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An Introduction to the Morphological Delphi Method for Design: A Tool for Future-Oriented Design Research

Abstract Projecting analytical concepts is a difficult, though established process in innovation management. Designers face methodological obstacles, however, when engaging with a future system with rapidly changing factors. First, the system's users do not yet exist. Second, continuing changes in key factors and their interactions make conceiving of relationships and delivering synthesizable data impossible. The rational core for making projections suffers from a lack of substantiation. Both morphological analysis and the Delphi method are established tools in strategic foresight. We suggest that a morphology-based Delphi method supports the process of projecting future outcomes in innovative, complex projects. In addition, each tool compensates for the other's theoretical and functional deficits by illustrating transparent, value-based arguments in a modifiable, iterative manner.

Keywords
Morphological analysis
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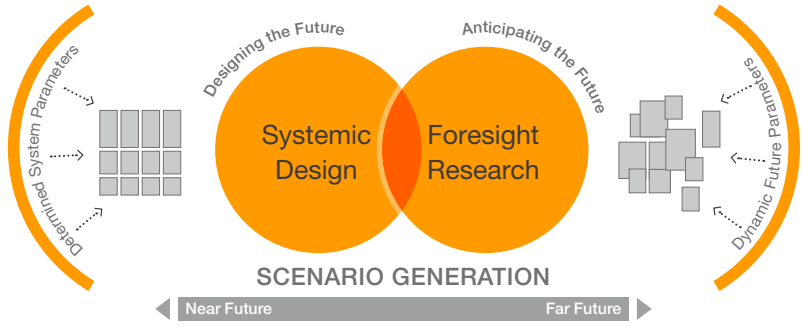

Figure 1 Overlap of systemic design and strategic foresight in future-oriented design projects. Copyright © 2017 Mehdi Mozuni and Wolfgang Jonas.

Introduction

Systemic design, an approach that links systems thinking and design,[1] overlaps procedurally with strategic foresight research, which inquires into and anticipates the future.[2] Both seek to discover something in the future (Figure 1). This overlap expands when designers employing a user-centric approach cannot provide data about end users because they exist ten or more years in the future.

The changing values of key factors pose a problem for future-oriented design (FOD): systemic design inquiries that project into the mid- to distant future. When designing for the present, researchers aim to collect as much data as possible, illuminating existing systems and supporting short-term projections and decision-making. But, future reality is not singular. Researchers' subjective predictions concerning how external factors may affect a system will track along an infinite number of trajectories. The analytical core researchers use to make projections needs repeated validating.[3]

In designing future systems we borrow theory and practice from strategic foresight,[4] and adopt scenario planning into future-oriented design. However, forecasting techniques prove inadequate for this process, since "visioning and designing a future" demand skills (i.e., innovation) beyond merely predicting the future.

Various researchers[5] discuss the benefits of a matrix-based approach to modeling complex problem spaces. Designers and engineers call this approach generative design,[6] while foresight researchers term it morphological analysis.[7] Matrix-based approaches provide a comprehensive scheme for modeling dynamic factors, simulating their interactions and displaying all mathematically possible solutions, many using computer-aided design (CAD).[8] Yet, some researchers claim these algorithms dampen design teams' creativity.[9]

The Delphi method – a survey technique to gain consensus knowledge by questioning a panel of experts in multiple rounds[10] – provides a reliable alternative to user research. This approach delivers highly innovative scenarios, due to its rich intellectual components, yet proves weak for exploring solutions systematically and exhaustively. We suggest that a matrix-based cumulative expert survey, a hybrid of the Delphi method and morphological analysis, better supports future-oriented innovation management processes. Beyond this, the two tools compensate for each other's shortcomings by illustrating transparent value-based arguments in a modifiable, iterative manner.

This article (1) discusses the theoretical framework of future-oriented design, in which strategic foresight meets "research through design,"[11] (2) reviews the advantages and disadvantages of the Delphi method and morphological analysis in generating scenarios in design and strategic foresight, and (3) proposes a solution whereby the Delphi method receives a systematic framework from morphological analysis.

1 Peter H. Jones, "Systemic Design Principles for Complex Social Systems," in *Social Systems and Design*, ed. Gary S. Metcalf (Tokyo: Springer, 2014), 91–128.

2 Michel Godet, "Strategic Foresight La Prospective: Use and Misuse of Scenario Building" (working paper, Cahiers du LIPSOR, 2008), 11, available at http://innovbfa.viabloga.com/files/LIPSOR___Strategic_Foresight.pdf.

3 Tom Ritchey, *Wicked Problems—Social Messes: Decision Support Modelling with Morphological Analysis* (Berlin: Springer, 2011).

4 Michel Godet, François Bourse, Pierre Chapuy, and Isabelle Menant, *Futures Studies: A Tool-Box for Problem Solving* (Paris: GERPA Prospective, 1991).

5 For example, see Donald V. Steward, "The Design Structure System: A Method for Managing the Design of Complex Systems," *IEEE Transactions on Engineering Management* EM-28, no. 3 (1981): 71–74, DOI: https://doi.org/10.1109/TEM.1981.6448589; Gregory M. Mocko et al., "A Modelling Scheme for Capturing and Analyzing Multi-domain Design Information: A Hair Dryer Design Example," in *Proceedings of International Conference on Engineering Design*, ICED'07, 28–31 August 2007: 463–64.

6 Generative design refers to algorithmic applications for generating varieties of morphologies. See Jon McCormack, Alan Dorin, and Troy Innocent, "Generative Design: A Paradigm for Design Research," in *Proceedings of Futureground, Design Research Society International Conference*, ed. David Durling, Arthur De Bono, and John Redmond (Melbourne: Monash University Press, 2004), 1–8.