Technological Forecasting & Social Change 97 (2015) 15–28

Contents lists available at ScienceDirect

Technological Forecasting & Social Change

Foresight support systems to facilitate regional innovations: A conceptualization case for a German logistics cluster

Jonas Keller [a,*], Christoph Markmann [a], Heiko A. von der Gracht [b,1]

[a] EBS Universitaet fuer Wirtschaft und Recht, EBS Business School, Konrad-Adenauer-Ring 15, 65187 Wiesbaden, Germany
[b] Friedrich-Alexander-University (FAU) Erlangen-Nuremberg, Lange Gasse 20, 90403 Nuremberg, Germany

ARTICLE INFO

Article history:
Received 2 March 2013
Received in revised form 3 August 2013
Accepted 10 December 2013
Available online 28 January 2014

Keywords:
Foresight support systems
Regional innovation
Information technology
Cluster
Trend database
Prediction market

ABSTRACT

We present the conceptualization of a foresight support system (FSS), which is designed to implement a continuous and embedded foresight process among partners of a business cluster. We argue that engaging in foresight (1) enables clusters and organizations to face discontinuous change, (2) avoids lock-in of business clusters by networking and knowledge exploitation and that (3) collaborative foresight can support such networking. As systemic instruments that connect stakeholders and support continuous foresight processes, FSSs are especially suited to achieve these results. We present five basic premises to conceptualize an FSS and concretize them by a requirement analysis for an FSS funded by the German Federal Ministry of Education and Research in the course of Germany's Leading-Edge Cluster Logistics. The requirements lead to the conceptualization of a foresight database, a digital future workshop application, and a prediction market application integrated in a futures platform. All applications are interlinked to support users through a guided, web-based, multi-method foresight process. The implementation of the FSS in business clusters and insights acquired during the three-year project are discussed. Overall, we present insights on how regionally implemented foresight contributes to regional innovation systems and thereby contribute to the emerging research stream on FSS.

1. Introduction

In business clusters, networking and cooperation among companies and institutions facilitate organizational learning and enable even small and medium-sized enterprises (SMEs) to profit from economies of scale and scope while maintaining flexibility [1,2]. Clustering is a much-cited approach for resource-constrained enterprises to react to the constant pressure to innovate in light of increasing competition and market dynamics. However, business clusters – defined by Porter [1: p.78] as “geographic concentrations of interconnected companies and institutions in a particular field” – can suffer from lock-in effects. Rigid resource allocation then leaves companies and regions with inflexible product portfolios or business models in light of discontinuous or long-term change [3].

One way to prevent lock-in effects is through an effective regional innovation system (RIS) that incorporates external and unorthodox knowledge into the region's and companies' learning processes [4,5]. Collaboration of the regions' companies, research institutions, and policy actors in a “networked” approach contributes to such a development. In this article, we argue that foresight methodology and particularly foresight support systems (FSS) [6] can play an important role in supporting the functionality of an RIS. By integrating various foresight instruments electronically to support a continuous foresight process, FSS support us in investigating challenges from different perspectives and thus improve upon the individual methods' results [cf. 7]. This support enables companies to prepare for discontinuous change and to acquire new perspectives that can provide new impulses. If all actors of a cluster, i.e. companies, research organizations and governmental institutions, work collaboratively to apply a foresight support

* Corresponding author. Tel.: +49 611 7102 2113; fax: +49 611 7102 10 2113.
E-mail addresses: jonas.keller@ebs.edu (J. Keller), heikovdg@gmx.de (H.A. von der Gracht).
1 Tel.: +49 911 5302 444; fax: +49 911 5302 460.

0040-1625/$ – see front matter
http://dx.doi.org/10.1016/j.techfore.2013.12.031

system, the ensuing *embedded* and *continuous* foresight processes can contribute to a successful preparation towards discontinuous change.

From this argumentation, we derive five basic premises for a collaborative FSS to be applied in business clusters. We then develop an FSS concept for the regional logistics industry of western Germany, where research institutes and businesses are pooling their competencies to support innovation for the EffizienzCluster LogistikRuhr initiative funded by the German Federal Ministry of Education and Research (BMBF) [8]. The cluster's 120 companies and 11 research institutes are specialized in diverse areas and are committed to achieving long-term growth and prosperity. In addition, the logistics industry is largely dominated by SMEs that exploit current market opportunities. However, due to resource constraints, these companies have limited capacity to advance innovation and explore new market opportunities. Furthermore, global competition and rapid technological advancements have increased this traditionally slow-changing industry's exposure to change. These aspects made the Leading-Edge Cluster Initiative for Logistics an ideal environment to establish a foresight support system – the Competitiveness Monitor (CoMo) – to collaboratively exploit cluster potentials and activate innovation capabilities.

The conceptualized FSS combines quantitative and qualitative data and foresight methods. A foresight database (FDB) serves as the knowledge pool of the FSS. This information is further used in a digital futures workshop application (FWA), which is derived from the concept of Jungk and Muellert [9], and brings together stakeholders (from the cluster) to work on their common, future-related challenges. The application guides the users in a collaborative manner through a complete foresight workshop, from problem identification and definition, to a multi-method foresight process, to the development of practical solutions. The third tool, a prediction market application (PMA), can be used to further quantify possible future developments relevant to the cluster by trading different options of future factors among Competitiveness Monitor's users. Prediction markets build on the wisdom of the crowd's assumption [10] and the efficient market-hypothesis [11]. While they are an established method in a variety of fields [e.g. 12], the tool's interlinkage within a foresight support system is novel. The three tools can be accessed from a futures platform (FP), which also allows for adapting the FSS to individual needs.

While many foresight methods are individually applied [13], information about ways of reasonably combining them is limited and strongly differs according to specific requirements and objectives [14]. Furthermore, their application and combination within an action-oriented foresight process, which also includes an initial depiction of a potential future problem and a final development of a concrete plan of action, is currently hardly explored but starts to receive increasing attention. A more topic and task-oriented process extends the traditionally explorative foresight process and thereby raises its relevance and usability for practice [15]. Due to the variety of future challenges that could be examined, an FSS should offer a wide range of method combination opportunities but also guide the selection process according to the topic of investigation to keep the foresight process clear and focused.

Furthermore, the linkage to external sources has only been investigated to a limited extent. Most input is provided manually through short-term surveys, expert assessments, or different search operations. However, the interlinkages to other databases or corporate IT infrastructure can add value to users' foresight processes and provide an improved, updated and always accessible information base. Thereby, our research contributes to the emerging field of FSS in two ways. First, we demonstrate that FSS can lead to more embedded and continuous foresight processes and thereby facilitate regional innovation. Second, we present design considerations of an FSS and demonstrate how the interlinkage of methods, tools, and external sources can result in a more accessible and action-oriented foresight process.

In the following section, we demonstrate how collaborative foresight processes in an FSS environment expand the scope of future awareness and peripheral vision of open foresight [16] and thus may support the organizations of business clusters in implementing RISs and dealing with discontinuous change. From this discussion, we derive basic premises for the establishment of such an FSS and subsequently specify them by single requirements. We then discuss how the different applications are integrated into an FSS and conclude with a summary of challenges and insights acquired from this case. Finally, limitations and opportunities for future research are presented.

2. Regional innovation systems and foresight

SMEs often locate in business clusters in order to cope with resource constraints [17]. The geographic proximity as well as the linkages among cooperating and competing peers provides firms with cost advantages, access to otherwise less available resources, technological externalities, as well as more intense knowledge transfer [18,19]. Moreover, networking and location effects in clusters have been found to improve the innovativeness of respective firms [20]. However, research demonstrates that clusters usually only support SMEs in adopting and diffusing incremental innovation as opposed to discontinuous innovation [21]. Pouder and St. John even determine that after some time, firms in clusters are more vulnerable to discontinuous change [22]. This can be traced back to the path-dependency of clusters, i.e. past developments lead to present resource configurations, which determine future actions [3].

Path-dependency in business clusters comes with the danger of a lock-in effect, i.e. excessively focusing on one trajectory to react to more innovative competition [4,23]. Thus, in order to stay competitive, firms (or clusters) should incorporate links to external and non-local knowledge into their local network [24]. Toedtling and Trippl [5] discuss that clusters' successful adaptation to changing external conditions is closely related to the RIS which the cluster is part of. While Porter does not differentiate between business clusters and innovation systems [25], a more general view in academic literature views clusters and RIS as similar but not congruent [e.g. 24,26]. Autio [27] developed a widely cited RIS-framework which distinguishes among knowledge application and knowledge generation and sharing. He labels knowledge application as an "exploitation subsystem". This subsystem contains the industrial companies and is usually put at the same level as the cluster [cf. 24]. The knowledge generation and sharing subsystem contains those organizations – such as research and