# Delphi: A brief look backward and forward

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### A B S T R A C T

In response to a request by the guest editors, we have set down our thoughts regarding the evolution of Delphi, beginning with our immersion in the subject in the late 1960s and concluding with some rumination about its future. Our focus is on the changing roles of Delphi. Most importantly, with the profound impact of the internet on organizational and community planning systems, it will foster a new age of participation through communication, coordination, and collaboration.

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## 1. The Past

Delphi was developed at the RAND Corporation in the 1950s by Olaf Helmer, Norman Dalkey, Ted Gordon and associates under the auspices of the U.S. Air Force as a technique to apply expert input in a systematic manner using a series of questionnaires with controlled opinion feedback. Key features were preservation of anonymity in the expert panel's responses and iteration of the questionnaires. A key benefit of participation was the ability of individuals to participate in a group communication process asynchronously at times and places convenient to them. The initial applications were in the area of national defense, with the first unclassified use a RAND report [1] on long-range forecasting. An offspring was the Trend Delphi, in which a group extrapolates a trend curve into the future.

We both encountered Delphi first in 1968: Turoff in the work for the Office of Emergency Preparedness (OEP) and Linstone in the preparation of the very first issue as editor of the new journal *Technological Forecasting and Social Change* (TFSC). That issue already included an article on a U.S. Navy technological forecasting procedure entitled "SEER: a Delphic Approach Applied to Information Processing" by G. Bernstein and M. Cetron. Our two paths soon crossed as the second and third TFSC volumes (1970–1972) featured Turoff's articles on "Design of a Policy Delphi" [2] and "Delphi Conferencing" [3], respectively. A Policy Delphi seeks to expose different policy options and the most important pro and con evidence or arguments to support each policy resolution. Delphi Conferencing refers to an online computer-mediated asynchronous conference system with anonymity.

Our Delphi book [4] featuring many articles from TFSC was published in 1975. In a foreword Olaf Helmer wrote "Delphi has come a long way in its brief history, and it has a long way to go". He called for the solidification of the Delphi technique and foresaw

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its potential importance in supplying 'soft' data in the social sciences. Now a centenarian, he can view his comments more than thirty years ago with eminent satisfaction.

A recent development is the Problem Solving Delphi, a system for providing collaborative judgment [5]. It collects participants' rankings or paired comparisons. Using Thurstone's Law of Comparative Judgment the votes of the N participants are converted to a single group interval scale where the distance between objects in the scale is proportional to the amount of agreement on preference order. Two solutions or components of solutions at the same point on the scale would be due to a 50–50% vote on whether A was preferred to B or B was preferred to A. Participants are encouraged to focus their discussion on resolving the major disagreements [6,7].

Over the past four decades more articles in TFSC have been devoted to Delphi than to any other technique in the domain covered by the Journal. A recent featured article is "RT Delphi: an efficient "round-less" almost real time Delphi method" by Ted Gordon and Adam Pease [8]. It exemplifies how computers and the Internet have enhanced the original concept by allowing for computer-mediated asynchronous communication that is now accessible globally by any group member. This flexibility makes it possible for the user to participate in any phase of a decision process at any time.

The popularity and proliferation of Delphi literature over half a century inevitably means that more than one generation of analysts is involved. The Linstone–Turoff book [4] already included a bibliography of 670 Delphi-related items and by now the number of papers must be in the thousands. Since the book was made available free online, the number of citations has more than doubled to over 2200 (Google scholar: 8/15/2010). As a new generation enters the field it is oblivious of some of the work done by a previous generation with the result that it "reinvents the wheel." Computer Mediated Communications (CMC) is particularly subject to this problem. The computer field is driven more by industry than by academics and every company seeks a new name for its "new" system to reflect its alleged uniqueness.

This is a continuing problem in the areas of Computer and Information Systems where every vendor wants to make his system sound new and rarely points out the evolution based upon earlier systems. Derivatives of Delphi have emerged under names such as prediction markets, collaborative tagging, recommender systems (like Netflix), and social networks that usually serve a commercial objective [7]. But a new name does not necessarily imply a new field.

In the Delphi area the specific topics of Group Decision Support Systems (GDSS), Collaborative Systems, and Collective Intelligence, and CMC are areas employing many of the ideas from the Delphi area [9,10]. These papers categorize hundreds of experiments and field studies in Group Decision Support Systems based in part upon common Delphi factors such as anonymity, feedback structures, pen names, communication process structures, and voting. In the 1978 and 1993 editions of *The Network Nation* [11], Hiltz and Turoff extrapolated the concept of Delphi in the form of Computer Mediated Communications as attempts to produce Collective or Collaborative Intelligence among groups. This is the seemingly "simple" concept that an effective group communication process should allow the group to reach a "better" result than any member of the group would have determined acting alone.

One of the most important aspects of Delphi we attempted to illustrate in the Delphi book [4], by the wide variety of examples we chose, was that every communication structure presented in the different applications was specifically tailored to the "nature of the application and the nature of the participating group". We focused on the philosophy C. W. Churchman in his book on *The Design of Inquiry Systems* [12] and that of Heidegger's "negotiated reality" as not only templates for the design of information systems but also for the design of Delphi processes [4 (Chap. 2)]. This concept has been extended in a number of ways in that the later work by Dr. Turoff applied the same approach to Computer Mediated Communications and to online versions of Delphi [11, (Chap. 14); 13,14].

Today when "collaborative structures or knowledge structures" are referred to in the literature , they are another set of names for exactly what was meant in the 1975 book by us as Delphi or group communication structures. A major concern in designing a Delphi, particularly online versions, is that the structure allows the participants to classify easily their inputs, particularly qualitative ones, in a morphological structure they can mutually understand. The resulting knowledge structure and its evolving content can prevent information overload [15]. In the future, we hope that participating groups will be able to collaboratively build and evolve the knowledge structure that they desire for their ongoing deliberations. Evolving structures with user participation was an essential part of the EIES (Electronic Information Exchange System) from 1976 to the mid-nineties [11,16].

Recent experiments and field trials have confirmed the efficacy of using graduate online learning groups in upper division courses oriented to collaborative learning for the total class [17,18]. In the 1975 book we specifically recommended research into the use of Multi-Dimensional Scaling (MDS) as a feedback structure by including an article on that topic. To date there has not been any meaningful use of that method except for the one dimensional approach of Thurstone to expose the subjective group linear scale from individual ranking or paired comparison input. The fact that MDS can now be run on one's personal computer might change that in the future. Also MDS is a perfect method for trying to aid a group to find the underlying dimensions or factors they are using to represent knowledge in their topic.

The "Tower of Babel" we often find in the professional literature when crossing disciplinary lines is by no means unique to Delphi, as demonstrated in a special TFSC issue on Strategic Foresight developed by Coates, Durance, and Godet [19]. There is much discussion of Technology Foresight as a new concept developed in the UK in the 1980s by SPRU (Science and Technology Policy Research at the University of Sussex, UK) and others. Actually work that is now defined as technology foresight was done in the 1960s but not under that name. Not surprisingly, the new generation of researchers is often unfamiliar with their predecessors' work, which may have been done in a different institution or country or in the context of classified national security projects. An historical appreciation of the evolution of a field, as well as codification of terminology, usually comes at a later stage, when maturity sets in and textbooks are compiled.