the way of scoping the activity and developing novel methodology and processes in line with these changing contexts and contents.

According to OECD (2016) social changes such as population changes, society, inequality and wellbeing will have lasting impact on humanity. The world's population is expected to peak 10 billion by 2050. Global population growth will put immense pressure on natural resources. Family and household structures are also experiencing immense changes especially in OECD countries where there is an increase in one-person households as well as couples without children. About 90% of urban growth is occurring in Africa and Asia. Improved access to basic amenities such as electricity, water and sanitation are some of the benefits urbanization will have on society. The treatment of infectious diseases in the developing countries is being compromised as a result of the growing resistance to antibacterial. Also, the mass migration of displaced people from war torn areas is causing social and political tension on the countries they are coming from and the countries they are moving to.

Under Technological trends, Digitalization plays a unique role. Production and service provision are gradually becoming digitalized leading to highly integrated and efficient production and delivery processes. Digital technologies are impacting societies and economies by slashing computing and equipment cost. The global digitalization has led to an increase in development that are open sourced leading to the creation of more employment (OECD, 2016).

On the demand side production, population growth, higher incomes, sustained demand for bio-fuel, changing diets and urbanization are causing changes in consumption in developing economies. The supply side is seeing slowdown in global agricultural production growth to 1.5% (Boubaker, 2014; International Monetary Fund (IMF), 2015). China's decreased consumption and the global increase in the production of commodities such as shale oil in the US has caused a significant drop in price of commodities. This has the potential of making commodity exporters to diversify their exports and local economies. There has also been changes in accounting and regulation standards which has increased following the economic crisis of 2008 (Tysiac, 2016).

Under environmental trends, the growing world population in addition to economic growth has placed natural resources under immense pressure. Energy consumption has risen steeply, causing further changes in the climate. In poor and highly populated countries, the threat on biodiversity is increasing. This trend is driven by technological innovations, which are adopted around the world.

The role of governments is gradually changing. This change, fueled by globalization is shaping the global political landscape. The decline in public confidence in government, in addition to the transition to a more polarized world are leading to growing instability. The shift in global powers towards the east and south is empowering new players such as megacities, non-state and states actors are driving and facilitating globalization (OECD, 2016). These and a number of other trends shape the context of STI policy and how these policies are formulated. As discussed above, Foresight has been a popular

instrument for formulating STI policies and strategies. A number of countries have adopted Foresight and undertaken activities at different levels of governance including national, regional, corporate, and sometimes at the international level. Particularly national Foresight cases have been illustrative on how governments looked in to the future, prioritized areas for STI and allocated funding. Recent developments in the global landscape, changing trends and transforming society, economy and policy created different reactions against Foresight by the STI policy makers of various leading economies in the world. In order to demonstrate this five cases have been selected from the countries, which have led to the formulation of STI policies using Foresight. Recent developments have indicated that the attitudes of these countries against Foresight have varied considerably. The following case analyses describe how these variations have emerged and discuss some of the underlying reasons.

Five Foresight cases have been selected for comparison, including Finland, The United Kingdom, Germany, Japan and Russia. Among the indicators for comparison are: (i) the contextual landscape of the Foresight programme, (ii) scope and coverage of Foresight exercises, (iii) regularity of undertaking Foresight activities for policy formulation, (iv) funding mechanisms, (v) scale of participation, and (vi) the use and implementation of results.

## **Results, discussion and implications**

The Foresight activities of the countries analyzed show various levels of intensity. Although each of them has indicated considerable commitment for Foresight activities up until the 2010s, their attitudes have varied significantly since then. Countries with stable economic and political conditions continue their commitment for Foresight activities. Among the programmes compared, Finnish Foresight programme can be considered as the most institutionalized. The programme is well integrated into the governance structures of the country at different levels from the national government, to companies as well as large research institutions and research funding bodies. Well set up and well embedded Foresight programme is represented in the parliament with the “Committee for the Future”, which was established in 1993, and is considered to be the first futures committee in the world.

Similarly, as the longest running Foresight programme in the world, Japanese Foresight has been stable almost all the time since the first implementation in the early 1970s. There have been changes in the content and processes in parallel with new and emerging science and technology areas as well as new methods for Foresight.. For instance, the Japanese activities have moved from a single to multi-method approach, and are now also scoped to cover societal issues along with science and technology areas. Given the fact that the evaluations of earlier rounds of Foresight indicates high success rates, it is expected that the commitment for Foresight is going to be at a steady level with further improvements in methodology and scope.

Germany is one of the countries, which has moved from large scale national Foresight activities. Foresight exercises are organized around the key emerging technology fields. The BMBF still plays an instrumental role for coordinating Foresight activities. Recent Foresight activities focused more on monitoring social and technology trends as well as challenges. Several volumes of reports are published and disseminated on a regular basis, which gives a stability to the on-going Foresight efforts.

When began, the UK Foresight programme was one of largest national initiatives and inspired a number of other countries in undertaking . The Foresight activities in the UK have declined in intensity in the last decade. Foresight activities in the UK have reduced in intensity and have become narrower and more demand oriented. At the level of national government Foresight has already been reduced to a minimum level with no strong public appearance. The dedicated website for Foresight has been abandoned, and been replaced by a few pages under the Government website. The pages were last updated in May 2016.

Among the countries analyzed, Russia has indicated an increasing intensity in Foresight activities. Opposite to the UK programme, under crisis and strict sanctions Russia considered Foresight as a strategic instrument for formulating long-term priorities and policies. Foresight studies at different levels of governance from federal to regional and sectoral to corporate levels indicate a coherent and complementary ecosystem. Strategies particularly for substituting imported technologies and goods appear to be successful, which help to increase the commitment for Foresight activities.

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### **Conclusions: What is on the agenda for the next ten years?**

Foresight activities largely started and diffused across countries globally through “bandwagon” and “millennium” effects (Keenan, 2009). The activities in the past decade indicated that Foresight is now much more customized and absorbed by national and regional governments as well as corporations. The tools and methods have been richer and much more sophisticated through the use of new technologies (Saritas and Burmaoglu, 2015). Looking into the future of Foresight, it can be said that the activity will adapt itself into changing contexts, emerging new areas, and will improve its methodological toolbox through the use of new technologies and participatory methods.

The dynamic changes in the world bring challenges for undertaking long-term Foresight activities. Global economic fluctuations, increasing conflicts, mass immigration and all the other factors brought disruptive effects on long-term policies. Therefore, there is an increasing need for making Foresight more adaptive and dynamic into fast-changing contexts. Saritas et al. (2017) gives an example of developing a new scenario approach, which brings together multiple time horizons and multiple paths for achieving or avoiding future scenarios. In order to remain relevant and acclaimed Foresight approaches need to mediate this emerging ‘tension’ between long and short terms.

In parallel to the changing contexts, the scope and coverage of Foresight activities are also changing and evolving. Moving from heavily technology oriented activities with the recent more social-

orientation, the activities of the next decade are expected to evolve into more trans- and anti-disciplinary domains. This new focus will provide a platform for a wide variety of scientific disciplines, multiple levels of governance as well as all innovators from the individual to institutional levels.

One of the most noteworthy improvements in Foresight is the fact that the activity is continuously drawing more and more on emerging technologies of information and communication. Among those, Big Data appears to be very promising in terms of using more and real-time evidence for Foresight. New sources of information beyond textual data including visual as well as sensor data increase the quality and quantity of input. Similarly new ways of analyzing and visualizing data provides opportunities for making more sense of interpretation and use. Some examples of using Big Data for identifying trends are provided by (Saritas and Burmaoglu (2016) and Burmaoglu and Saritas (2017) Furthermore, the technologies like Blockchain, have the potentials to increase participation and provide more transparency for the Foresight process. The potentials provided by increased computer power, semantic analysis, and cloud based technologies are expected to take Foresight to next levels.

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