



Integrating Delphi and participatory backcasting in pursuit of trustworthiness – The case of electric mobility in Germany

Martin Zimmermann*, Inga-Lena Darkow¹, Heiko A. von der Gracht¹

Institute for Futures Studies and Knowledge Management (IFK), EBS Business School, Konrad-Adenauer-Ring 15, 65187, Wiesbaden, Germany

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ABSTRACT

Backcasting is an established approach to assess the creation and realisation of desirable futures, being especially suitable for complex issues where a radical change is required. A variety of methods is used to execute backcasting exercises with broad stakeholder participation. However, due to certain group inefficiencies it is a challenge to execute backcasting exercises in a participatory and yet rigorous and trustworthy way. We present an innovative participatory backcasting approach, integrating a Delphi survey and semi-structured interviews for electric mobility in Germany. As a major contribution, we demonstrate how to increase trustworthiness in participatory backcasting, by allowing for continuous stakeholder participation in a structured and transparent manner: from the creation of a preferable future to the assessment of the major factors leading to this future. The results illustrate a future vision of electric mobility in Germany in the year 2030 and present a discussion of the major factors leading to this desirable future. In addition to presenting the major benefits of our approach by integrating Delphi and participatory backcasting, we also outline the challenges related to this approach, such as difficulties in developing detailed roadmaps or the limited inclusion of end-users as major stakeholders.

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1. Introduction

Backcasting is an established approach to assess a desirable future, with focus on discovery, rather than justification [1,2]. The method is suitable when envisioning an alternative future which is discontinuous from the rather unsustainable status quo. Therefore, backcasting is identified as a useful approach in the pursuit of sustainable development [1,3–5]. A key benefit of applying backcasting is the ability to examine a structure to realise this future [1]. Nevertheless, there are several challenges in the application of backcasting: The soundness of the research process developing future images and a desirable future in a participatory manner is very often difficult to judge, leading to an insufficient trustworthiness of the process [e.g. 6,7].

Backcasting is used in various sustainable development topics, such as backcasting energy futures by Giurco et al. [1], energy use in buildings by Svenfelt et al. [4] or sustainable development of cities by Höjer et al. [8]. The future of sustainable mobility, by applying a participatory backcasting approach, has been discussed in very few cases in most recent published research. One example for such a backcasting study is from Hickman and Banister [9], which concentrates on developing transport policy packages for the UK in 2030. In this backcasting study, focus groups are the prevalent participatory method to gain qualitative insights from experts. However, such classical group discussion methods face certain group inefficiencies, such as the dominance of certain opinion leaders.

The main goal of this paper is to present a novel and rigorous qualitative backcasting approach, by involving multiple stakeholders in establishing the image of a desirable future and bridging the gap between the present and this desirable future.

* Corresponding author. Tel.: +49 611 7102 2100.

E-mail addresses: martin.zimmermann@ebs.edu (M. Zimmermann), inga-lena.darkow@ebs.edu (I-L. Darkow), heiko.vondergracht@ebs.edu (H.A. von der Gracht).

¹ Tel.: +49 611 7102 2100; fax: +49 611 7102 10 2199.

We base our methodological advancement on a participatory backcasting approach that comprises a Delphi survey and semi-structured interviews. We apply the concept of trustworthiness from Guba and Lincoln [10] in order to pursue rigour in our qualitative research. The focus of our research is: How can the rigour of qualitative participatory backcasting be improved?

After introducing participatory backcasting and the notion of trustworthiness we compare a set of participatory backcasting approaches which include multiple stakeholders in the process in order to determine the limitations in current research. We then demonstrate that by integrating a Delphi approach and multi-stakeholder interviews into a backcasting study, we can address a complex problem in a rigorous and trustworthy manner (Section 2). We develop a pathway-oriented participatory backcasting process. By introducing the single steps, we explain the detailed rationale behind integrating Delphi and participatory backcasting (Section 3). Our backcasting approach is then applied to the case of electric mobility in Germany (Section 4). This country was selected because it conducts manifold research and development activities in the automotive industry and the government enforces electric mobility [e.g. 11]. The goal of the case study is to develop a future vision for electric mobility as well as to identify and discuss relevant factors for this desirable future. By doing so, we enable decision makers to account for the challenges concerning the future of electric mobility. After an assessment of the trustworthiness dimensions (Section 5) we provide conclusions (Section 6).

2. Participatory backcasting, trustworthiness, and the Delphi method

2.1. Participatory backcasting

Backcasting is a technique that addresses “the articulation of desired futures, and the analysis of how they might be achieved” [12, p. 1]. The basic idea of backcasting is therefore to develop a desirable future vision and to consider how this can be achieved [13,14]. Dreborg [15] defines a set of application criteria for the backcasting approach: backcasting is particularly useful when (1) complex and persistent problems are in focus, (2) dominant trends are part of the problem, (3) external factors are present, (4) the need for major change exists, and (5) the time frame and thematic focus allow for radical changes. Thus, backcasting is used to overcome cognitive barriers that are at play when major transitions are necessary [16]. In the past, the backcasting approach was used for different research purposes. According to Quist and Vergragt [13], backcasting was first used for energy studies and then became relevant for sustainability issues.²

Backcasting can be executed by conducting desk research or workshops with a small group of researchers. However, backcasting becomes more complicated when it is applied in the case of an unstructured problem which is characterised by conflicting interests and great, often insoluble, scientific uncertainties. At this point, increased stakeholder involvement is necessary in order to be able to account for their diverging views and interests as well as the respective underlying assumptions [5,17]. Moreover, these stakeholders usually possess not only essential knowledge, but also relevant resources [3]. The degrees of stakeholder participation vary: in comparison to simple involvement of stakeholders to express their views as to what futures are desirable, highly participatory approaches, such as the one executed by Eames and Egmore [6], involve a large number of local citizens in the backcasting process [12]. Stakeholder workshops or focus group sessions are often employed in such participatory backcasting studies. In our understanding, workshops are loosely defined stakeholder sessions with a flexible number of participants, whilst focus groups tend to involve a smaller group of experts [18].

2.2. The notion of trustworthiness

An important issue for every kind of research is establishing methodological rigour. This is linked to the researcher's responsibility to make sure that research procedures have been adhered to and confounding factors are eliminated, where possible in order to produce dependable results [19–22]. Especially in quantitative research, this process is based on the assessment of reliability, external and internal validity, as well as objectivity [22]: reliability can be understood as “the consistency of measurement within a study” [24, p. 28]. Validity can be divided into external validity and internal validity. External validity measures the generalisability of the findings; whereas internal validity refers to the confidence that is placed in the cause and effect relationship, usually proven by experimental research [22, 25]. A further important aspect of rigour in (quantitative) research is objectivity of the research, which is closely related to validity [26].

Ensuring rigour is also essential in qualitative research in order to generate valuable results [22, 27, 28]. However, many researchers argue that the above-mentioned criteria of rigour mainly used in a quantitative context cannot be directly used for qualitative research without major adjustments [e.g. 20,29]. In qualitative research, the notion of trustworthiness has become a popular concept for the rigour in the research process. Lincoln and Guba [23] introduced four dimensions for trustworthiness in qualitative research that relate to the four dimensions mentioned for quantitative research above: credibility, dependability, confirmability, and transferability [30].

Credibility is comparable to the concept of internal validity. The qualitative application means “to carry out the inquiry in such a way that the probability of the findings will be found to be credible is enhanced” [23, p. 296]. Dependability relates to reliability and gauges the extent to which results are predictable and stable so that one can depend on them [31]. Confirmability relates to objectivity. In a qualitative sense it means that multiple observers can agree on a phenomenon; their collective judgement can be

² For a detailed overview of the different phases in the development of backcasting please refer to Quist and Vergragt [13].

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