



The influence of information and communication technology (ICT) on future foresight processes – Results from a Delphi survey



Jonas Keller^{*}, Heiko A. von der Gracht

EBS Universität für Wirtschaft und Recht, EBS Business School, Konrad-Adenauer-Ring 15, 65187 Wiesbaden, Germany

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ABSTRACT

Information and communication technology (ICT) tools are increasingly being used to implement foresight exercises. Until now, it has not been analyzed how this development affects the quality and structure of foresight processes. In this paper, a Delphi study is conducted to analyze the future path of ICT in foresight and to identify channels by which ICT drives progress in foresight and where there are limitations to this development. Using a real-time variant of the method, we posed 20 projections about ICT in 2020 to 177 foresight experts. In analyzing both quantitative and qualitative results of the study, we reveal that ICT will likely promote a shift in the focus of foresight exercises from scanning and data retrieval to more qualitative steps, such as interpretation, decision-making and implementation. In a growing foresight market, ICT should contribute to more efficient and accurate foresight processes with better accessibility to information, easy-to-use collaboration tools, data and knowledge linkages, quantitative modeling tools and process optimization. However, the qualitative nature of the discipline, value-driven challenges, as well as technological and competitive barriers should assure that foresight will remain a creative and human-centered activity with ICT tools only serving as supportive tools.

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1. Introduction

In an age of increasing complexity and pace of innovation, futures thinking and foresight are becoming more important and attractive than ever before. Engaging in strategic foresight supports organizations in maintaining sufficient flexibility for future developments and unforeseen circumstances. While governments and public institutions may employ foresight to prepare for the long-term, companies can equip themselves with capabilities to react to weak signals and to quickly change the course of action according to market demand [1]. Consequently, the implementation of foresight practices, such as scenario planning, has increased [2]. The velocity and dynamism of the environment go along with a torrent of data, which society and technological progress are generating. Decision-makers and individuals in general are unable to process all of

this information. Hence, there is a need for supportive tools, which rely on information and communication technology (ICT) [3]. Futurists and strategists consider ICT tools to have addition potential for increasing the quality of futures research, for example via internationalization, indexing and brain research (e.g. [4]).

Foresight processes are already supported by a large diversity of software applications. This includes trend databases, analytical software for trend extrapolation or scenario software packages. Since foresight – defined as a systematic, participatory, future-intelligence-gathering and medium- to long-term vision building process aimed at enabling present-day decisions and mobilizing joint action ([5], p. V) – is ultimately about adaptation to future developments that should reflect in decision-making [1,6], software serving any facet of forward-looking decision support can be called an ICT-based foresight tool. For the purpose of the research at hand, we define ICT-based foresight tools as ICT used to initiate, automate, implement or support foresight processes. For foresight processes, we employ a generalized

^{*} Corresponding author. Tel.: +49 611 7102 2100; fax: +49 611 7102 1990.
E-mail address: jonas.keller@ebs.edu (J. Keller).

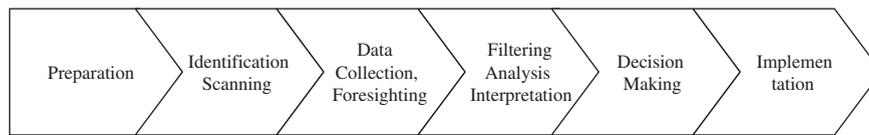


Fig. 1. Main phases of the foresight process.
Modified from Reger (2001).

version of Reger's [7] technology foresight process (see Fig. 1). Furthermore, we argue that the use of ICT tools will have profound consequences on the nature of foresight processes.

Bañuls and Salmeron [8] considered ICT support in foresight to be an antecedent of foresight support systems (FSSs) which aim at supporting strategic decision making. This relates FSSs to decision support systems (DSSs), which share the same goal [9]. However, DSSs have been more adept in operational and managerial tasks thus far. Courtney [10] attributed this to the fact that DSSs commonly require numbers or similar 'hard' information as input, but stated that complex – or wicked [11] – problems of decision-making in modern society require more 'soft' or qualitative input. Foresight is usually an approach to tackle wicked problems (e.g. [12]) and, as a creative and group-based process, primarily relies on qualitative information. Thus, it is not surprising that foresight has lagged behind other – more operative – processes when it comes to incorporating ICT into professional processes. For example, Bishop and Collins [13] listed a number of scenario techniques, the vast minority of which involves ICT tools. In recent years, however, the transfer from academic thinking to actual employment of supportive software in companies' foresight processes has gained traction [8].

While overall ICT promises to be a driver for further development in foresight, it also seems probable that there are barriers and limitations to the adoption of ICT-support in foresight. The above argument already demonstrates that the more qualitative a process is the harder it becomes to support it with ICT. In addition, as is true for all DSSs, the sophistication of the FSSs cannot turn bad input into usable outcomes (cf. [14]). The complex nature of decision making environments poses various challenges for FSSs (cf. [10,15]) including non-linear interactions and influences as well as ethical questions such as accountability and responsibility issues. This shows that a structured conception of ICT's possible future contribution to foresight processes does not exist yet. The research at hand addresses this lack of conception, by aiming to aggregate expert opinions on the future role of ICT in foresight and projecting the resulting changes in foresight process execution.

As a structured group communication process the Delphi technique is appropriate to achieve this aim [16], especially since we were confronted with a situation of future uncertainty [17]. Fitting to the research at hand we employed an ICT-based real-time variant of the technique. It was conducted among 177 internationally renowned foresight experts from 38 countries. The participants were presented with 20 projections about the future role of ICT in foresight in 2020. The experts estimated the probability of occurrence for each projection. In addition, they rated the impact on the foresight profession if the projection was to occur, as well as the desirability of the projection taking place. By analyzing and discussing the results of this survey, we contribute to the systematization of research being conducted in the various fields of ICT-based foresight

tools. We identify how ICT can drive progress in foresight, as well as reveal limitations to this development. Furthermore, we strive to encourage researchers to enrich their peers' work.

The remainder of this paper is structured as follows. The next section retraces the conceptualization of the projections posited to the Delphi panel. Thereafter, we outline the further methodological process employed for the Delphi study. We briefly state both the quantitative and the qualitative results of the Delphi survey. ICT-based drivers in foresight processes as well as limitations are identified before we draw conclusions.

2. Conceptualization and development of projections

The Delphi projections posed to the panel were arrived by through desk research, a series of three workshops among a team of foresight academics and a pretest by five further external experts from industry and academia in order to ensure clarity, completeness and understanding of the projections. This process verified the validity of the projections' content and ensured that major topics were not disregarded [18]. The projections were formulated based on the guidelines from Salancik et al. [19], which provide specific orientation regarding the optimal number of words and type of formulation required. The final set of projections is presented in Table 1 below. Furthermore, each projection subsequently deducted from literature.

During our review of literature, we observed that ICT-based tools have radically overhauled many business processes, such as supply chain management (e.g. [20]) or marketing (e.g. [21]), and have contributed to overall productivity growth (e.g. [22]). We also noted that progress in such technology continues according to Moore's law (the number of transistors on integrated circuits doubles roughly every two years). Even if the speed of progress should diminish [23], computer capacity will still increase significantly until 2020. Furthermore, since qualitative processes, such as foresight has not yet profited from large efficiency gains through ICT, progress hinges less on hardware but more on advancements in software development and social practices. Consequently, many authors believe this can significantly improve processes, outcomes and knowledge exchange (e.g. [24]). Simultaneously, prominent futurists have been calling for increased application of ICT in foresight and foresight has slowly started to be incorporated in DSSs. We, therefore, pose four projections (with short titles in parentheses) describing how ICT support has significantly penetrated the realms of foresight, as well as subsequent strategic decision making, and how product development in ICT-based foresight tools has continued to thrive:

P1 2020: Information and communication technology (ICT) has revolutionized the practice of futures research (Practice of Futures Research).

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