



Asset modification for regional industrial restructuring: digitalization of the culture and experience industry and the healthcare sector

Nina Kyllingstad, Jan Ole Rypestøl, Ann Camilla Schulze-Krogh & Maria Tønnessen

To cite this article: Nina Kyllingstad, Jan Ole Rypestøl, Ann Camilla Schulze-Krogh & Maria Tønnessen (2021) Asset modification for regional industrial restructuring: digitalization of the culture and experience industry and the healthcare sector, *Regional Studies*, 55:10-11, 1764-1774, DOI: [10.1080/00343404.2021.1878126](https://doi.org/10.1080/00343404.2021.1878126)

To link to this article: <https://doi.org/10.1080/00343404.2021.1878126>



© 2021 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



Published online: 18 Feb 2021.



[Submit your article to this journal](#)



Article views: 2050



[View related articles](#)



[View Crossmark data](#)



Citing articles: 1 [View citing articles](#)

Asset modification for regional industrial restructuring: digitalization of the culture and experience industry and the healthcare sector

Nina Kyllingstad^a , Jan Ole Rypestøl^b , Ann Camilla Schulze-Krogh^c  and Maria Tønnessen^d 

ABSTRACT

This paper researches how firm- and system-level asset modification and alignment underpin and direct new path development from digitalization. It suggests that asset reuse mostly promotes path extension or path upgrading, while asset creation and asset destruction will be more evident in the process of path emergence. The empirics support asset modification as a key mechanism for regional restructuring from digitalization, but suggest that the typology should be more nuanced. Specifically, the empirics demonstrate asset upgrading as a key mechanism.

KEYWORDS

regional industrial restructuring; organizational and system-level entrepreneurs; firm-level assets; system-level assets; asset modification processes; digitalization

JEL O33, O44, R11

HISTORY Received 21 October 2019; in revised form 10 January 2021

INTRODUCTION

How regional industries transform and develop is a core topic within the field of evolutionary economic geography (EEG) (MacKinnon & Cumbers, 2007). In short, the EEG approach maintains that regional economic growth tends to follow an evolutionary progression (Boschma & Frenken, 2006, 2012; Isaksen & Trippel, 2016), and further, that regions are unevenly conditioned to foster and promote industrial growth and development (Martin, 2010; Martin & Sunley, 2006). The regional innovation systems (RIS) literature complements EEG and contends that organizational thickness and diversity are important factors that will affect industrial restructuring together with region-specific institutional arrangements (Asheim et al., 2019). The EEG approach maintains that the actors involved and the mechanisms that unfold in regional industrial change processes promote different types of outcome (Asheim et al., 2019; Grillitsch et al., 2018). This


approach suggests that the extension of existing pathways follows from incremental innovations that include existing knowledge and technologies, while the creation of new industries requires more radical processes that most often involve the creation of new knowledge and skills (Grillitsch et al., 2018; Isaksen et al., 2018c).

Actors, asset modification and path outcomes are identified in this paper as key aspects of regional industrial development. The paper argues that these aspects are not fully developed and that the connections between them are under-communicated in the existing literature. Concerning actors, this paper argues in line with recent contributions and suggests that agents of change include both organizational- and system-level entrepreneurs (Asheim et al., 2019; Isaksen et al., 2018b; Kyllingstad & Rypestøl, 2018). Organizational-level entrepreneurs are agents motivated by firm success, while system-level entrepreneurs are individuals, or groups of individuals, motivated by generating collective value by restoring system failures.


CONTACT

^a  niky@norceresearch.no


NORCE Norwegian Research Centre Kristiansand, Norway.

^b **(Corresponding author)**  jary@norceresearch.no

NORCE Norwegian Research Centre Kristiansand, Norway.

^c  ann.c.schulze-krogh@uia.no

Department of Working Life and Innovation, University of Agder, Grimstad, Norway.

^d  maria.tonnessen@uia.no

Department of Working Life and Innovation, University of Agder, Grimstad, Norway.

Further, we agree with Trippel et al. (2020) who argue that asset modification is a key mechanism in the processes of regional industrial change. In this paper, we extend this argument and research how new path development derives from aligned processes of asset modification at the firm and system levels. Moreover, it adds *asset upgrading* as a modification type not previously discussed in the literature. We introduce asset upgrading as a mechanism of existing asset renewal that moves beyond asset reuse as it includes new elements. Finally, and inspired by Trippel et al. (2019) and Rypestøl (2020), the paper contributes to the existing knowledge because it argues that particular types of asset modification tend to support specific types of path outcome.

Empirically, the paper draws from investigations of ongoing processes of asset modification within the culture and experience industry and the healthcare sector in the Agder region of southern Norway. It places a main focus on digitalization and industry 4.0 as a driver for restructuring, and finds these two sectors to be especially relevant due to the increased opportunities (and threats) that follow from digitalization in these sectors.

THEORETICAL UNDERPINNINGS/ CONCEPTUAL FRAMEWORK

In recent years, regional industrial restructuring has become a core topic within EEG research and innovation studies. While established viewpoints maintain a narrower focus on actors, assets and outcome, the emerging perspectives suggest a more nuanced approach. A short presentation of this emerging literature is now presented.

Entrepreneurial actors

According to the literature, a RIS is defined as ‘encompassing all regional economic, social and institutional factors that affect the innovativeness of firms’ (Asheim et al., 2016, p. 48). Recently, this approach has been criticized for being overly concerned with the systemic dimension, while paying less attention to the role of the actors who affect the innovativeness of firms (e.g., Qian et al., 2013; Rypestøl, 2017, 2018; Sternberg & Müller, 2005; Uyarra, 2010). In response to this critique, research has increasingly focused on the role of various types of actors and their agency in the process of regional economic change (e.g., Grillitsch & Sotarauta, 2018; Isaksen & Jakobsen, 2017; Isaksen et al., 2018a; Kyllingstad & Rypestøl, 2018). The recent literature identifies two main types of actor who affect processes of regional industrial change. The first type is the well-known firm-level entrepreneur motivated by profit opportunities and success, and who exploits such opportunities through new venture creation and innovation activities in an existing firm. This type of entrepreneur, their motivation and the role they play in the processes of providing economic development are thoroughly described in entrepreneurship literature (e.g., Kirchoff, 1994; Kirzner, 1973; Rypestøl, 2017; Schumpeter, 1934, 1942). A broader perspective on firm-level entrepreneurs is described by Isaksen et al. (2018a, p. 8)

and includes firms and organizations that ‘come up with new ideas, inventions, or innovations that have some potentials to upgrade existing or create new regional paths’. In the present paper, we also embrace non-profit seeking entrepreneurs, and thus use the term *organizational-level entrepreneurs* when describing the entrepreneurial actors that operate at the micro-level in RISs.

More recently, a second type of entrepreneurial actor has been introduced, known as the *system-level entrepreneur* (Asheim et al., 2019; Isaksen et al., 2018c; Kyllingstad & Rypestøl, 2018). Unlike organizational-level entrepreneurs, system-level entrepreneurs are not motivated by personal success, profit or by maximizing other forms of organizational-level outcomes. Instead, system-level entrepreneurs are seeking opportunities to generate collective value by addressing and repairing systemic failures. Such systemic failures may relate to structural, relational or cognitive elements in RISs. Thus, system-level entrepreneurs are agents ‘who contribute to altering the conditions for industry in a region through developing and changing the RIS’ (Asheim et al., 2019, p. 54). Examples of agencies performed by system-level entrepreneurs are the launching of a new study programme to promote new knowledge in a region (Isaksen et al., 2018a), raising the idea of sustainability as a business opportunity for regional firms (Kyllingstad & Rypestøl, 2018) or the launching of new arenas for knowledge sharing and innovation among regional firms (Isaksen et al., 2018c). The facilitation of creative workshops to support and encourage innovative performance in a region or industry (Kyllingstad & Rypestøl, 2018) would be an additional example.

Based on the different roles of organizational- and system-level entrepreneurs, the recent literature suggests that two routes exist towards regional industrial development (Asheim et al., 2019; Isaksen et al., 2018a; Kyllingstad & Rypestøl, 2018). The literature distinguishes between an organic version, where regional change is initiated by innovative organizational-level entrepreneurs, and a planned version, where RIS evolution is initiated by system-level entrepreneurs who ‘adapt the RIS to new potential needs in the industrial setting’ (Asheim et al., 2019, p. 60). A central argument in this literature is that regional restructuring processes will benefit from a tight alignment between the two types of entrepreneurial agency. Such an alignment is important because system-level entrepreneurs play the role of facilitators, while organizational-level entrepreneurs are exploiters who bring new ideas and opportunities to the marketplace (Isaksen et al., 2018c).

Assets and asset modification processes

This paper draws on recent contributions from economic geographers who apply a broad perspective to the understanding of assets (MacKinnon et al., 2019; Trippel et al., 2020). Following this broad conceptualization, we classify assets as being either natural assets, material and infrastructural assets, industrial assets, human assets or institutional assets. Further, and in line with arguments raised by the resource-based view of the firm (e.g., Foss, 1996; Penrose, 1995; Prahalad & Hamel, 1990), we

recognize that assets can be both firm and region specific. Thus, we understand firm-level assets as any tangible and intangible asset accessible and controlled by one or more agents at the organizational level (including research and development (R&D) organization, policy administration and non-governmental organizations (NGOs)), while system-level assets are those that can be exploited by any actor within a certain geography. On the system level, this understanding of assets matches the broader definition of RISs as systems that encompass all factors that affect the innovativeness of firms (Asheim et al., 2016). Any significant change of direction in regional trajectories would thus require changes in firm-specific assets, supported by changes in the system encompassing those actors. We maintain that even though renewing existing assets and developing new assets in organizations and firms are vital, asset modification processes are equally vital for regional restructuring.

Table 1 exemplifies the distinction between the different types of asset and their scaling.

The resource-based view of the firm argues that it is important to modify the asset base to uphold and increase competitive advantage and geographical attractiveness (Barney, 1991; Lippman & Rumelt, 1982). This paper builds on these premises and suggests, in line with contemporary research, that asset modification can take three alternative forms: first, by recombining or redeploying existing assets; second, by importing or creating new assets not previously available; and third, by destructing old assets (Isaksen et al., 2019; Trippel et al., 2020). We further assert that these forms of asset modification pertain to both the organizational and system levels. The *reuse of existing assets* 'refers to how existing assets can be applied to other purposes' (Isaksen et al., 2019, p. 7). For example, when firm-specific skills and technologies are used for purposes other than those initially intended, as in a new market or, at a system level, when existing academic theories

are applied to new fields. *Creation of new assets* refers to the introduction of totally new assets in a firm or organization. Such an introduction can follow either from radical innovation processes or from the importing of new assets. At the firm level, radical innovations may result from intense R&D activity, or they may be imported by hiring of new personnel or through acquisition of other companies. At the system level, examples of asset creation are the development of new scientific principles in academia or processes whereby a new type of firm or industry settles in the region for the first time, introducing new knowledge and skills. While the reuse and creation alternatives are easy to understand, the process of *asset destruction* may be less intuitive. We argue that asset destruction is a viable option when preferable asset alternatives occur and when existing assets hamper future development. Examples of destruction at the firm level include the replacement of old and outdated machines with modern alternatives or, at the system level, the mindful changing of existing institutional arrangements because new solutions push existing institutional frames to expand (e.g., Sotarauta & Suvinen, 2018).

As described by the resource-based view (e.g., Maskell et al., 1998), firm- and system-level assets relate and influence each other. We label this process *alignment*. Such alignment is evident, we argue, if asset modification processes in firms and organizations are strengthened and complemented by assets found at the system level. Vice versa, asset alignment is also evident when system-level entrepreneurs can benefit from asset modifications at the firm level. Thus, asset alignment refers to processes by which firm- and system-level entrepreneurs can mutually benefit from each other's asset base. An example to illustrate the importance of alignment can be a cluster administration creating a new digital tool (a system-level asset) which, if used and incorporated by its cluster members, has the potential of restructuring the industry. In this

Table 1. Assets types and scales.

Type of assets	Asset scale	
	Examples of organizational assets	Examples of system assets
Natural	Land, water reservoirs, mineral mines and oil wells, owned by a specific firm	Climate, waterfalls, coastlines, not restricted commodity sources
Infrastructural and material	Buildings, machines, vehicles, financial resources, networks and infrastructure controlled by a specific firm	Knowledge infrastructure and physical infrastructure
Industrial	Firm-specific technology, management	Generic technology, organizational methods and available risk capital
Human	In-house knowledge and skills	Knowledge spillover: knowledge and skills that are available to the workforce, access to research and development (R&D) knowledge through local universities and research organizations
Institutional	In-house formal and informal rules and regulations, organizational culture and history, and networks	Institutional settings, laws and regulations. Regional entrepreneurial culture

Source: Modified from Rypestøl (2020, p. 134).

case the cluster administration functions as a system-level entrepreneur while the members are organizational-level entrepreneurs. The restructuring of an industry will certainly require more than one firm taking advantage of the system asset. Thus, we argue that both alignment between system- and firm-level assets, as well as alignment between assets available in various firms, is important for new path development. If the system asset remains unused, the work conducted by the system-level entrepreneur will be superfluous. In addition, it signals that the different entrepreneurs are not in agreement on the direction of the cluster or the industry, making restructuring more challenging.

Path outcome

Path dependency theory is central to the EEG discipline. In short, the theory argues that regional industries develop along certain trajectories as anchored in history (Boschma & Frenken, 2006; Martin, 2010; Tödtling & Trippel, 2013). Contemporary research distinguishes between types of development that could result in a variety of alternative path outcomes (Asheim et al., 2019; Grillitsch et al., 2018). This paper distinguishes four types of path outcome: extension, upgrading, diversification and emergence. While path extension represents a non-sustainable type of development, the three other types refer to different types of restructuring which follows the classification of alternative path outcomes suggested by Grillitsch and Asheim (2018).

Path extension follows from incremental innovations in existing industries along well-established technological trajectories (Isaksen, 2015). In this type of development, existing knowledge is exploited to uphold the existing structure. However, due to a lack of new knowledge, the regional industry that develops along this trajectory will, ultimately, move towards stagnation and decline (Isaksen & Trippel, 2016).

Path upgrading is the outcome from a variety of developments that contribute to revitalizing an existing pathway. Such upgrading occurs when there is significant change in an existing industrial path, which leads the path in a new direction (Grillitsch et al., 2018). New directions can follow from new technology, organizational innovation or from a new or renewed business model. An alternative route towards industrial renewal involves

firms making a positive shift within the value chain due to upgraded skills or renewed production capabilities (Grillitsch & Trippel, 2018). Finally, it can result from industries developing niches by integrating symbolic knowledge (Grillitsch & Asheim, 2018).

Path diversification refers to firms using knowledge and other assets from existing industries in new ones. The diversification can either be related or unrelated. Related path diversification occurs when existing firms redistribute assets and move into new but related industries, or when a new type of firm is established using knowledge and technology already found in the region. Unrelated path diversification refers to progressions where firms move to a new type of industry, combining existing assets such as technology, competencies and knowledge with new unrelated ones (Grillitsch & Asheim, 2018).

Finally, *path emergence* is the most radical type of path outcome (Grillitsch & Asheim, 2018). The literature identifies two processes that can lead to path emergence. The first is path importation, which describes situations where an established industry moves location to a new region or through the inflow of skilled workers or entrepreneurs who start ventures new to the region by using new assets such as competencies, knowledge, technology and machines. The second is path creation that follows radical innovation, scientific discoveries or the introduction of radically new business models (Asheim et al., 2019). In path creation, new regional industries are born out of innovations new to the world.

Analytical framework

In the previous section we argued that regional industrial restructurings are multi-actor and multilevel phenomena that follow an evolutionary process towards four alternative outcomes. Figure 1 illustrates this process, and we suggest the illustration provides an analytical framework to guide further investigation of how regional industries restructure.

In line with contemporary research, this paper understands new path development as an evolutionary process that can be initiated by entrepreneurial agents at the organizational level as well as at the system level (Isaksen & Jakobsen, 2017; Isaksen et al., 2018a, 2018c; Kyllingstad & Rypestøl, 2018). Further, and in line with contemporary research concerning regional restructuring, we find

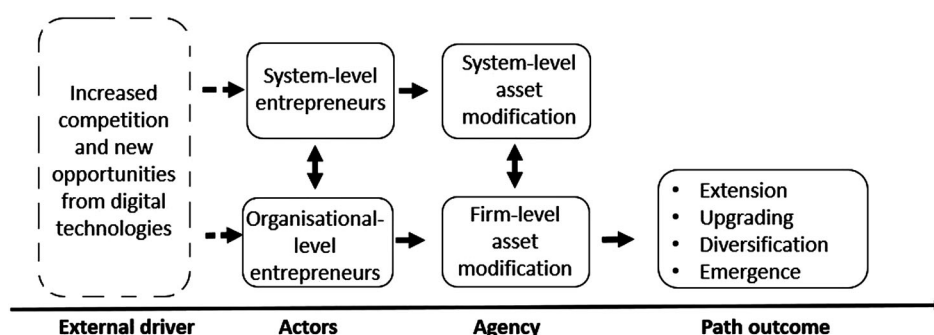


Figure 1. Analytical framework towards regional restructuring.

Table 2. Relationship between asset modification and path outcome.

Type of asset modification	Path outcome			
	Path extension	Path upgrading	Path diversification	Path emergence
Reuse	×	×	(×)	
Creation		(×)	×	×
Destruction		(×)	(×)	×

Note: × = the most likely outcome; (×) = a possible outcome; and a blank space = an unlikely outcome.

Sources: Based on Trippel et al. (2019) and Rypestøl (2020).

that existing assets are mainly tailored to support existing industrial structures (Asheim et al., 2019), while a modification of existing assets is needed to support change into new path development (Isaksen et al., 2019; Trippel et al., 2020). We lean on established theory when arguing that assets can be formed at both the firm and system levels (Maskell & Malmberg, 1999). Further, we argue that regional industrial restructuring will benefit from firm- and system-level asset alignment (Kyllingstad & Rypestøl, 2018). Also, we agree with Trippel et al. (2020) that asset modification can take several forms, and we distinguish between asset reuse, asset creation and asset destruction. Finally, we lean on recent research on path development (Grillitsch & Asheim, 2018) and argue that the outcomes of regional restructuring can take different forms. The literature on regional restructuring suggests that the least radical mechanisms support the least radical outcomes, while more radical types of restructuring follow from radical innovations in products, services, processes or marketing (Grillitsch et al., 2018; Isaksen et al., 2018c). In line with this argument, we extend the existing literature as we suggest that minor modifications of existing assets support less radical outcomes in regional restructuring, while more radical outcomes require a more radical change of assets. Table 2 suggests possible relationships between asset modification and the main categories of path outcome, where × represents the most likely outcome, (×) represents a possible outcome, while a blank space represents an unlikely outcome. In addition to the introduced alternatives of path restructuring, it also includes the option of path extension. This alternative is relevant as possible path outcomes can take the form of continuation as an alternative to restructuring.

CONTEXT AND METHOD

In this paper we use Figure 1 and Table 2 to analyse an ongoing process of restructuring through digitalization in the culture and experience industry and the healthcare sector in the Agder region of southern Norway. Digitalization is an element of industry 4.0 and can be understood as the introduction of a broad range of digital technologies such as robots, augmented reality, big data and advanced three-dimensional (3D) printing in economic activities (Isaksen et al., 2020b). Due to this introduction of digital technologies, organizations and firms must continuously improve their assets for digitalization in order to stay competitive in a global economy (Isaksen et al., 2020a;

Totterdill, 2018). Thus, asset modification for digitalization is also key for the competitiveness of the culture and experience industry, and for enhancing the efficiency and quality of the public healthcare sector (Aceto et al., 2020).

Context and cases

This paper studies an ongoing process of restructuring from digitalization within the culture and experience industry and the healthcare sector in the Agder region. Agder is historically rooted in forestry and shipping, while significant industries today are sub-supplier industries to the oil and gas sector, process industries, and culture and experiences. It consists of 30 municipalities with a total of about 305,000 inhabitants. In this geographical setting, we examine the ongoing processes of restructuring in the home-based healthcare sector and the culture and experience industry. We find that these industries are particularly relevant as both are heavily affected by digitalization. In the following, we present a short description of the challenges and opportunities that arise in these two industries.

Home-based healthcare

Home-based healthcare faces increasing challenges from an ageing population, from the introduction of new user groups and the increasing scarcity of health personnel (Karlsen, 2013). Thus, innovative and effective solutions are needed to ensure high quality in future healthcare services. In 2016, Norway established the eHealth Directorate to strengthen its national e-health governance and to increase the implementation of digital technologies in the healthcare sector. While the state is responsible for legislation, ensuring equal rights and exercising control and supervision, the municipalities provide healthcare and social services to their inhabitants.¹ In 2018, a total of 32,083 persons worked in the health sector in Agder (Statistics Norway, 2019). A regional coordination group for eHealth and welfare technology (RKG) was established in 2018 to position Agder as a flagship region within the domain of e-health development in Norway.² One initiative of RKG was a joint procurement of security and alert technology for home-based healthcare services and nursing homes in Agder.³ This initiative is only one of several digital e-health initiatives introduced and implemented in the Agder region. We investigate ongoing industrial restructuring based on the processes in four municipalities and one overarching regional actor. The

municipalities are recognized as 'organizational-level entrepreneurs', based on their motivation for improving their services as cost-efficiently as possible. The overarching regional actor seeks to serve the digitalization process from a regional perspective and is thus characterized as a system-level entrepreneur.

Culture and experience industry

The culture and experience industry is under massive pressure to restructure and implement new digital products. This development is important to increase its impact and to lower the costs of production. However, the process of digital restructuring also challenges existing solutions as existing copyright laws are challenged by the new business models required to tackle an increasingly digital audience (Falk & Sheppard, 2006). We investigated the restructuring that takes place around digitalization based on processes in three dominant organizations and one cluster administration. Again, the organizations are recognized as organizational-level entrepreneurs, motivated by improving their services as cost-effectively as possible. The cluster administration is identified as a system-level entrepreneur because it seeks to support digitalization from a regional perspective.

In this study, the motivations of organizational- and system-level entrepreneurs in the home-based healthcare sector and culture and experience sector coincide. This makes it relevant and possible to analyse asset modification processes in two different industries.

Empirical research questions

The overall empirical research question addressed in this paper is: What specific asset modification processes contribute to various types of path development in the culture and experience industry and in the healthcare sector in Agder? To answer, we investigate the following in more detail:

- Who are the dominant organizational- and system-level entrepreneurs in the culture and experience industry and in the healthcare sector in Agder?
- What type of assets are considered important for digitalization in the culture and experience industry and the healthcare sector in Agder?
- What mode of asset modification is considered important to support digital transformation in the firms and region of interest?
- What outcome can be expected from the asset modification processes identified?

Research design

The research design of this article is the qualitative case study approach (Yin, 2013). This approach is particularly suited to studying contemporary phenomena such as how different organizations build assets for digital transformation. Data were collected from in-depth interviews and an extensive literature review, including strategic documents, R&D reports and websites. The interviews

were conducted in a semi-structured manner, allowing us to follow interesting leads with in-depth enquiries. The semi-structured interview is a well-known approach for gaining insights into complex phenomena (Welch et al., 2011; Yin, 2013). The interviewees were top managers; the interviews lasted about 60 minutes. The interviews were recorded and transcribed with consent from the interviewees, as recommended by qualitative research practice (Gioia et al., 2013). In the healthcare sector, we interviewed persons representing different municipalities in the region. In total, we interviewed five persons from four different municipalities. We also interviewed one system-level entrepreneur. In the culture and experience sector we interviewed three persons from three key firms and one system-level entrepreneur. The data were sorted manually, in line with relevant categories extracted from the research questions and analysed accordingly.

ANALYSIS AND RESULTS

Our cases included a wide range of organizations and firms belonging to the culture and experience industry and the healthcare sector. We found the cases to be relevant, as digital tools and processes were presented as an important part of their solutions for improving services and developing vibrant business models.

In our analytical model, we distinguish between organizational- and system-level entrepreneurs as different but crucial actors in the asset modification process. We found that the two types of entrepreneur played different roles in the process of digital transformation. The system-level entrepreneurs seemed to play the role of facilitating digitalization, for example, by encouraging implementation of new digital tools on a regional scale, while organizational-level entrepreneurs played the role of exploring and materializing those tools as new ideas. Thus, resonance and tight alignment between those two roles make the process of asset modification beneficial to digital transformation. In light of this, we identify assets and address the asset modification processes while arguing for prospective new path development.

What assets are important for digitalization in the culture and experience industry and the healthcare sector in Agder?

A variety of assets were emphasized as important for digitalization in our cases, ranging from intangible assets, such as knowledge and institutions, to tangible assets, such as financial resources and digital and physical infrastructure. Our typology of assets, as described in Table 1, identifies five possible types. Except for the natural asset type, we found the other four to be present in our cases, that is, industrial assets, human assets, material and infrastructural assets, and institutional assets. However, within these four types, there are subcategories of assets that, according to our informants, are more important for digitalization. Within the industrial asset type, technology is considered the most important, while knowledge is important within the human asset type. In relation to material and

infrastructural assets, sufficient financial resources are crucial; and finally, within the institutional asset type, a stimulating culture is favourable for digitalization. We will now elaborate on these four main assets identified for digitalization at the firm and system levels of the culture and experience industry and the healthcare sector in Agder.

Technological assets are clearly important when discussing digitalization. The establishment of a common public procurement initiative illustrates the importance of technological assets at the system level. This initiative started with the recognized need for procuring digital technology for the homecare sector. This task was too complex for any organization to undertake alone. Thus, the responsibility was elevated to a regional level by the creation of a system-level entrepreneur aiming to organize a public procurement process. After becoming almost fully operational, this system-level entrepreneur gradually turned in to a system-level asset for digitalization by being accessible to all municipalities in the region. Although this initiative is a system-level asset, each municipality still had to decide if and how involved they wanted to be. While this illustrates the importance of technological assets at the system level, several cases also highlighted the importance of technological assets at the organizational level. One example was firm B, which opened itself up to new opportunities by improving its software so that live concert streaming became available through an app. This modification of an asset through a new use of technology was crucial as it enabled the firm to reach a larger audience, including residents in nursing homes.

The second asset type highlighted as important for digitalization was digital knowledge. Such knowledge is vital to developing and improving the different services that our cases provide. Several informants pointed to the importance of allocating existing resources or hiring people who excel in digital knowledge and skills. The consequence of not having the right knowledge was illustrated by an informant who said, 'Globally, the transformation pushes development, and at this point in time it is nearly too late, as we have not put enough time and effort in the knowledge needed to make a strategy for this digital shift' (firm C). Another example relates to the process of a regional digitalization project and states, 'The participants attended with different knowledge, but it became obvious that they lacked the technical competence' (municipality B).

Our informants also highlighted financial resources as an important driving force to successful digitalization. An example is the initiation of the public procurement project (RKG) mentioned above. For some of the members, the lack of financial resources was a reason for establishing the project, in addition to the technological complexity. At the organizational level, financial resources are extremely important because working with new digital solutions, involving investments in hardware and software, is financially draining for any organization. Within the culture and experience industry, the system-level entrepreneur pointed towards finances as a critical firm-level asset for digitalization. Our informant notes that the lack of

such resources at the firm level challenges firm- and system-level asset alignment since many smaller firms are not capable of exploring opportunities provided for them.

In addition to the assets described above, institutions such as organizational culture, management and history were mentioned as particularly important assets, both hindering and promoting digitalization. Our cases came from the same region, and therefore, our informants were mostly concerned with institutions at the firm/organizational level. One informant illustrated the importance of a positive culture, including a willingness and an eagerness to learn and work with digitalization, when saying: 'We are particularly conscious of saying that new ideas should be saluted. We are removing ourselves from previous prejudices' (firm A). This quotation illustrates how management plays an important role in forming an enabling culture for digitalization. In contrast to willingness to adopt new digital thinking, a rigid culture can be obstructive to digitalization, for example, when employees refuse to adapt to new technical systems.

The illustrations above highlight four assets particularly important for digitalization. However, as described in the theory section, the mere existence of these assets is not sufficient to ensure digital transformation. Thus, the assets need to be modified.

Asset modification processes at play in the Agder cases

As mentioned above, asset modification processes are characterized either as the reuse of assets, the creation of new assets or the destruction of old assets. Our empirics indicate, however, that a fourth type of asset modification plays out in the processes of restructuring from digitalization. While the introduced asset-reuse mechanism includes processes in which existing assets are redeployed or recombined (Trippel et al., 2020), our empirical investigations demonstrate that restructuring can also follow from the combination of existing assets and new assets. Examples of this include combining existing knowledge with new knowledge to upgrade digital services or combining new and old technology to update software and hardware.

In the following we will explore in greater depth the types of asset modification processes that are important in supporting digital transformation in our cases.

Asset reuse

Asset reuse describes processes where existing assets are used or deployed in areas other than those first intended. An obvious example of redeployment is how digital technology shifts investments, for example, from physical infrastructure to digital infrastructure. In our cases, there were few examples of reuse or redeployment related to technological knowledge and institutional assets. However, there were examples of how they used significant investments in digital technology to improve services through webpages and tools for analysing big data relating to customer behaviour and satisfaction. As financial assets are restricted in most cases, this illustration is arguably an

example of the reuse of financial assets. Although we did not explicitly see shifts in investment, we assume that the firms would have used the investments elsewhere if digitalization had not been a priority. Even if financial assets are the basis of development in an organization, in our cases, the asset reuse mode was not the prominent modification process in digital transformation.

Asset upgrading

As argued, there is a need for a more refined typology of asset modification when explaining processes of digitalization. This was confirmed by our cases showing processes not covered by the existing typology. Firm C described an upgrading process when explaining how its organization moved from paper tickets to e-tickets. The process involved expanding the knowledge asset by merging existing knowledge on how to sell tickets with new digital knowledge needed on how to sell them online. The process also involved an upgrade of its technological assets as the firm had to improve its existing software to make ticket sales possible online. This upgrading process was arguably significant in improving services and access to new markets. Another case experienced a similar effect after upgrading its booking system, stating that, 'During the last five years, we increased the number of tickets sold [online] from 30% to 75%' (firm A). These examples illustrate the upgrading process and show the value of it. Having 75% of tickets sold online creates a greater understanding of the organization's customer segments. This has the potential to influence future asset upgrading, for example, through digital marketing.

In our cases, we also found examples of knowledge asset upgrading. One informant specified the need for upgrading employees' knowledge of using digital technology by stating, 'We experienced an increasing need for upgrading employees' knowledge, making sure that we didn't lose any competence when the [digitalization] project was finalized' (firm A). Having the right knowledge among an organization's employees is a challenge in any change process. One informant explained it this way: 'it is difficult because you have several skilled employees who do not necessarily have the right competence. Then you must either replace or develop' (firm A). These examples illustrate the importance of asset upgrading for digitalization, showing how modifying the existing asset base, relating to both technology and knowledge, is significant.

Asset creation

In some of our cases, reusing or upgrading the existing asset base is insufficient for digitalization. Typical examples of asset creation are buying or developing new technology to support digitalization or importing new knowledge through hiring personnel. One of our organizations had done the latter (firm B). It stated that when searching for new personnel, the firm explicitly searched for people with digital marketing competence. Other examples of asset creation were found in developing apps, for example, for streaming live concerts. This process

of asset creation involved buying novel technology and developing a platform for communicating the live streams.

While upgrading and creating assets are important, sometimes there is also a need to destruct old assets to move forward with digitalization.

Asset destruction

In the home healthcare sector, for instance, they saw the need to destruct old concepts of how to take care of the elderly population. The conventional notion, according to our informants, is that persons over 75 years in need of care should have a place in a nursing home. However, developments in digital technology now enable the elderly population to stay longer at home. Thus, people working in this sector need to unlearn old ways of viewing and working with elderly care. The process involves both the introduction of new technology that enables the elderly to stay longer in their homes as well as more efficient use of healthcare personnel. However, the most important process was the unlearning of old routines and notions of elderly care.

Regarding financial assets, we again saw the importance of asset destruction. As mentioned, one of our cases was searching for alternative financial resources by creating new business models. Our informant stated, 'You cling to an existing business model and in the process forget to increase your competence' (firm C). This shows the importance of modifying the financial asset base by deconstructing old ways of business thinking. This example serves as an illustration of the complexity of distinguishing between asset types, as the deconstruction of business models entails modification of both knowledge and financial assets.

In summary, we find evidence to support our argument for a more refined typology of asset modification. Our cases show that the reuse modification mode is of less relevance to digitalization than the other three. Of these, we find asset upgrading to be the most significant for digitalization. Based on the modification processes identified in our cases, we argue that certain path outcomes can be expected.

Possible path outcome in the Agder cases

In the theory section, we argued that minor modifications of existing assets, such as reuse, support less radical path outcomes, while more radical outcomes are related to more radical modification modes, such as asset creation and destruction. A reuse modification mode will, at best, develop existing industry because it includes incremental digital innovation processes, using existing technology or knowledge in areas other than those first intended. Thus, we argue that the most likely outcome of the reuse modification mode is path extension.

The moderate modification processes imply that digitalization moves the industry in new directions. As suggested by our asset upgrade mode, the merger of existing and new digital technologies and knowledge provides organizations with an increased competitive advantage.

In turn, this competitive advantage improves services and moves the industry as whole towards path upgrading.

According to theory, the asset creation and destruction modification modes suggest more radical path outcomes, such as the creation of new industry paths through processes such as diversification or emergence. However, in our cases, the asset creation and destruction modification examples, such as organizations discarding their business models and unlearning old conventions, suggested movement towards path upgrading rather than path diversification or emergence.

Distinguishing between modification modes and assets types is a complex procedure. In our cases, however, we find enough evidence to suggest possible path outcomes. The cases showed fewer examples of reuse: thus, we do not expect that digitalization in the home-based healthcare sector and the culture and experience industry in Agder moves the examined service industries towards extension. Instead, the upgrade modification mode was evident in all our cases, and even if asset creation and destruction seemed equally important, the modification involved in these processes was not radical enough to suggest path emergence. Thus, we find that the most likely outcome of digitalization in our cases seemed to be path upgrading.

CONCLUSIONS

This paper researches regional industrial restructuring as a path-dependent process that is fuelled by processes of asset modification. It maintains that such processes include two complementary entrepreneurial actors who play out at two different levels. These actors are organizational- and system-level entrepreneurs, and their agency has an effect at the organizational and system levels, respectively. The paper demonstrated that these two types of actor are crucial to regional industrial restructuring. Organizational-level entrepreneurs, in our cases, improved services as cost-effectively as possible. However, sometimes this improvement was too challenging for the organizational-level entrepreneurs to handle alone. Instead, a system-level entrepreneur was needed to coordinate, maintain and build structural, relational and cognitive elements of RISs. In cases where system-level entrepreneurs facilitated ongoing processes by introducing new opportunities, they shifted category from being a system-level entrepreneur to becoming a system-level asset, as the example from the homecare sector in this paper showed.

We explored the importance of various types of assets for digitalization and found that the most prominent assets are technology, knowledge, financial capital and supportive institutional arrangements. These assets, as our cases showed, are important at both levels investigated. At the firm level, organizations need these critical assets to create cost-effective and high-quality services, while at the system level, the same assets are important to complement regional organizations and firms with relevant resources.

Further, we found that asset modification is important at both the firm and system levels. This is important because

change requires more than the existing combination of assets can provide. The empirical case demonstrated that asset modification is more nuanced than suggested in the literature. Specifically, empirics highlighted the need for a fourth mode of modification, introduced as an asset upgrade. This type of asset modification was evident at both levels and substantiated by processes in which the existing asset was revitalized by novel elements. As such, digitalization was mostly fuelled by processes in which existing assets were linked with related novel assets. This type of modification was evident in all four identified critical assets, and at both levels. Although modification of assets is important, the alignment between the system and organizational levels is also important. In the healthcare sector, we found that the interests were aligned. Both the system- and organizational-level entrepreneurs (municipalities) worked towards incorporating digital technology into the home healthcare sector by modifying their assets. In the culture and experience industry, the level of alignment was not as high as in the healthcare sector. Although both system- and organizational-level entrepreneurs worked towards digitalization, the different organizational-level entrepreneurs, both those interviewed and other central actors in the region, were at different stages in their digital maturity.

Finally, our empirical case supported a link between asset modification and path outcome. Specifically, the cases demonstrated that asset modification steered further development towards industrial upgrading. However, the paper demonstrated that while all types of asset modification are important in processes of restructuring from digitalization, some are more dominant than others. In our case, asset upgrade was the most prominent procedures at both the firm and system levels.

This paper adds to the existing knowledge concerning industrial restructuring processes in two ways. Theoretically, it extends the literature because it introduces the mode of asset upgrade and suggests and argues for a link between the various types of asset modification and the various types of path outcome. Empirically, the paper contributes to a better understanding of industrial restructuring by highlighting the importance of asset upgrade at both the firm and system levels.

This paper has certain limitations which call for future research. First, although asset upgrading proved to be the most important modification mode in this study, there is a need for more studies to explore the relevance of asset upgrade as a mechanism for regional restructuring. Second, as research on regional restructuring most often refers to manufacturing firms, it would be interesting to see additional studies on the importance of assets and asset modification processes in the service sector. Third, the cases investigated represent the culture and experience industry and the public healthcare sector in a relatively coordinated economy (Fellman et al., 2008). Therefore, one should take into consideration that the two sectors considered might gain more public support for digitalization in Norway than in less coordinated economies. Thus, we encourage future studies to investigate similar sectors in more liberal economies. Finally, the Agder RIS holds

relatively good preconditions for digitalization as it hosts a university that graduate candidates within information technology (IT) and an industry cluster comprising several IT firms. Thus, future research on RISs with less developed preconditions for digitalization could be interesting.

ACKNOWLEDGEMENTS

The authors thank Professor Arne Isaksen and three anonymous reviewers for their valuable comments.

DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

FUNDING

The research for this article was supported by the Regional Research Fund Agder [grant number 285529].

NOTES

1. See <https://www.regjeringen.no/en/topics/health-and-care/municipal-health-and-care-services/id10903/> for more information.
2. See <https://www.ehelseagder.no/om-rkg/> for more information.
3. See <http://innovativeanskaffelser.no/wp-content/uploads/2018/08/rapport-prosessbeskrivelse-fellesanskaffelseagder-210818.pdf>.

ORCID

Nina Kyllingstad  <http://orcid.org/0000-0001-8563-2119>

Jan Ole Rypestøl  <http://orcid.org/0000-0002-1855-2060>

Ann Camilla Schulze-Krogø  <http://orcid.org/0000-0001-8348-1863>

Maria Tønnessen  <http://orcid.org/0000-0003-3679-3957>

REFERENCES

- Aceto, G., Persico, V., & Pescapé, A. (2020). Industry 4.0 and health: Internet of things, big data, and cloud Computing for healthcare 4.0. *Journal of Industrial Information Integration*, 18, 100129. <https://doi.org/10.1016/j.jii.2020.100129>
- Asheim, B. T., Grillitsch, M., & Trippl, M. (2016). Regional innovation systems: Past–present–future. *Handbook on the Geographies of Innovation*, 36, 45–62. <https://doi.org/10.4337/9781784710774.00010>
- Asheim, B. T., Isaksen, A., & Trippl, M. (2019). *Advanced introduction to regional innovation systems*. Elgar.
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120. <https://doi.org/10.1177/014920639101700108>
- Boschma, R., & Frenken, K. (2006). Why is economic geography not an evolutionary science? Towards an evolutionary economic geography. *Journal of Economic Geography*, 6(3), 273–302. <https://doi.org/10.1093/jeg/lbi022>
- Boschma, R., & Frenken, K. (2012). Technological relatedness and regional branching. In H. Bathelt, M. P. Feldman, & D. F. Kogler (Eds.), *Beyond territory: Dynamic geographies of innovation and knowledge creation* (pp. 64–81). Routledge.
- Falk, J. H., & Sheppard, B. K. (2006). *Thriving in the knowledge age: New business models for museums and other cultural institutions*. Altamira.
- Fellman, S., Iversen, M., Sjögren, H., & Thue, L. (2008). *Creating Nordic capitalism: The business history of a competitive periphery*. Palgrave Macmillan.
- Foss, N. J. (1996). Higher-order industrial capabilities and competitive advantage. *Journal of Industry Studies*, 3(3), 1–20. <https://doi.org/10.1080/13662719600000001>
- Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2013). Seeking qualitative rigor in inductive research notes on the Gioia methodology. *Organizational Research Methods*, 16(1), 15–31. <https://doi.org/10.1177/1094428112452151>
- Grillitsch, M., & Asheim, B. (2018). Place-based innovation policy for industrial diversification in regions. *European Planning Studies*, 26(8), 1638–1662. <https://doi.org/10.1080/09654313.2018.1484892>
- Grillitsch, M., Asheim, B., & Trippl, M. (2018). Unrelated knowledge combinations: The unexplored potential for regional industrial path development. *Cambridge Journal of Regions, Economy and Society*, 11(2), 257–274. <https://doi.org/10.1093/cjres/rsy012>
- Grillitsch, M., & Sotarauta, M. (2018). *Regional growth paths: From structure to agency and back*. Lund University. CIRCLE – Center for Innovation, Research and Competences in the Learning Economy.
- Grillitsch, M., & Trippl, M. (2018). Innovation policies and new regional growth paths: A place-based system failure framework. In J. Niosi (Ed.), *Innovation systems, policy and management* (pp. 329–358). Cambridge University Press.
- Isaksen, A. (2015). Industrial development in thin regions: Trapped in path extension? *Journal of Economic Geography*, 15(3), 585–600. <https://doi.org/10.1093/jeg/lbu026>
- Isaksen, A., & Jakobsen, S.-E. (2017). New path development between innovation systems and individual actors. *European Planning Studies*, 25(3), 355–370. <https://doi.org/10.1080/09654313.2016.1268570>
- Isaksen, A., Jakobsen, S.-E., Njøs, R., & Normann, R. (2018a). Regional industrial restructuring resulting from individual and system agency. *Innovation: European Journal of Social Science Research*, 1–18. <https://doi.org/10.1080/13511610.2018.1496322>
- Isaksen, A., Kyllingstad, N., Rypestøl, J. O., & Schulze-Krogø, A. C. (2018b). Differentiated regional entrepreneurial discovery processes. A conceptual discussion and empirical illustration from three emergent clusters. *European Planning Studies*, 1–16. <https://doi.org/10.1080/09654313.2018.1530143>
- Isaksen, A., Langemyr Eriksen, E., & Rypestøl, J. O. (2020a). Regional industrial restructuring: Asset modification and alignment for digitalization. *Growth and Change*. <https://doi.org/10.1111/grow.12444>
- Isaksen, A., Tödting, F., & Trippl, M. (2018c). Innovation policies for regional structural change: Combining actor-based and system-based strategies. In A. Isaksen, R. Martin, & M. Trippl (Eds.), *New avenues for regional innovation systems – Theoretical advances, empirical cases and policy lessons* (pp. 221–238). Springer.
- Isaksen, A., & Trippl, M. (2016). Path development in different regional innovation systems: A conceptual analysis. In M. D. Parrilli, R. D. Fitjar, & A. Rodriguez-Pose (Eds.), *Innovation drivers and regional innovation strategies* (pp. 66–84). Routledge.
- Isaksen, A., Trippl, M., Kyllingstad, N., & Rypestøl, J. O. (2019). Digital transformation of regional industries: The link between new path development, innovation system dynamics and asset

- modification. [Working Paper Series]. *PEGIS Papers in Economic Geography and Innovation Studies*, 2019(2), 1–18.
- Isaksen, A., Tripl, M., Kyllingstad, N., & Rypestøl, J. O. (2020b). Digital transformation of regional industries through asset modification. *Competitiveness Review: An International Business Journal*. <https://doi.org/10.1108/CR-12-2019-0140>
- Karlsen, J. (2013). Innovasjon i offentlig sektor. In I. B. Abilsen, A. Isaksen, & S.-E. Jakobsen (Eds.), *Innovasjon-organisasjon, region og politikk* (pp. 101–123). Cappelen Damm AS.
- Kirchhoff, B. A. (1994). *Entrepreneurship and dynamic capitalism: The economics of business firm formation and growth*. ABC-CLIO.
- Kirzner, I. M. (1973). *Competition and entrepreneurship*. University of Chicago Press.
- Kyllingstad, N., & Rypestøl, J. O. (2018). Towards a more sustainable process industry: A single case study of restructuring within the Eyde process industry cluster. *Norsk Geografisk Tidsskrift – Norwegian Journal of Geography*, 1–10. <https://doi.org/10.1080/00291951.2018.1520292>
- Lippman, S. A., & Rumelt, R. P. (1982). Uncertain imitability: An analysis of interfirm differences in efficiency under competition. *Bell Journal of Economics*, 13(2), 418–438. <https://doi.org/10.2307/3003464>
- MacKinnon, D., & Cumbers, A. (2007). *An introduction to economic geography: Globalization, uneven development and place*. Pearson Education.
- MacKinnon, D., Dawley, S., Pike, A., & Cumbers, A. (2019). Rethinking path creation: A geographical political economy approach. *Economic Geography*. <https://doi.org/10.1080/00130095.2018.1498294>
- Martin, R. (2010). Roepke Lecture in Economic Geography: Rethinking regional path dependence: Beyond lock-in to evolution. *Economic Geography*, 86(1), 1–27. <https://doi.org/10.1111/j.1944-8287.2009.01056.x>
- Martin, R., & Sunley, P. (2006). Path dependence and regional economic evolution. *Journal of Economic Geography*, 6(4), 395–437. <https://doi.org/10.1093/jeg/lbl012>
- Maskell, P., Eskelinen, H., Hannibalsson, I., Malmberg, A., & Vatne, E. (1998). *Competitiveness, localised learning and regional development*. Routledge.
- Maskell, P., & Malmberg, A. (1999). The competitiveness of firms and regions: 'Ubiquitification' and the importance of localized learning. *European Urban and Regional Studies*, 6(1), 9–25. <https://doi.org/10.1177/096977649900600102>
- Penrose, E. T. (1995). *The theory of the growth of the firm*. Oxford University Press.
- Prahalad, C. K., & Hamel, G. (1990). The core competence of the corporation. *Harvard Business Review*, 3, 79–91.
- Qian, H., Acs, Z. J., & Stough, R. R. (2013). Regional systems of entrepreneurship: The nexus of human capital, knowledge and new firm formation. *Journal of Economic Geography*, 13(4), 559–587. <https://doi.org/10.1093/jeg/lbs009>
- Rypestøl, J. O. (2017). Regional industrial path development: The role of new entrepreneurial firms. *Journal of Innovation and Entrepreneurship*, 6(1), 3. <https://doi.org/10.1186/s13731-017-0064-1>
- Rypestøl, J. O. (2018). *New regional industrial path development: Entrepreneurs, knowledge exchange, and regional contexts* [Doctoral dissertation]. University of Agder, Kristiansand.
- Rypestøl, J. O. (2020). Regional industrial restructuring. In L. Farinha, D. Santos, J. J. Ferreira, & M. Ranga (Eds.), *Regional helix ecosystems and sustainable growth* (pp. 125–146). Springer.
- Schumpeter, J. A. (1934). *The theory of economic development*. Harvard University Press.
- Schumpeter, J. A. (1942). *Capitalism, socialism and democracy*. Routledge.
- Sotarauta, M., & Suvinen, N. (2018). Institutional agency and path creation. In A. Isaksen, R. Martin & M. Tripl (Eds.), *New avenues for regional innovation systems – Theoretical advances, empirical cases and policy lessons* (pp. 85–104). Springer.
- Statistics Norway. (2019). *Employment, register-based*. <https://www.ssb.no/statbank/table/07984/tableViewLayout1/>
- Sternberg, R., & Müller, C. (2005). *Entrepreneurship in regional innovation systems – A case study of the biotechnology industry in Shanghai*. Paper presented at the DRUID Tenth Anniversary Summer Conference, Copenhagen, Denmark, June 27–29, 2005.
- Tödtling, F., & Tripl, M. (2013). Transformation of regional innovation systems. In P. Cooke (Ed.), *Re-framing regional development: Evolution, innovation, and transition* (pp. 297–317). Routledge.
- Totterdill, P. (2018). The corporate response to the fourth industrial revolution. *European Journal of Workplace Innovation*, 3(2). <https://doi.org/10.46364/ejwi.v3i2.455>
- Tripl, M., Baumgartinger-Seiringer, S., Frangenheim, A., Isaksen, A., & Rypestøl, J. O. (2019). Green path development, asset modification and agency: Towards a systemic integrative approach. [Working Paper Series]. *PEGIS Papers in Economic Geography and Innovation Studies*, 2019(1), 1–23.
- Tripl, M., Baumgartinger-Seiringer, S., Frangenheim, A., Isaksen, A., & Rypestøl, J. O. (2020). Unravelling green regional industrial path development: Regional preconditions, asset modification and agency. *Geoforum; Journal of Physical, Human, and Regional Geosciences*, 111, 189–197. <https://doi.org/10.1016/j.geoforum.2020.02.016>
- Uyarra, E. (2010). What is evolutionary about 'regional systems of innovation'? Implications for regional policy. *Journal of Evolutionary Economics*, 20(1), 115–137. <https://doi.org/10.1007/s00191-009-0135-y>
- Welch, C., Piekkari, R., Plakoyiannaki, E., & Paavilainen-Mäntymäki, E. (2011). Theorising from case studies: Towards a pluralist future for international business research. *Journal of International Business Studies*, 42(5), 740–762. <https://doi.org/10.1057/jibs.2010.55>
- Yin, R. K. (2013). *Case study research: Design and methods*. Sage.