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Original Research Paper

## Niche aggregation through cumulative learning: A Multiple case study of electric bus projects

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## ABSTRACT

This paper seeks to answer the question of how learning processes support niche aggregation. It brings together literature on strategic niche management and theoretical concepts derived from literature on project management and learning in project-based firms to analyze the ongoing standardization efforts for fast-charged electric bus systems in Europe. The analysis suggests that niche aggregation is a cyclical process that depends on two learning processes: knowledge sharing and knowledge accumulation. Whereas knowledge sharing is an interactive process that involves several organizations, knowledge accumulation is an internal organizational learning process that enables firms to move beyond local niche projects and engage in external networks. These learning processes are mutually reinforcing and jointly support niche aggregation.

## 1. Introduction

The technological niche is a central concept in theories on sustainability transitions. It points at local experiments and demonstration projects as critical seeds for profound sociotechnical transformations (Hoogma et al., 2002; Kemp et al., 1998, 2001; Schot and Geels, 2007; Raven, 2012). Niches are defined as protective spaces that empower communities in favor of path-breaking innovations (Smith and Raven, 2012). To facilitate such empowerment, interactions between local niche projects are crucial. Accordingly, transition scholars have recognized the need to widen the scope from individual projects to networks of experiments. This literature emphasises on cyclical patterns of learning and aggregation into generic knowledge, through shared cognitive rules, structures and standards, the so called ‘global niche’ (Geels and Raven, 2006; Geels and Deuten, 2006; Schot and Geels, 2008).

Yet, the attempt in favor of global aggregation carries a tendency to neglect niche localities and the prerequisites for an informed spatial dimension (Coenen et al., 2012). Space has various manifestations, which result in heterogeneity and asymmetry amid sociotechnical systems (Raven et al., 2012). If experiences are taken out of their context, they may lose their local connotations. This in turn makes it difficult to make connections across projects, resulting in isolation and local stickiness that could reversely affect the development of shared cognitive rules, structures and standards (Bakker et al., 2015). This paper presents a multiple case study of electric bus demonstration projects in Europe. The paper analyses how experiences from these local niche projects have aggregated into generic knowledge. Focusing the analysis on learning in niche development, the paper seeks an answer to the question of how different learning processes support niche aggregation. Each case in our study has its unique historical and organizational context, but we found strong linkages that suggested cumulative learning processes among them.

The next section presents a theoretical framework that builds on literature on project management, and project-based organizing, and learning in project-based firms, combining this with literature on niches and niche aggregation. This emanates in a distinction between different kinds of learning processes. Subsequently a methodology section qualifies the case selection and presents the

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methods used for data collection and analysis. Then we describe each case in details. Thereafter, an analysis section compares the cases, highlights important linkages and discusses how learning processes facilitated aggregation. A concluding section summarizes main findings and contributions of the paper.

## 2. Theoretical framework

### 2.1. Projects and niches

During the past two decades, there have been several initiatives within strategic niche management (SNM) scholarship with policy and managerial implications specifically around the topic of (niche) projects. For instance, [Weber et al. \(1999\)](#) discussed about the importance of ‘demonstration projects’ in their workbook for European Commission on the transition to sustainable transport systems. Another study was carried out by [Mourik and Raven \(2006\)](#) for the Energy Research Centre in the Netherlands, where they devised policy strategies to facilitate the creation of local projects and niches but also expressed the need to move beyond individual niche projects. Nevertheless, a brief review of the existing literature shows that the term ‘project’ or ‘project management’ as theoretical concepts have been less elaborated in this field.<sup>1</sup>

According to project management literature, projects are temporary endeavors, which are different from non-project (permanent) organizations that run daily operations. From this perspective, a project can be seen as an extraordinary set of activities which are driven by specific goals and future visions that are shared by its participants ([Morris, 2013](#)). Moreover, projects depend on specific resources, which clients or sponsors assign to them depending on their needs. These characteristics of projects can be compared to that of niches. Synthesizing literature on strategic niche management, [Smith and Raven \(2012\)](#) argue that niches have three distinct properties i.e. temporary shielding, nurturing path-breaking innovations and empowerment. They also emphasise on *visions* and *expectations* as crucial elements for justification of niches, thus being central ingredients in the process of empowerment. We classified these characteristics in terms of orientation, time, resources and uniqueness and made a comparison between the two streams of literature. These are summarized in [Table 1](#) below:

As the table shows, there are many similarities between projects and niches in terms of intentionality, temporality, and novelty. However, there are also some distinct differences. Whereas the intended outcomes of projects are often expressed in terms of highly specified goals such as S.M.A.R.T. criteria,<sup>2</sup> the intended outcomes of niches tend to be more open and multifaceted. Moreover, while the narrowed scope and specific goal characteristics of projects constitute the basis for stability and ensure clients and sponsors to allocate resources to those projects, the widening of scope and engagement of varieties of actors is rather necessary for niches to gain support and attain more resources. That is, enrollment of various actors and opening up of the scope is necessary to mobilize resources and to link the protective space to wider processes of social change ([Schot and Geels, 2008](#); [Smith and Raven, 2012](#)). Niche actors may vary in terms of size i.e. small, medium or large, maturity i.e. incumbent or newcomer and governance structure i.e. public, semi-public and private actors.

### 2.2. Project-based organizing and niche linkages

Using projects as a prime means for organizing large coordinated actions implies a step away from classic functional organizations towards flexible and temporary organizational settings. This way of organizing can be seen as a natural response to intensified demands for the development of complex product systems-CoPS ([Hobday, 1998](#)). Projects are an effective way to organize innovative tasks and to combine a wide range of technical and managerial competencies ([Davies and Brady, 2000](#)). Hence, managers use projects to facilitate responsiveness, flexibility and collaboration ([Hobday, 2000](#)). Yet, the temporary nature and exclusive goal-orientation of projects result in isolating effects, which in turn hamper the transfer of experiences beyond project scope. Therefore, research on project-based firms have investigated on how the broader organization can benefit from lessons-learned in individual projects. To facilitate this, there is a need to create linkages between projects. According to [Engwall \(2003\)](#), there is a need for an ontological change in the understanding of projects: ‘instead of lonely and closed systems, projects have to be conceptualized as contextually-embedded open systems, open in time as well as in space’ (*ibid* p.790).

Studies of project-based firms suggest that there is a need to combine tacit and explicit (codified) flows of knowledge in order to facilitate long-term organizational learning ([Prencipe and Tell, 2001](#); [Williams, 2008](#); [Vendelø et al., 2010](#)). For instance, [Prencipe and Tell \(2001\)](#) observed learning in project-based firms at different levels, from the individual level, via the group or project level to the organizational level. They showed how different learning mechanisms supported various processes of learning within the organization, including experience accumulation, knowledge articulation, and knowledge codification. They concluded that project-based firms deploy different learning mechanisms to develop specific learning profiles, depending on their tasks characteristics and the requirements of their business.

Research on learning in project-based firms finds parallels with the literature on niche aggregation. According to ([Geels and](#)

<sup>1</sup> Online bibliographic search using Google Scholar resulted in maximum 396 hits as of 25, September 2017. The search criteria were different combinations of the following phrases: “Project Management” and “Strategic Niche Management”. Search results were first sorted based on relevance and then based on the date of publication. Then the first 50 search hints from each list have been selected for specific references to project management literature. Although the term “Project Management” have been found in some occasions, none of the search findings had any specific discussions dedicated to elaboration of project management principles within strategic niche management.

<sup>2</sup> S.M.A.R.T.: Specific, Measureable, Achievable, Realistic, Time-bound.

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