

Routes for employee-driven innovation: how HRM supports the emergence of innovation in a formalized context

Maarten Renkema , Jeroen Meijerink  and Tanya Bondarouk 

Faculty of Behavioral, Management and Social Sciences; Human Resource Management Department,
University of Twente, Enschede, The Netherlands

ABSTRACT

Although research has shown that HRM can contribute to innovation, only limited scholarly attention has been given to the bottom-up emergence of innovation based on an employees' ideas. Furthermore, while scholars have accumulated knowledge about innovative behavior in business contexts where innovation is nurtured, to fully understand 'innovation by employees' we need to also address business contexts where innovation by employees is not overtly expected. For these reasons, the aim of this paper is to explore the bottom-up emergence of so-called employee-driven innovation (EDI) in a formalized business context and study how HRM support mechanisms contribute to this. We conducted an explorative single case study in a highly formalized company – a medical laboratory in the Netherlands. The data analysis was based on 40 interviews, documents, and observations. We found that a highly formalized business context does support innovation by employees, but that this has specific *employee-driven innovation routes* through which employees innovate. Furthermore, the findings suggest that the content and process of EDI emergence should be studied using a multilevel perspective. We offer recommendations on how EDI routes should be modelled and reflect on what this contributes to the HRM – innovation literature.

KEYWORDS

Employee driven innovation; human resource management; bottom-up emergence; IWB

Introduction

Motivated by the evidence that innovation contributes to organizational success (Anderson et al., 2014), researchers have studied the contribution of HRM to innovation outcomes (Bos-Nehles et al., 2017; Seeck & Diehl, 2017). HRM practices are instrumental in stimulating innovation through

CONTACT Maarten Renkema  m.renkema@utwente.nl  Faculty of Behavioral, Management and Social Sciences; Human Resource Management Department, University of Twente, Drienerlolaan 5, Enschede 7500 AE, The Netherlands.

 Supplemental data for this article is available online at <https://doi.org/10.1080/09585192.2021.1913625>.

© 2021 Informa UK Limited, trading as Taylor & Francis Group

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way.

enhancing organizational learning (Shipton et al., 2005), innovative climate (Shipton et al., 2006), and human capital (De Winne & Sels, 2010). Recently, HRM scholars have started to acknowledge the multilevel nature of the HRM – innovation relationship (Shipton et al., 2016). Indeed, researchers have already accumulated evidence that organizational-level HRM practices positively relate to both the innovation performance of organizations (Beugelsdijk, 2008) and the innovative behavior of individual employees (Alfes et al., 2013; Dorenbosch et al., 2005; Veenendaal & Bondarouk, 2015). This shows that the relationship between HRM and innovation is multilevel in nature (Kozlowski & Klein, 2000; Ostroff & Bowen, 2000); organization-level HRM policies influence individual employees' innovative behaviors, which in turn contribute to collective innovation.

Academic studies have gathered conceptual and empirical knowledge about the top-down effects of HRM on employees' innovative behavior. This has allowed scholars to turn their attention to the understudied bottom-up role of an individual's innovative behavior. This recent shift in scholarly focus has started to explore and examine the emergence of organizational-level innovation performance based on individuals' innovative behavior (Do et al., 2018; Renkema et al., 2017; Shipton et al., 2017). Studying the emergence of innovation through a bottom-up process is justified by observations that ideas generated by individual employees need to be shared and implemented within organizations for organizational-level innovation performance to occur (Gong et al., 2013). Although HRM researchers have studied both the idea generation and implementation behaviors of employees, this does not yet fully explain how innovative ideas at the individual level develop into organizational-level innovation (e.g. Gupta et al., 2007).

We build our arguments on research findings that show that the antecedents of different innovation dimensions reside on different levels of analysis (Axtell et al., 2006; Gong et al., 2013). Another important organizational-level variable that affects innovation is structural formalization (Damanpour, 1991; Hirst et al., 2011), which refers to work processes such as pre-described rules, procedures, policy manuals, and job descriptions (Mintzberg, 1980). We take this notion further by elaborating in this paper on how HRM activities support and/or inhibit the emergence of individual ideas and their route to boosting organization-level innovation performance. In so doing, we address the research gap resulting from HRM researchers mostly studying individual-level innovation while overlooking how these ideas are implemented at the organizational level.

This study aims to explore the bottom-up emergence of innovation in a formalized context and the HRM support mechanisms that

contribute to this. In doing so, we introduce the concept of employee-driven innovation (EDI) to the HRM literature. EDI refers to the generation and implementation, across organizational levels, of new ideas, products, services, and/or processes originating from work-floor employees who are not overtly required to be active in these activities. We study EDI in a healthcare context, where one would expect enhancing EDI to be complicated by the high degree of formalization. In this setting, the daily tasks of work-floor employees do not include innovative behavior (Montag et al., 2012) as employees are expected to follow many formalized routines to reduce errors (Kohn et al., 2000).

Our contribution to the literature is twofold. First, we add to the multilevel HRM and innovation research by examining the role of HRM in the bottom-up emergence of innovation. Following the idea that emergence has multiple aspects, we show that the role of HRM should be categorized by whether it influences the content or the process of emergence. We illustrate which HRM practices are relevant in those EDI aspects and we show how the strictly formalized context plays a role in the way employees can contribute to innovation. Second, we adopt a process perspective on how innovative ideas are created, shared, and implemented, while also drawing on the vast body of knowledge about variance in employees' innovative behavior. Through this, we uncover different routes, their underlying phases, and the process steps that result in innovation by work-floor employees. In combination, we develop a multilevel model of the emergence of innovation from employees in a formalized organizational context.

The paper continues as follows. We first conceptualize EDI in a formalized context, and the role of HRM. Next, we present the results of a single, multilevel case study in a medical laboratory, to identify the EDI process and the ways through which HRM encourages EDI. We conclude with the theoretical and practical implications.

Literature review

Connecting HRM with innovative work behavior and innovation performance

IWB refers to the actions of individual employees focused on '[...] the intentional creation, introduction, and application of new ideas within a work role, group, or organization, in order to benefit role performance, the group, or the organization' (Janssen, 2000, p. 288). This definition reflects the idea that IWB consists of several dimensions and behavioral tasks. Scholars have shared a consensus in studying such IWB dimensions as idea generation, idea promotion, and idea realization (Scott & Bruce, 1994).

Studies of the HRM – IWB link have accumulated knowledge about single HRM practices that enhance IWB, the drawbacks of IWB, and the contribution of IWB to organizational outcomes. A literature review into the HRM – IWB link showed that practices such as training and autonomy positively affect innovative work behavior (Bos-Nehles et al., 2017). Another review found evidence for a positive relationship between HRM and innovation performance at the organizational-level (Seeck & Diehl, 2017), in which innovation is generally referred to as “the intentional introduction and application within a role, group or organization of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit role performance, the group, the organization or the wider society” (West & Farr, 1989, p. 16).

An important aspect for our study is the assumption made in these earlier works that the organization’s capability to innovate is derived from the individual-level employees’ capabilities and motivation, which is influenced by HRM (Jiménez-Jiménez & Sanz-Valle, 2008). We take this a step forward and suggest building upon this assumption and examining the relationship between HRM and innovation from a multilevel perspective (Lin, 2015). The multilevel approach will allow us to conceptualize the ways in which HRM contributes to the bottom-up process of innovation, i.e. how IWBs turn into innovation outputs (Gong et al., 2013). Taken in isolation, the IWB concept is an individual behavioral construct that does not encompass how innovations are developed and implemented. From a behavioral perspective, one could expect greater innovative behavior to lead to more innovative outcomes, such as the development or improvement of products and processes (Crossan & Apaydin, 2010). The underlying assumption is that increasing employees’ IWB leads to more ideas being generated and then implemented in the organization, which is supported by empirical findings (Fu et al., 2015).

This observation directs us to address *how* the individual-level IWB construct manifests as innovation performance. Innovative employees do not automatically succeed in getting their ideas implemented (De Spiegelaere, 2014). Hence, the question remains how to depict innovations as a bottom-up emergence, and how the behaviors of individual employees result in innovative output at the organizational level. To address this issue, we introduce *employee-driven innovation* (EDI) to the HRM literature, a concept that can connect IWB with innovative outcomes at two levels of analysis: the individual level and the organizational level. Doing so we consider innovation as the outcome of EDI, where innovative behavior of employees serves as the input, and HRM may be important for stimulating EDI. Through HRM, organizations can utilize tacit employees’ knowledge rooted in their front-line work experience (Schweisfurth & Herstatt, 2016).

Employee-driven innovation

Scholarly attention to innovative behaviors and innovation has grown immensely, and while it is not our intention to comprehensively review this vast literature (see Anderson et al., 2014), some concepts require further introduction. In the innovation literature, several streams of research can be identified. One stream focuses on conceptualizing innovations through several dimensions (Crossan & Apaydin, 2010). Another stream examines the contribution of intra-organizational actors in the innovation process, such as in the literatures on intrapreneurship, user-driven innovation (Schweisfurth & Herstatt, 2016; Von Hippel, 1986), innovative behavior (Scott & Bruce, 1994), high-involvement innovation (Bessant, 2003), and workplace innovation (Oeij et al., 2017). These concepts share the active role of work-floor employees in the innovation process of organizations. Extensive literature reviews have highlighted that research generally focuses on (1) individual-level innovative behaviors or (2) on contextual factors that affect innovation performance (Hammond et al., 2011).

In this study, we build on the concept of *employee-driven innovation* (EDI), because it distinctively helps to bridge individual and contextual innovation foci. Thereby we focus on innovation as an outcome of the EDI process, where innovative behaviors serve as the input, and study the role of HRM as contextual factor. EDI describes different forms of employee participation in innovation processes (Høyrup, 2012). In the innovation literature, substantial attention has been focused on the top-down approach to innovation in which new products and processes are developed by a specific group of employees. In contrast, EDI is based on the assumption that *every* employee can be a driver of innovation (Evans & Waite, 2010). EDI shifts the attention towards innovations that arise beyond the R&D departments and are initiated, developed and/or implemented by employees who are not tasked with innovation (Høyrup, 2010). To do so, Høyrup (2012) stresses the importance of workplace learning, which enable employees to engage with their jobs and come up with new ways to do their tasks (Kesting & Ulhøi, 2010). Hence, the EDI concept is rooted in the idea that there is room for innovation and learning in almost every job (Shalley & Gilson, 2004), changing the approach from top-down to bottom-up because it is initiated and led by operational employees (Birkinshaw & Duke, 2013).

However, this does not mean that organizations do not have a role to play in the bottom-up process, because managers can actively involve employees in innovation processes. Based on the initial work on EDI, various EDI modes were developed, which can be placed on a

continuum between *management-directed* to *self-initiated* employee innovation activities. The former entails a deliberately planned process of involving all employees, directed by management, whereas the latter involves a bottom-up process that is fully self-initiated (Sørensen et al., 2013). Other models distinguish between several *orders* of EDI; first-order EDI (truly self-initiated), second-order EDI (mixture of top-down and bottom-up processes), and third-order EDI (top-down process: managers invite employees to innovate) (Fuglsang & Sørensen, 2011; Høyrup, 2012). Nevertheless, rather than contrasting these orders, recent work suggests that EDI should be seen as a combination of top-down and bottom-up initiatives (e.g. Engen, 2016; Fuglsang, 2008).

As such, the innovation process is an interaction between employees and managers (Høyrup, 2012), given that individual employees are often not able to generate and implement innovation throughout the organization on their own (Sundbo, 2003), meaning that organizations need a more structured approach (Amundsen et al., 2014). Based on this discussion and following the definitions by Høyrup (2010) and Kesting and Ulhøi (2010), we view employee-driven innovation as:

the generation and implementation across organizational levels of new ideas, products, services, and/or processes that originate from one or more work-floor employees who are not overtly required to undertake such activities.

Our definition of EDI has two important implications for understanding how IWB emerges as organization-level innovation. First, EDI involves innovation activities in which frontline employees are at the core of the innovation process. The definition highlights that EDIs are innovations that are not necessarily required from the employees, as they emerge from employees who do not have formal job tasks dedicated to innovation (Kesting & Ulhøi, 2010). These employees are ideally positioned to provide suggestions since they face challenges during their work, understand market demands (Skaggs & Youndt, 2004), and have access to external resources (Schweisfurth & Herstatt, 2016; Tirabeni & Söderquist, 2019). Second, EDI has a potential to change the innovation approach from top-down to bottom-up, being initiated and led by work-floor employees and integrated with management actions. This idea corresponds with the notion that one of the factors in the successful implementation of innovations is the active involvement of all stakeholders across all levels within organizations (De Spiegelare et al., 2012).

We recognize that how EDI is conceptualized is closely related to IWB¹. While innovation is the ‘outcome’ of the EDI process, employees’ innovative behavior serves as the input to EDI. Implicitly, EDI reveals employee behavior from a multilevel perspective: it is focused on the

initial ideas generated by employees, and the involvement and participation of employees in the implementation of innovations at the organization. This bottom-up innovation process explains how the dynamics and interactions of the individual behaviors, revealed over time, produce the collective phenomenon of innovation performance (Kozlowski & Klein, 2000). Innovative outputs are only possible when employees share, interact, and coordinate their ideas. Hence, the emergence of EDI depends on individuals' innovative behaviors and the coordination and interaction of those behaviors. In viewing EDI as a bottom-up process, we can start to uncover how HRM can shape the process of innovation emergence.

Emergence of EDI through enabling processes

To better conceptualize the role of HRM activities in EDI emergence and develop a theoretical framework for our study, we draw on insights from multilevel theory while it offers key conceptual insights on EDI emergence, as well as features that support emergence processes (Kozlowski & Klein, 2000). EDI can best be described as an *emergent phenomenon*, whereby individual characteristics coalesce into a higher-level collective outcome (Kozlowski & Klein, 2000). Characteristics such as affections, behaviors, and cognitions are amplified through interaction and coordination to form a collective phenomenon (Allport, 1954; Katz & Kahn, 1978). We treat innovation as such an emergent phenomenon because it has its foundations in the characteristics of individuals - innovations arise from an individual's ideas and interactions. Following Kozlowski and Klein (2000), we argue that EDI has emergent properties because it manifests itself as innovation - a collective phenomenon - when individuals interact and exchange ideas. With this argumentation we are in keeping with the EDI literature (e.g. Høyrup, 2012), which also implicitly describes an emergence process of how interactions among employees lead to innovations. The principles underpinning multilevel theory show that there have to be underlying contextual and emergent mechanisms that drive the relationship between HRM and innovation (Ostroff & Bowen, 2000). Emergence at a higher level is determined by multiple factors involving emergence-enabling states and processes (Ployhart & Moliterno, 2011), while system interactions amplify and shape how emergence affects performance (Kozlowski & Chao, 2012).

To arrive at our conceptual framework, we draw on three features of emergence (content, process, and structure) that help to conceptualize EDI emergence and how it is enabled by HRM activities (Fulmer & Ostroff, 2015). First, the content of emergence refers to the 'raw material'

of emergence, individual-level attributes such as cognitions and perceptions (Ostroff et al., 2013, p. 660). In line with this, we view the *content of EDI emergence* as the elemental content of individual operational employees' innovative ideas that are aggregated at a higher organizational level to result in innovation. Second, the process of emergence describes how lower-level elements interact and create higher-level phenomena (Kozlowski & Chao, 2012). Translated to the EDI context, the *process of EDI emergence* is related to the interaction among individual employees that is required to implement ideas and thereby shape higher-level outcomes such as innovation performance (Kozlowski & Klein, 2000; Ployhart & Moliterno, 2011). Finally, the structure of emergence is a factor that influences emergence, allowing for realization of a higher-level property (Morgeson and Hofmann, 1999; Fulmer & Ostroff, 2015). In line with this, the *EDI structures* are higher-level contextual factors, such as HRM activities and formalization, that shape the process of EDI emergence. In this research, EDI captures the content, the process, and the structure of emergence, as it entails both the innovative ideas and the process that leads to the implementation of the innovation across organizational levels, while also analyzing how the structure influences the content and process. Forming part of the 'structure' of emergence, organizational structure and practices have been identified as factors that potentially affect the emergence (Fulmer & Ostroff, 2015). For example, Amundsen et al. (2014) highlight that specific programs can be used to enhance EDIs impact on innovation outcomes. Driven by our research aim, to study how HRM affects innovation in a formalized context, we focus on HRM activities and formalization as structural features of EDI emergence.

HRM activities as a structural factor

HRM activities can both enhance the creation of innovative ideas (content) and stimulate their successful implementation (process). For example, HRM can shape features of the collective interactions of individuals – such as the concerted actions that are necessary to coordinate innovative activities (Li et al., 2018). However, different mechanisms might be involved regarding content and process. As an illustration, job complexity has been found to affect the implementation of ideas (process), but not to influence the creativity of employees (content) (Ohly et al., 2006). Furthermore, training could have a greater effect on EDI content, whereas task composition and autonomy seem more likely to be related to the EDI process. Therefore, when analyzing EDI emergence from a multilevel perspective, it is important to analyze structural dimensions that enable emergence and to distinguish between HRM activities that affect the content and the process of emergence.

The formalized work context as a structural factor

Formalization is a structural dimension that is not obviously associated with supporting the innovative behavior of employees. However, given that EDI involves ideas that arise from frontline employees, who often work in a formalized context, it is essential to reflect upon the workplace rules – and these are embodied by formalization. Formalization is one of the design elements of an organizational structure and refers to work processes that are prescribed through rules, procedures, policy manual, and job descriptions (Mintzberg, 1980). Formalization is usually seen as constraining the discretionary power of employees. In relation to the link between formalization and innovation, we know that mechanistic organizational systems and the corresponding managerial control, which translate into high formalization and high centralization, inhibit innovativeness (Aiken & Hage, 1971; Pierce & Delbecq, 1977). In other words, a high degree of formalization suppresses the expression of individual differences and reduces creativity (Hirst et al., 2011).

In line with this, we can expect a formalized work environment to be an unfavorable context for EDI. However, this does not mean EDI is impossible. For example, Veenendaal and Bondarouk (2015) found that production workers could still be innovative, although such manufacturing jobs are typically highly formalized within machine bureaucracies (Mintzberg, 1980). Nevertheless, blue-collar employees in manufacturing organizations can make innovative suggestions if they have autonomy, feel ownership, and can participate in decision-making (Axtell et al., 2000; Ramamoorthy et al., 2005). Vough et al. (2017) show that, even in highly formalized jobs, individuals can be engaged in proactive work behaviors provided there is a clear routine. The apparently contradictory findings related to formalization poses the question as to how the formalized context affects EDI content and process and which mechanisms explain the success of EDI.

Initial research framework

Based on the above discussion, we examine the emergence of innovation by studying how ideas (*content*) coming from individuals are implemented within the organization (*process*), and how HRM and formalization (*structure*) contribute to this emergence process. Figure 1 delineates how the content, the process, and the structure of EDI emergence are connected. Building on the work on emergence-enabling processes (Ployhart & Moliterno, 2011; Fulmer & Ostroff, 2015), we use an emergence-based model of HRM and innovation by exploring how ideas stemming from individuals give rise to innovation, and how HRM can affect the emergence processes. Given that EDI refers to innovations

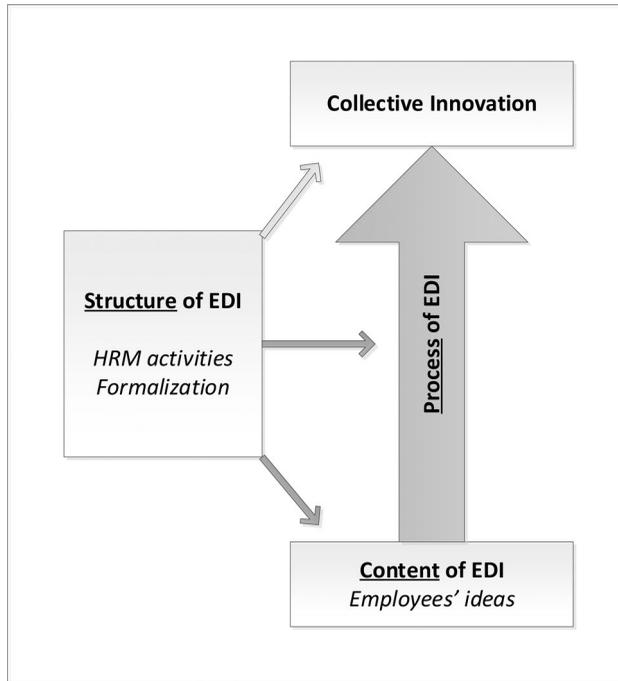


Figure 1. Initial conceptual framework: EDI emergence model.

that are developed by employees who are not overtly expected to be innovative (Montag et al., 2012) and who, because of this, are often constrained by norms, rules, and procedures, we include formalization as a structural factor.

Methodology

To explore the bottom-up emergence of EDI, and how HRM influences this process, an exploratory qualitative case study has been conducted at a highly formalized organization. We have opted for a qualitative case study because we were interested in exploring the emergence of EDI within a formalized organizational context. Since this is not immediately apparent in the literature, we sensed that an in-depth study of a single case would help uncover EDI processes (Elsbach & Kramer, 2003). We have selected the *single* case because the organization under study was *typical* for studying EDI in a formalized context (Yin, 2009). Typical case studies serve to uncover tensions within a particular case. Provided that existing studies have shown that formalization can be either an advantage or disadvantage for innovation, the current study seeks to better understand the tensions between formalization and the emergence of employee-driven innovation. Our typical case study served to uncover such tensions, thereby allowing to uncover the HRM mechanisms that

explain how and under which conditions EDI emerge in a formalized context. Qualitative research is further appropriate because we are focusing on developing theory using a process approach (Strauss & Corbin, 1990). In addition, we were convinced that the case study was appropriate because our research is focused on elaborating HRM mechanisms, whereby we would contrast previous understanding with observed events to extend existing HRM – EDI research model and theory (Lee et al., 1999).

Data collection

The case study company is a Dutch medical laboratory, in this study labelled 'MedLab'. MedLab is a particularly appropriate organization in which to study EDI in a formalized context because it is highly formalized and has technological and market pressures that necessitate innovation to survive. The case study was carried out between February 2016 and May 2017. For triangulation purposes, we relied on multiple data collection techniques, including document analysis, semi-structured interviews, and observations. The analysis of different data sources enriched the findings: from interviews we got to know that innovation efforts focused on cost reduction, which we also observed during general staff meetings and was reiterated in company communication. Given our multilevel perspective, we interviewed and observed work-floor employees who generated and implemented innovative ideas and then analyzed the resulting EDI processes.

Data sources and procedure

The first research phase included desk research, document analysis, informal conversations, and observations. This allowed us to understand the organizational context and to get to know employees who were involved in EDI processes. EDIs were operationalized as innovative initiatives that had involved work-floor employees. Potential EDIs were shortlisted based on documents and observations. In close collaboration with the HR manager, we then identified employees involved in these innovation initiatives. We conducted semi-structured interviews with these employees and their supervisors (six interviews). Consequently, we asked employees and supervisors about the EDI process and their role in it, and about the factors that stimulate and inhibit innovation. The secondary data used were in the form of strategic documents, research reports, and minutes of meetings.

Based on the preliminary observations from the first phase, we conducted more interviews with innovative employees and with top

Table 1. Overview of interviews.

<i>Informants</i>	<i>#Interviews</i>	<i>Total Length</i>
Board of directors	1	66 min.
Clinical chemists	2	103 min.
Support staff	7	425 min.
Department managers	6	335 min.
Specialists	4	247 min.
Phlebotomists	4	220 min.
Analysts	16	833 min.
Total	40	37 hours

management, department managers, supervisors, and support staff to identify their role in EDI (24 interviews). We also conducted interviews with ten employees who were not necessarily identified as innovative and randomly selected them from across the organization. The third phase of the research consisted of reflection and discussing the results. During this phase, results were discussed, reflected upon, and clarified with key informants to enhance the trustworthiness of the data collected and our interpretations of findings (Yin, 2009).

The semi-structured interviews were conducted to identify employees' role in EDI, their perceptions regarding HRM practices, and factors that affect EDI. Sample questions from the interview protocol that we followed are: 'How often do you look at opportunities to renew or improve products and/or processes?', 'What do you do after you have developed an idea', and 'What does the organization do to stimulate innovation?' Each interview lasted approximately one hour. Prior to each interview, interviewees were assured about confidentiality. Interviews were audio-taped, transcribed verbatim, and verified by interviewees. The first author also made field notes to supplement the audiotapes. In total, 40 interviews were conducted at three different laboratory locations (see Table 1).

Data analysis

The raw data were inserted in a data analysis software (NVivo) and then analyzed using several steps and coding strategies. The analysis of the data consisted of three elements. First, each of the transcripts were read and, while reading through the documents, initial ideas on the main research concepts were written down. Core thematic concepts and critical incidents were identified, such as innovative initiatives. Subsequently, three levels of coding were applied to all the raw data: open and axial coding, selective coding, and theoretical coding (Strauss & Corbin, 1998). Using the main research concepts developed in the initial reading phase, we identified potential codes using open coding to make sense of the content. For example, we detected the different activities undertaken by employees after generating a new idea (e.g.

communicating and monitoring). Advancing our coding, we then identified groupings of codes, which became our first-order categories. For example, where we had coded text about communicating ideas with colleagues and with managers as first-order codes, we now grouped them together as 'communication of idea'. The third level of coding was the construction of second-order dimensions, which were based on our first-order codes and were subsequently linked with themes based on the existing literature (i.e. third-order themes). Some categories had already been identified as themes within the literature, for example the EDI process phases, whereas others, such as 'routes of EDI', emerged as EDI-supporting mechanisms through the coding process.

In parallel, the second element consisted of identifying specific instances of EDIs. We assessed whether mentioned initiatives should be seen as EDIs by comparing them to the key elements of the EDI definition. They were assessed based on the following criteria: they had to include (1) the generation and/or implementation of a new idea, product/service, or process; (2) to originate from an employee for whom innovation was not a regular task; and (3) to be integrated within the organizational context. Also here we used triangulation, for instance by identifying examples of EDI from different interviewees, combined with descriptions written in internal communication. Next, the identified EDIs were analyzed and categorized, resulting in an inductively arrived overview of different types and routes of EDI.

The third element of data analysis followed principles of theoretical coding: it consisted of developing a process overview of EDI. Based on the first two elements of analysis, a process approach was used to identify the general steps and phases of EDI emergence. Several open first-order codes were used to develop the EDI process model. Although the stages of the model were inductively determined, some of them resembled dimensions of IWB and could therefore be equated with existing literature. For example, we coded texts related to the application of initiatives and those about using ideas on the work floor as 'implementation of idea', a dimension of IWB'. Subsequently, stimulating and constraining HRM activities that were associated with the EDI process and its various stages were inductively identified. For example, we linked phases of the EDI process with stimulating HRM activities by analyzing what had helped informants to further their ideas. Based on this analysis, we could also link the HRM activities to the elemental content and process of emergence and categorized first-order HRM activities as top-down stimulation and bottom-up championing (theoretical relationship).

Hence, we created a data structure consisting of the first, second, and aggregated themes to develop an inductive process model including the different stages of EDI emergence and the concepts that influence the

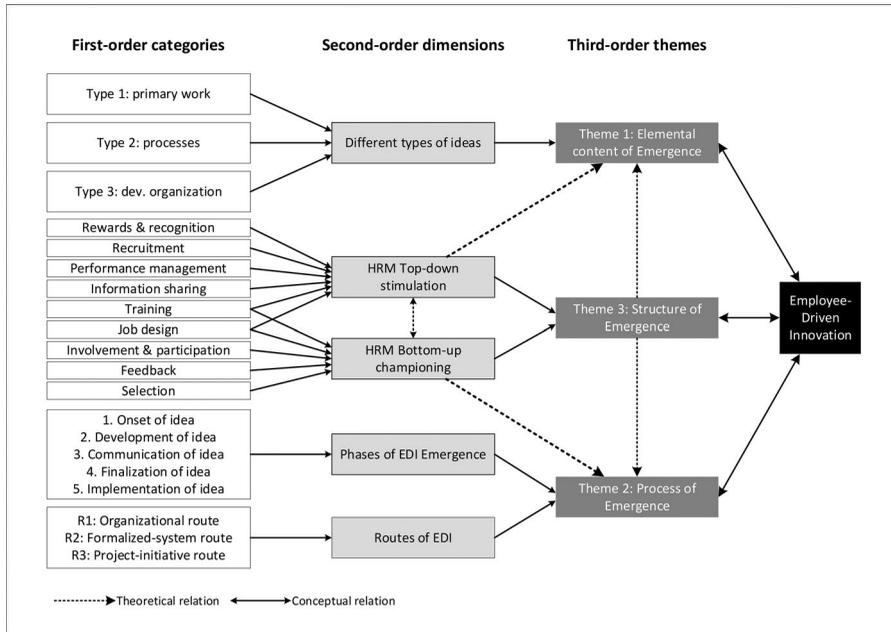


Figure 2. Data structure with first-order, second-order and aggregate dimensions.

development of EDI (see Figure 2). Appendix 1 highlights the codes and example quotes that represent this structure.

Findings

The case study reveals that HRM activities can positively contribute to EDI in a formalized environment. Despite or maybe, thanks to the formalized context, we saw employees who were engaged in generating and implementing innovative ideas.

Case description and approach to innovation

MedLab is a medical laboratory that performs and reports diagnostics on blood samples. In total, the organization has 445 employees, divided across three laboratories and around 80 locations for blood collection. MedLab has many written rules and procedures – derived from the ISO-15189 accreditation, which defines norms about quality and competences. It has implemented a system to guarantee the quality of the healthcare it provides, with the goal of assessing and controlling the service quality as part of meeting ISO norms.

In public documents, MedLab communicates that innovation is an important organizational mission. While we did not identify a long-term strategy, MedLab's vision clearly calls for innovation as an important part of the business. In its approach to innovation, MedLab aims to

develop specific content-related priorities in which the organization wants to excel (strategic letter, 2016). Strategic documents also refer to this aim to innovate: 'MedLab needs to distinguish itself more through quality, innovation, and entrepreneurship'. However, it is also apparent that there was no clear operational plan on how to achieve this and/or to stimulate innovative behaviors. In fact, an external consultant advised MedLab to put more focus on innovation.

Emergence of EDI - initiatives and unique approaches

We identified over a hundred initiatives at MedLab. Most of the innovative ideas concerned innovations in processes, such as changes to procedures or improving communication between departments. The majority of the ideas were discussed among colleagues and supervisors and were implemented relatively easily. Of the many factors that constrained EDI, a lack of resources, priority, recognition, and organizational knowledge were the consistently mentioned. In particular, given the (quality) procedures, the wider organizational implications that needed to be addressed were limiting EDI. Whereas there was an expectation from management that employees would develop ideas, many employees saw limited possibilities to innovate. A bottom-up process through which innovation was fully initiated, developed, and implemented by frontline employees was an exception. Most of the developed bottom-up initiatives involved an important role for managers.

The content of EDI emergence – different types of EDI

The data revealed that there are clear differences in the underlying content of EDIs, and that this had an impact on the further development of emerging EDIs. Therefore, we provide a broad outline of the three main types of EDIs identified at MedLab. The research revealed three main elemental content-types of innovations that were developed: these were ideas related to (1) primary work content (e.g. new test for vitamins), (2) work processes (e.g. blood sampling routing), and (3) organizational developments (e.g. education programs) – see [Table 2](#). Our analysis also indicates that the process of EDI emergence is dependent upon the elemental content of the EDI. Depending on the ideas that employees want to pursue, different routes are used. These EDI emergence processes and routes are now discussed.

The process of EDI emergence – different phases and routes of EDI

We inductively developed a phase-model outlining five phases through which EDIs develop: the onset, development, communication,

Table 2. Examples of the different types of employee-driven innovation routes at MedLab.

	Route 1: Organizational Route Example: 'Combination of workstations' Content-type 2: Processes	Route 2: Formalized-system Route Example: 'purchase of an AED' Content-type 3: Org. developments	Route 3: Project-initiative Route Example: 'changing maintenance times' Content-type 2: Processes
Phase 1: Onset of idea <i>Opportunity and problem recognition</i>	An employee saw that some workstations were idle for considerable periods during the day. "Once I said, you can combine work stations. It is not necessary to have one person at one place, because they do not have enough work for the whole day."	"We are in the building of the hospital. In the past we had an AED, but now it is behind closed doors [because of the relocation of the hospital]."	"We analyzed the process and recognized that, on maintenance days, we were always late." (Analyst)
Phase 2: Development of idea <i>Finding solutions and generating ideas</i>	The idea was to combine workstations and let people switch during the day. "... on other equipment there is space left, so you can combine those. There are many opportunities."	"Well, we work with a very young population of workers [sarcastic], so there is a real chance that you need an AED."	"Well, we thought, what can we do? We are going to try some things, doing the maintenance at other times." (Analyst)
Phase 3: Communication of idea <i>Discussing idea with others, communicating with leaders, reporting</i>	Subsequently, the idea was communicated and the department head evaluated it. "I talked to my manager about it, yes."	"So I suggested it once, let's buy an AED for MedLab. [...] Then you fill in an improvement form. You know when I heard something back? When the thing was already on the wall..."	"Then we checked whether we could do the maintenance at another time. Employees came up with these ideas." (Department manager)
Phase 4: Finalization of idea <i>Involving others, testing/piloting, evaluating, convincing, keeping track, decision-making</i>	The final idea has not yet been established. "They are working on it, but I don't think they dare to make the step and say: guys now we do it differently."		"We have tested and evaluated and, in the end, we set the time at 9:15 to 9:30." (Department manager)
Phase 5: Implementation of idea <i>Putting into practice, communicating, familiarizing, routinizing</i>	Not yet implemented.	"The AED was already on the wall when I got a notification of the improvement form – 'we are considering the purchase of one'. That really motivates me ... [sarcastic]."	"Of course you show that to the employees. And I like that idea – that you can show the results." (Department manager)
Most important factors and mechanisms	Lack of decision-making by higher management	Lack of communication/feedback; opacity of decision-making	Involvement of employees; direct feedback

finalization, and implementation of ideas. In all these phases, different employee actions played a role. In the first EDI phase – the *onset phase* – new ideas arise from the recognition of a problem or opportunity. In general, being very aware of the practicality of the work routines, employees were very good at recognizing challenges. In the *development phase*, employees found solutions for the challenges and opportunities they encountered and generated ideas. The *communication phase* involved discussing the idea with direct colleagues and leaders, and receiving initial feedback. The *finalization phase* consisted of involving others in the idea, developing the idea further, testing, and convincing others. The final, *implementation phase*, occurs once an idea has been established and decisions made that the idea is worth implementing, and the idea is then put into practice.

Routes of EDI

It was particularly striking at MedLab that different types of innovative initiatives were developed, and that these ideas were developed through different organizational routes. Based on an in-depth analysis of the initiatives, we distinguished three routes through which these initiatives are developed in the organization: (1) the *organizational* route, (2) the *formalized-system* route, and (3) the *project-initiative* route. We view all these EDI routes as pathways through which employees' initiatives are developed in a bottom-up fashion in the organization.

Route 1: organizational route

The first EDI route reflects the organizational structure. Employees first shared their ideas with colleagues and supervisors, and then communicated them with the department heads. Often the manager took over the responsibility and communicated the idea further. Department managers adopted a leadership role and championed the initiatives with other departments, higher management, and/or customers. Often, the prevailing process no longer involved employees in the further development of the innovation. However, there were some exceptions in which employees were still active in the later EDI phases.

The case study showed that supervisors needed to have knowledge about what to do with ideas generated on the work floor. Given the nature of the work and the formalized context, employees were not expressly required to be innovative and, therefore, official protocols for dealing with ideas were lacking. As a result, success in pursuing innovative ideas depended on the direct supervisors and their organizational knowledge. In our case study, supervisors indicated that they did know how to deal with EDIs:

I doubt whether it is described like that, but that is the way to go. Of course, you have to consult with colleagues. Actually, you know it – you know when a clinical chemist needs to make a decision or whether you can discuss [the idea] with your department head, who in turn can discuss it with the clinical chemist' (Specialist 1).

The organizational route is predominantly used for EDIs related to the *primary work content*. That is, ideas directly related to blood collection and analysis such as ideas about how to better carry out blood analysis and improve the steps for blood collection. This type of EDI requires the approval by higher management – employees did not have the autonomy to themselves initiate innovations in this area:

'Well, they [employees] can make decisions about whether test results are analytically sound, that is verification. However, in the area of innovation, they cannot develop new diagnostics or whatever. That does not happen' (Clinical Chemist 1).

Moreover, most of the primary work content is formalized in protocols and cannot be changed without consulting many parties within the organization, requiring employees to share their ideas through the organizational hierarchy route. This is the case when it comes to new equipment, new tests, and new software.

Further, we saw that EDIs that were concerned with work processes were also pursued through this route. In some cases, innovations in work processes could be implemented very quickly, particularly when the innovation did not affect other units in the organization and no coordination was necessary. Outside of the primary processes formalized in protocols, other ideas could be acted upon more easily. For example, it was relatively easy to create new workstations or to improve customers' waiting times. That is, when innovative ideas did not relate directly to protocols, they could be implemented more directly:

'And issues where there is no protocol involved. Those things can be arranged. And then the feedback is good' (Phlebotomist 3).

Route 2: formalized-system route

All employees were encouraged to share problems and ideas through an online system in which official procedures and protocols were described. All inputs were assessed by the responsible department manager. Employees were able to keep track of their suggestions through the online system. In theory, employees were supposed to get an email about how the organization had dealt with the input. However, many respondents indicated their dissatisfaction with the system because it often took a long time before problems were resolved or ideas taken into consideration, and there was a lack of feedback to the employees.

The quality department had the role of assessing whether any changes were appropriately enacted. Usually, other employees were given the responsibility for making small changes in the protocols based on inputs from employees.

The EDIs developed through this route were predominantly related to work processes, with employees often pointing out minor errors or ideas to improve work processes. Even ideas that were unrelated to the department manager's responsibilities were communicated through this route. For example, one employee mentioned that he used the formal system to communicate ideas about the ICT system. Further, this route was used to communicate ideas about or errors in the primary work content. Again, the department managers played a crucial role in the development of an EDI, as they would formally need to assess the incident and also analyze whether further action was needed. As such, the formalized incident system enhanced the influence of department managers on the EDI process and reduced the direct influence of work-floor employees.

'They are supposed to assess those things for all incidents separately, if it is an issue only in their own department or within the whole organization' (Quality worker).

Route 3: project-initiative route

Many employees claimed that there was much more room for their input in specifically arranged project teams. For example, MedLab had organized Lean teams to improve the logistics of their blood-sample collection. Several employees had been asked to take part in the project, and non-participants were also encouraged to share ideas for improvement through project meetings and posters on the walls. As they were explicitly assigned the task of thinking creatively about existing processes and solutions, this EDI route offered more freedom for employees to develop and implement their ideas.

In principle, all types of EDI could be developed through this route, from work content and process to organization-level ideas. However, our data show that organizational developments were most likely to be developed through the project-initiative route. These ideas were not directly related to the primary work and processes of the organization. In general, ideas in this category were directed towards improving the quality of internal and external coordination and communication, finding new markets, or improving work-life processes (e.g. buying an AED). A typical example is the 'Project Communication' that was initiated by two employees from different departments to improve internal communication between departments. Within this project, several ideas were developed to fine-tune interdependent work processes. The HR manager

championed the project and helped to prepare a project plan that was used to gain approval from the management team. Eventually, the two employees were put in charge of the project and recruited other colleagues. What is particularly striking in this example is that all management-level employees were explicitly excluded from participating in the project. Another example of this project-initiative route is the 'Market Opportunities' project, a strategic project team developed by a board member in which all employees of MedLab could participate to create and develop ideas to produce new value:

'From the start I was involved. I think around 20 to 25 ideas were proposed, particularly to generate more money. That was the goal, to generate more income by involving work-floor employees, since they have a clear picture of the processes and opportunities to generate more money. I think 25 ideas were developed, but none of them were accepted' (Analyst 1).

In sum, we uncovered five different stages in the EDI process and described the different *types* (content) and *routes* (process) through which EDIs emerge. By analyzing the distinct types and routes of the emergence process, we identified differences in the content and processes of EDIs. The case study also revealed that innovations emerged from employees' ideas through different routes within the organization, and that the route followed was contingent on the type and content of an employee's idea. Although our observations showed occasional overlap and mixing of routes and the elemental content, we hold to the three routes analytically distilled when modeling the EDI process.

The structure of EDI emergence – enabling the content and the process

Based on our analysis of the interdependency between the content and the processes of EDI, we now describe the mechanisms that support and constrain the emergence of EDI in a formalized context. We observed the influence of several HRM activities, particularly by increasing employees' opportunities to be involved in innovation (Appendix 2).

HRM activities as enabling factors

Our data show that certain HRM practices are more relevant in some phases of EDI than in others. The in-depth analysis resulted in two main categories: practices that mainly affect the *content* of emergence, and practices that mainly affect the *process* of emergence. There are factors that increased the likelihood of new ideas being generated (top-down stimulation), and factors that increased the likelihood of employees' ideas being implemented (bottom-up championing). We

categorized the HRM practices by where they appeared to have the most influence, and focused on those activities that were most evident and relevant for EDI emergence (Appendices 1 & 2).

HRM policies that were related to the content of emergence were *training, rewards, job design, recruitment, participation, information sharing, and performance management*. When *training* opportunities were offered, which not often was the case, this was perceived as a good vehicle for generating ideas. Although most training sessions were focused on improving productivity, in particular collaboration with other organizations was valued for its influence on idea generation. The results show that *rewards and recognition* played a prominent role by acknowledging innovative initiatives. Recognition, for example through showing appreciation for employees' efforts, offering compliments, or providing a small non-monetary reward (e.g. vouchers or chocolate bars), was particularly beneficial in encouraging innovative employees to continue to develop ideas. The emergence of EDI was further enabled by appropriate *job design*. One of the practices that stimulated innovative content to emerge was offering extra tasks to employees. Especially with the many protocols in place, the regular work can become tedious. There was a group of employees who enjoyed more challenging work, and by allowing these employees to do extra tasks (such as quality assessments, or website editing) or join projects, the organization benefited from the ideas they then generated. Further, one of the most important aspects was hampered by the specific situation at MedLab in that the organization had very low workforce mobility, leading to virtually zero *recruitment* of new employees. However, for EDI to emerge, recruitment from outside was deemed to be important as, through this, the organization gains novel insights and increases the likelihood of ideas being generated. The findings show that *information sharing* is another important enabler of EDI emergence. Here, EDI could be channeled and shaped by providing information about organizational developments: informing the workforce about strategy and future plans increased the likelihood that employees would develop ideas that were valuable for the organization, which in turn increased the potential of successful implementation across organizational levels. Significant levels of communication and information sharing enabled a common understanding regarding expectations for innovation to develop. Predominantly it appeared to be transparency that was key to successfully stimulating EDI emergence. Employees often lacked the information that formed the basis of strategic decision-making, and we saw that this was important to get employees involved in the innovation process. Lastly, our data reveal that *performance management*, by facilitating employees to raise ideas, can stimulate EDI emergence. Almost all department managers used appraisals to raise the issue of

employee development, and employees could bring forward their wishes to be involved in innovation projects.

HRM policies that were related to the process of EDI emergence were *training, job design, selection, involvement, and feedback*. *Training* helped to stimulate the implementation of new ideas across levels, for example when employees received training about how to involve workers in improvement projects. At MedLab, specialists were trained in the Lean methodology and subsequently developed their own projects in which many ideas of employees were generated and implemented. The results indicate that the job design involved a high level of formalization. Interviewees indicated that the use of protocols can make employees think less critical about their jobs. They also stated that it affected the change and speed of implementation of EDIs, as protocols needed to be adapted first. Before changing protocols, new ideas had to be tested and validated. Others indicated that sometimes these protocols provide clarity and can also help with EDI. Our data analysis shows that especially the *selection* of staff for projects proved to be an important factor in the process of EDI emergence. The success of innovation projects largely depended on the employees selected to participate. Department managers played a crucial role in this by selecting people based on their perceptions of their suitability. We also found that employees being *involved and participating* in decision-making or organization-wide project teams enabled the EDI process through which ideas are transformed into innovation because employees could more directly discuss, test, and apply their ideas. Lastly, our data reveals that *feedback* can stimulate the EDI emergence process. As managers were responsible for providing feedback, the implementation of related HRM practices depends on how they embody this role. Although the department managers at MedLab indicated that they aimed to give positive feedback, employees often felt that feedback was either lacking or overly negative. Providing more extensive and more constructive feedback would have helped to further develop ideas. Feedback was especially important during the EDI development phases since it could help fine-tune employees' ideas and enhance the likelihood of approval by higher management.

Hence, HRM activities facilitated the emergence of EDI by supporting both its content and process. In analyzing the influence of HRM, it is important to distinguish between the different practices. Some practices are more related to increasing the likelihood of new ideas arising, whereas others are more useful in facilitating the implementation process. However, to stimulate EDI, HRM practices should focus on both the content and the process of emergence. Although the identified practices were not *always* present at MedLab, a substantial number of EDIs

could still be developed. Most employees indicated that they felt there was an openness to new ideas. However, getting their ideas implemented was often more challenging. The barriers could be eased to enable the further development of employees' ideas by using appropriate EDI routes and increasing the availability of HRM activities. Nevertheless, many initiatives require the involvement and support of managers to champion ideas further. As such, in our case study, EDI was often a co-production by frontline employees and management.

Towards a model of enabling EDI emergence

We now continue the discussion of the results by focusing on how individual innovative behaviors are amplified by interactions (Kozlowski & Klein, 2000), and result in the emergence of EDI. Based on the theoretical explanation by Ployhart and Moliterno (2011), we propose an emergence-based approach that models how employees' innovative ideas lead to organization-level innovation, and how HRM can act as an emergence enabler. In developing this model (see Figure 3), we started from the analysis of our data, but were also guided by the principles of multilevel theory. Emergence at a higher level is determined by multiple factors, and system interactions amplify and shape how emergence affects performance (Ployhart & Moliterno, 2011; Kozlowski & Chao,

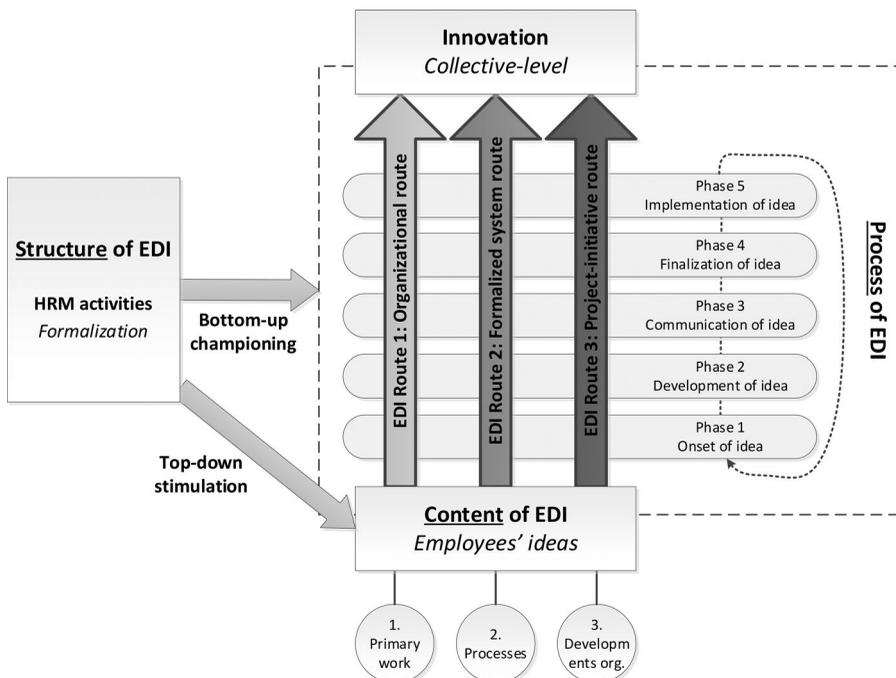


Figure 3. Inductive model of HRM and employee-driven innovation emergence.

2012). What was apparent is that emergence consists of the content and process of emergence, supported by the structural enablers that increase the likelihood of EDI.

Structural enablers of EDI emergence

Our results support previous assertions that organizational structure and HRM practices are important for the emergence process (Fulmer & Ostroff, 2015). In line with Guzzo and Noonan (1994), we have seen that practices can send strong signals to employees about which types of employees' innovative ideas are valued and expected in the organization. For example, the general staff meetings served as an important mechanism for information sharing by sending signals that ideas for efficiency improvements were highly valued.

The organizational structure also proved to be important for the emergence of EDI as the organization's formal structure affects employees' interaction possibilities (Kozlowski & Chao, 2012). This is particularly true in a highly formalized context, as employees have only limited opportunities to interact with colleagues outside their own department. We have seen that practices such as project teams can reduce this constraint by offering additional interaction channels. This supports the idea that enhancing communication and coordination is an important emergence-enabling process (Ployhart & Moliterno, 2011). Our results show that high-involvement policies can help to stimulate interaction among and participation by employees. Practices such as teamwork, suggestion schemes, and flexible tasks were found to positively affect EDI, supporting the claimed positive effects of such systems (Wood et al., 2012). Through these practices, employees can share knowledge and ideas that would otherwise be restricted within departments.

The results indicate that innovation might be hampered if employees are overtly committed to an organization. Although interaction and coordination form an important behavioral mechanism through which higher-level or collective outcomes can be achieved (Kozlowski & Klein, 2000; Ployhart & Moliterno, 2011), valuable new ideas seem less likely to arise when interaction is only possible with likeminded colleagues. In order to encourage meaningful interactions about innovation, organizations should facilitate workplace learning (Høyrup, 2010). Our analysis emphasizes that HRM practices related to the development of employees' knowledge and skills are very important to promote learning, for example through recruitment and training programs. Again, there is a double role for HRM. First, it is important to contribute to enabling cognitive emergence – to the ability to acquire, and transfer knowledge (Cohen & Levinthal, 1990; Zahra & George, 2002). Second, to facilitate

the emergence of innovation, it is important to focus on how knowledge and skills can be replicated through practices such as knowledge-sharing systems (Wang & Zatzick, 2015).

Particularly vital in a formalized context is offering channels through which ideas can be shared. Not only does our study support the idea that suggestion schemes are important to capture employees' creativity (Frese et al., 1999), we also offer new insights into the presence of multiple channels through which employees can interact and communicate their ideas. Our results support the claim that employees who are not expressly expected to be innovative can still develop ideas (Montag et al., 2012; Shipton et al., 2017), making use of one of EDI routes. HRM practices can be used to encourage employees to become involved, but there also have to be routes and channels through which employees can develop and implement their ideas. The presence of the former but absence of the latter sends mixed signals to employees: they could perceive that they are expected to innovate, but that their ideas are never implemented. Therefore, we propose a dual role of HRM in the emergence of EDI: combining top-down stimulation with bottom-up championing of innovative ideas.

Contributions

The aim of this study was to explore the bottom-up emergence of EDI in a formalized context and find out how HRM support mechanisms contribute to this. By considering the bottom-up process of EDI from a multilevel perspective, we have developed a model of EDI emergence that illustrates how ideas from individuals on the work floor can develop into collective innovations, and how HRM can contribute to this process. Empirical results combined with theoretical insights from multilevel theory stress the importance of the bottom-up process of EDI and its support mechanisms. The findings suggest that, despite being a seemingly unfavorable environment for innovation, in a context of high formalization, work-floor employees develop EDIs provided *routes for employee-driven innovation* are made available for them, and that these EDIs are stimulated by HRM practices.

Theoretical implications

Our research enriches existing research in two main ways. First, the findings extend previous knowledge about multilevel HRM and innovation by picturing the bottom-up process of innovation and showing how different HRM practices can be applied to facilitate this process. Thereby, our study illustrates the multilevel theorizing of the HRM-innovation link, which is increasingly called for in the literature (e.g. Shipton et al., 2016; Bos-Nehles et al., 2017). Particularly, our contribution is the

inductively built process-model of bottom-up innovation, arising from ideas proposed by work-floor employees whose job tasks do not require them to innovate. In doing so, this research extends the work of Shipton et al. (2017) and of Lin and Sanders (2017). More specifically, the in-depth exploration of the EDI emergence highlights how ideas are transformed into innovative outcomes. This nascent theory of EDI emergence extends the theorizing on HRM and innovation by distinguishing between different forms of content, process, and structure, and thereby helps to understand how ideas develop upwards. By doing so, our research offers a solution to one of the central knowledge problems in innovation – seeking for how employees' creative ideas can be better implemented and transformed into innovation (Gong et al., 2013; Shipton et al., 2017).

Furthermore, we contribute to multilevel theory building (Kozlowski & Klein, 2000) by presenting new insights into the inner workings of the emergence processes and enabling mechanisms of innovation (Ployhart & Moliterno, 2011). Our study supports previous claims that emergence-enabling mechanisms have a positive role in innovation (Li et al., 2018; Wang & Zatzick, 2015), being one of the first papers to report an in-depth empirical study that uncovers this largely unknown territory. The findings imply that HRM practices that stimulate the *content* of emergence, and those the *process* of emergence, should be distinguished when studying emergent phenomena. As part of the 'structure' of emergence, HRM practices can affect both the content (creation of ideas) and the process (implementation) and thereby shape the entire emergence process. However, it is possible for HRM practices to increase the likelihood that ideas are generated, but without this leading to more implemented innovations within the organization. If there are no emergence-enabling practices, the likelihood of ideas being successfully implemented is lower. When emergence-enabling mechanisms are weak, any HRM initiatives to stimulate innovation are likely to be in vain and may even be counterproductive since employees become demotivated if they perceive their ideas are not being taken seriously.

Second, we contribute to the innovation management literature. Earlier papers suggested that employees draw on specific resources to deploy in various phases of the innovation process (Schweisfurth & Herstatt, 2016). We show that HRM activities are relevant for supporting these internal innovation processes. More specifically, the findings contribute to the large body of research focused on contextual factors enhance innovative behavior (Scott & Bruce, 1994; Janssen, 2000; Bos-Nehles et al., 2017), as we have examined bottom-up innovation process in detail. We add to this literature by suggesting a model that integrates EDI content, process, and structure, and thereby help to understand how ideas develop upwards within an organization. Interestingly, because

of our exploration of both content and process of EDI, we found that although employees generally have ideas for improvements, a bottom-up process through which an innovation was fully generated and implemented by work-floor employees was an exception. The bottom-up innovation process can easily be stalled by a shortage of resources or lack of managerial support, which is also recognized in the literature on innovative behavior (e.g. Scott & Bruce, 1994; Janssen, 2005; Bos-Nehles et al., 2017). Hereby we build on calls from EDI researchers in proposing that organizations can benefit more from the systematic introduction of EDI practices (e.g. Amundsen et al., 2014), as this paper illustrates that employees who are not tasked with innovative activities also show commitment to improving a wide variety of organizational aspects. These employees can develop these ideas because they are facing everyday operational issues and can acquire resources through their connections (Schweisfurth & Herstatt, 2016; Tirabeni & Söderquist, 2019). Consequently, rather than focusing on a predetermined group of 'privileged' R&D employees, our findings stress that organizations can benefit from harnessing the innovative potential of the whole workforce by ensuring enabling mechanisms are in place.

Practical implications

To managers wishing to increase the innovativeness of their employees our findings show the importance of innovation routes. Various routes can be created through which employees' ideas can transform into EDIs. Our results also illustrate that although protocols do not necessarily constrain innovative behaviors, reinforcing existing protocols may lead to additional challenges during the EDI process. Rather, changes need to be made that will increase the likelihood of innovative efforts. Possibilities include building an innovative climate, increasing employees' motivation to be innovative, and providing recognition and appreciation once EDIs have been accomplished. For example, by introducing project teams or suggestion schemes even organizations with many formal rules can still benefit from the innovative potential of their work force. HR managers can boost employees' abilities, motivation, and opportunities to be engaged in EDI by implementing initiatives that invite employees to be innovative. More specifically, appraisal talks should emphasize the opportunities to do extra tasks, regular workplace exchanges of employees should take place, and interdepartmental project groups could be developed. HR managers could also develop organization-wide initiatives such as innovation competitions, strategic work teams, or knowledge platforms to increase involvement and offer new channels for their ideas. In sum, we have shown that whether EDI takes place does not only depend on

developing top-down initiatives to stimulate idea generation, but also on support for bottom-up development processes.

Limitations and future research

This study is not without its limitations. First, the results are based on a single case study. Although this may limit generalizability, we believe that our findings are important for theory building (Stake, 1978). We acknowledge that employees working in a medical laboratory might have unique characteristics that do not easily translate to other organizations. In laboratories it is plausible that innovation might be even more restricted by regulations than in other highly formalized organizations. At the same time, our findings will hold true for organizational settings with the similar work formalization degree. Second, there are limitations in the use of the process approach in this study. Most of the analyzed initiatives occurred in the past, and there may be important events missing from the data (Langley, 1999). To reduce the risk of hindsight bias due to forgetting previous events, data triangulation was used. Furthermore, intermediate analyses and results were validated through discussions with key informants. Third, although we were focused exclusively on EDI, we might have included other related proactive employee behaviors such as innovative behavior, organizational citizenship behavior and intrapreneurship. Indeed, we acknowledge that parts of our EDI model resemble some of the dimensions of the IWB concept (e.g. De Jong & Den Hartog, 2010). Nevertheless, the difference is more than a discursive one. First, EDI is focused on the innovation rather than on employees' behavior. Moreover, in our phase model, we combine EDI phases with employee behaviors. Phases such as *idea onset* and *finalization* add new aspects to innovative behaviors and its sub-dimensions. Furthermore, the examples of EDIs tended to be incremental in nature, rather than technological or radical innovations. As such, one should be cautious in attempting to generalize our findings to contexts where more radical employee ideas are needed. Finally, we made an important distinction between types of employees' ideas (content of EDI), the routes that are used to pursue these ideas through different stages (process of EDI) and the support mechanisms (structure of EDI). Future research should further conceptualize and study these linkages and expand the proposed inductive model in [Figure 3](#).

Note

1. We recognize that the concept of EDI is also related to a number of other employee behavioral concepts such as proactive behavior and organizational citizenship behavior. Although these concepts are important, we only pointed out differenc-

es between EDI and other individual-level innovation concepts in the above section, and specifically discussed its connection with IWB as we conceptualize EDI as linking mechanisms between IWB and innovation performance. We thank an anonymous reviewer for pointing this out.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work is part of the research program Innovating Human Resource Management for Employee-driven Innovation with project number 409-13-204, which is (partly) financed by the Netherlands Organization for Scientific Research (NWO). The authors would like to thank the editor and three anonymous reviewers for their feedback. Furthermore, we acknowledge the help of Nadine van Wijchen and thank all participants for their willingness to take part in this research project.

ORCID

Maarten Renkema  <http://orcid.org/0000-0002-9788-1929>

Jeroen Meijerink  <http://orcid.org/0000-0002-0210-073X>

Tanya Bondarouk  <http://orcid.org/0000-0002-8455-1859>

Data availability statement

The data that support the findings of this study are limitedly available on reasonable request from the corresponding author, [M.R.]. The data are not publicly available due to restrictions e.g. their containing information that could compromise the privacy of research participants.

References

- Aiken, M., & Hage, J. (1971). The organic organization and innovation. *Sociology*, 5(1), 63–82. <https://doi.org/10.1177/003803857100500105>
- Alfes, K., Truss, C., Soane, E. C., Rees, C., & Gatenby, M. (2013). The relationship between line manager behavior, perceived HRM practices, and individual performance: Examining the mediating role of engagement. *Human Resource Management*, 52(6), 839–859. <https://doi.org/10.1002/hrm.21512>
- Allport, F. H. (1954). The structuring of events: Outline of a general theory with applications to psychology. *Psychological Review*, 61(5), 281–303. <https://doi.org/10.1037/h0062678>
- Amundsen, O., Aasen, T. M. B., Gressgård, L. J., & Hansen, K. (2014). Preparing organisations for employee-driven open innovation. *International Journal of Business Science & Applied Management*, 9(1), 24–35.
- Anderson, N., Potočnik, K., & Zhou, J. (2014). Innovation and creativity in organizations a state-of-the-science review, prospective commentary, and guiding framework. *Journal of Management*, 40(5), 1297–1333. <https://doi.org/10.1177/0149206314527128>

- Axtell, C. M., Holman, D. J., Unsworth, K. L., Wall, T. D., Waterson, P. E., & Harrington, E. (2000). Shopfloor innovation: Facilitating the suggestion and implementation of ideas. *Journal of Occupational and Organizational Psychology*, 73(3), 265–285. <https://doi.org/10.1348/096317900167029>
- Axtell, C. M., Holman, D., & Wall, T. (2006). Promoting innovation: A change study. *Journal of Occupational and Organizational Psychology*, 79(3), 509–516. <https://doi.org/10.1348/096317905X68240>
- Bessant, J. R. (2003). *High-involvement innovation: Building and sustaining competitive advantage through continuous change*. Wiley.
- Beugelsdijk, S. (2008). Strategic human resource practices and product innovation. *Organization Studies*, 29(6), 821–847. <https://doi.org/10.1177/0170840608090530>
- Birkinshaw, J., & Duke, L. (2013). Employee-led innovation. *Business Strategy Review*, 24(2), 46–51. <https://doi.org/10.1111/j.1467-8616.2013.00947.x>
- Bos-Nehles, A. C., Renkema, M., & Janssen, M. (2017). HRM and innovative work behaviour: A systematic literature review. *Personnel Review*, 46(7), 1228–1253. <https://doi.org/10.1108/PR-09-2016-0257>
- Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 35(1), 128–152. <https://doi.org/10.2307/2393553>
- Crossan, M. M., & Apaydin, M. (2010). A multi-dimensional framework of organizational innovation: A systematic review of the literature. *Journal of Management Studies*, 47(6), 1154–1191. <https://doi.org/10.1111/j.1467-6486.2009.00880.x>
- Damanpour, F. (1991). Organizational innovation: A meta-analysis of effects of determinants and moderators. *Academy of Management Journal*, 34(3), 555–590.
- De Jong, J. P., & Den Hartog, D. (2010). Measuring innovative work behaviour. *Creativity and Innovation Management*, 19(1), 23–36. <https://doi.org/10.1111/j.1467-8691.2010.00547.x>
- De Spiegelaere, S. (2014). *The employment relationship and innovative work behaviour*. published.
- De Spiegelaere, S., Van Gyes, G., & Hootegem, G. V. (2012). Mainstreaming innovation in Europe-Findings on employee innovation and workplace learning from Belgium. *Lifelong Learning in Europe (LLinE)*, 17(4), 1–19.
- De Winne, S., & Sels, L. (2010). Interrelationships between human capital, HRM and innovation in Belgian start-ups aiming at an innovation strategy. *The International Journal of Human Resource Management*, 21(11), 1863–1883. <https://doi.org/10.1080/09585192.2010.505088>
- Do, H., Budhwar, P. S., & Patel, C. (2018). Relationship between innovation-led HR policy, strategy, and firm performance: A serial mediation investigation. *Human Resource Management*, 57(5), 1271–1284.
- Dorenbosch, L., van Engen, M. L., & Verhagen, M. (2005). On-the-job innovation: The impact of job design and human resource management through production ownership. *Creativity and Innovation Management*, 14(2), 129–141. <https://doi.org/10.1111/j.1476-8691.2005.00333.x>
- Elsbach, K. D., & Kramer, R. M. (2003). Assessing creativity in Hollywood pitch meetings: Evidence for a dual-process model of creativity judgments. *Academy of Management Journal*, 46(3), 283–301.
- Engen, M. (2016). *Frontline employees as participants in service innovation processes: Innovation by weaving*. Lillehammer University College.
- Evans, K., & Waite, E. (2010). Stimulating the innovation potential of ‘routine’workers through workplace learning. *Transfer: European Review of Labour and Research*, 16(2), 243–258. <https://doi.org/10.1177/1024258910364313>

- Frese, M., Teng, E., & Wijnen, C. J. (1999). Helping to improve suggestion systems: Predictors of making suggestions in companies. *Journal of Organizational Behavior*, 20(7), 1139–1155. [https://doi.org/10.1002/\(SICI\)1099-1379\(199912\)20:7<1139::AID-JOB946>3.0.CO;2-I](https://doi.org/10.1002/(SICI)1099-1379(199912)20:7<1139::AID-JOB946>3.0.CO;2-I)
- Fu, N., Flood, P. C., Bosak, J., Morris, T., & O'Regan, P. (2015). How do high performance work systems influence organizational innovation in professional service firms? *Employee Relations*, 37(2), 209–231. <https://doi.org/10.1108/ER-10-2013-0155>
- Fuglsang, L. (2008). *Innovation and the creative process: Towards innovation with care*. Edward Elgar Publishing.
- Fuglsang, L., & Sørensen, F. (2011). The balance between bricolage and innovation: Management dilemmas in sustainable public innovation. *The Service Industries Journal*, 31(4), 581–595. <https://doi.org/10.1080/02642069.2010.504302>
- Fulmer, C. A., & Ostroff, C. (2015). Convergence and emergence in organizations: An integrative framework and review. *Journal of Organizational Behavior*, 37, S122–S145. <https://doi.org/10.1002/job.1987>
- Gong, Y., Zhou, J., & Chang, S. (2013). Core knowledge employee creativity and firm performance: The moderating role of riskiness orientation, firm size, and realized absorptive capacity. *Personnel Psychology*, 66(2), 443–482. <https://doi.org/10.1111/peps.12024>
- Gupta, A. K., Tesluk, P. E., & Taylor, M. S. (2007). Innovation at and across multiple levels of analysis. *Organization Science*, 18(6), 885–897. <https://doi.org/10.1287/orsc.1070.0337>
- Guzzo, R. A., & Noonan, K. A. (1994). Human resource practices as communications and the psychological contract. *Human Resource Management*, 33(3), 447–462. <https://doi.org/10.1002/hrm.3930330311>
- Hammond, M. M., Neff, N. L., Farr, J. L., Schwall, A. R., & Zhao, X. (2011). Predictors of individual-level innovation at work: A meta-analysis. *Psychology of Aesthetics, Creativity, and the Arts*, 5(1), 90–105. <https://doi.org/10.1037/a0018556>
- Hirst, G., Van Knippenberg, D., Chen, C-h., & Sacramento, C. A. (2011). How does bureaucracy impact individual creativity? A cross-level investigation of team contextual influences on goal orientation–creativity relationships. *Academy of Management Journal*, 54(3), 624–641. <https://doi.org/10.5465/amj.2011.61968124>
- Høyrrup, S. (2010). Employee-driven innovation and workplace learning: Basic concepts, approaches and themes. *Transfer: European Review of Labour and Research*, 16(2), 143–154. <https://doi.org/10.1177/1024258910364102>
- Høyrrup, S. (2012). Employee-driven innovation: A new phenomenon, concept and mode of innovation. In S. Høyrrup, M. Bonnafous-Boucher, C. Hasse, M. Lotz, & K. Møller (Eds.), *Employee-driven innovation: A new approach* (pp. 3–33). Palgrave Macmillan.
- Janssen, O. (2005). The joint impact of perceived influence and supervisor supportiveness on employee innovative behaviour. *Journal of Occupational and Organizational Psychology*, 78(4), 573–579. <https://doi.org/10.1348/096317905X25823>
- Janssen, O. (2000). Job demands, perceptions of effort-reward fairness and innovative work behaviour. *Journal of Occupational and Organizational Psychology*, 73(3), 287–302. <https://doi.org/10.1348/096317900167038>
- Jiménez-Jiménez, D., & Sanz-Valle, R. (2008). Could HRM support organizational innovation? *The International Journal of Human Resource Management*, 19(7), 1208–1221. <https://doi.org/10.1080/09585190802109952>
- Katz, D., & Kahn, R. L. (1978). *The social psychology of organizations*. Wiley.
- Keating, P., & Ulhøi, J. P. (2010). Employee-driven innovation: Extending the license to foster innovation. *Management Decision*, 48(1), 65–84. <https://doi.org/10.1108/00251741011014463>

- Kohn, L. T., Corrigan, J. M., & Donaldson, M. S. (2000). *To err is human: Building a safer health system* (Vol. 6). National Academies Press.
- Kozlowski, S. W., & Chao, G. T. (2012). The dynamics of emergence: Cognition and cohesion in work teams. *Managerial and Decision Economics*, 33(5–6), 335–354. <https://doi.org/10.1002/mde.2552>
- Kozlowski, S. W., & Klein, K. J. (2000). A multilevel approach to theory and research in organizations: Contextual, temporal, and emergent processes. In K. J. Klein & S. W. Kozlowski (Eds.), *Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions* (pp. 3–90). Jossey-Bass.
- Langley, A. (1999). Strategies for theorizing from process data. *Academy of Management Review*, 24(4), 691–710. <https://doi.org/10.5465/amr.1999.2553248>
- Lee, T. W., Mitchell, T. R., & Sablinski, C. J. (1999). Qualitative research in organizational and vocational psychology, 1979–1999. *Journal of Vocational Behavior*, 55(2), 161–187. <https://doi.org/10.1006/jvbe.1999.1707>
- Li, Y., Wang, M., van Jaarsveld, D., Lee, G. K., & Ma, D. (2018). From employee-experienced high-involvement work system to innovation: An emergence-based human resource management framework. *Academy of Management Journal*, 61(5), 2000–2019. <https://doi.org/10.5465/amj.2015.1101>
- Lin, C.-H V. (2015). HRM and innovation: Review, synthesis, and extension. Paper presented at the *Academy of Management Proceedings*, 2015(1), 13256. <https://doi.org/10.5465/ambpp.2015.13256abstract>
- Lin, C.-H V., & Sanders, K. (2017). HRM and innovation: A multi-level organisational learning perspective. *Human Resource Management Journal*, 27(2), 300–317. <https://doi.org/10.1111/1748-8583.12127>
- Mintzberg, H. (1980). Structure in 5's: A synthesis of the research on organization design. *Management Science*, 26(3), 322–341. <https://doi.org/10.1287/mnsc.26.3.322>
- Montag, T., Maertz, C. P., & Baer, M. (2012). A critical analysis of the workplace creativity criterion space. *Journal of Management*, 38(4), 1362–1386. <https://doi.org/10.1177/0149206312441835>
- Morgeson, F. P., & Hofmann, D. A. (1999). The structure and function of collective constructs: Implications for multilevel research and theory development. *Academy of Management Review*, 24(2), 249–265. <https://doi.org/10.5465/amr.1999.1893935>
- Oeij, P., Rus, D., & Pot, F. D. (2017). *Workplace innovation: Theory, research and practice*. Springer.
- Ohly, S., Sonnentag, S., & Pluntke, F. (2006). Routinization, work characteristics and their relationships with creative and proactive behaviors. *Journal of Organizational Behavior*, 27(3), 257–279. <https://doi.org/10.1002/job.376>
- Ostroff, C., & Bowen, D. E. (2000). Moving HR to a higher level: HR practices and organizational effectiveness. In K. J. Klein & S. W. Kozlowski (Eds.), *Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions* (pp. 211–266). Jossey-Bass.
- Ostroff, C., Kinicki, A. J., & Muhammad, R. S. (2013). Organizational culture and climate. In I. B. Weiner, N. W. Schmitt, & S. Highhouse (Eds.), *Handbook of psychology, Vol 12: Industrial and organizational psychology* (Vol. 12, pp. 643–676). John Wiley & Sons.
- Pierce, J. L., & Delbecq, A. L. (1977). Organization structure, individual attitudes and innovation. *Academy of Management Review*, 2(1), 27–37. <https://doi.org/10.5465/amr.1977.4409154>
- Ployhart, R. E., & Moliterno, T. P. (2011). Emergence of the human capital resource: A multilevel model. *Academy of Management Review*, 36(1), 127–150. <https://doi.org/10.5465/amr.2009.0318>

- Ramamoorthy, N., Flood, P., Slattery, T., & Sardessai, R. (2005). Determinants of innovative work behaviour: Development and test of an integrated model. *Creativity and Innovation Management*, 14(2), 142–150. <https://doi.org/10.1111/j.1467-8691.2005.00334.x>
- Renkema, M., Meijerink, J., & Bondarouk, T. (2017). Advancing multilevel thinking in human resource management research: Applications and guidelines. *Human Resource Management Review*, 27(3), 397–415. <https://doi.org/10.1016/j.hrmr.2017.03.001>
- Schweisfurth, T. G., & Herstatt, C. (2016). How internal users contribute to corporate product innovation: The case of embedded users. *R&D Management*, 46(S1), 107–126. <https://doi.org/10.1111/radm.12103>
- Scott, S. G., & Bruce, R. A. (1994). Determinants of innovative behavior: A path model of individual innovation in the workplace. *Academy of Management Journal*, 37(3), 580–607.
- Seeck, H., & Diehl, M.-R. (2017). A literature review on HRM and innovation – taking stock and future directions. *The International Journal of Human Resource Management*, 28(6), 913–932. <https://doi.org/10.1080/09585192.2016.1143862>
- Shalley, C. E., & Gilson, L. L. (2004). What leaders need to know: A review of social and contextual factors that can foster or hinder creativity. *The Leadership Quarterly*, 15(1), 33–53. <https://doi.org/10.1016/j.leaqua.2003.12.004>
- Shipton, H., Budhwar, P., Sparrow, P., & Brown, A. (2016). *Human resource management, innovation and performance*. Palgrave Macmillan.
- Shipton, H., Fay, D., West, M., Patterson, M., & Birdi, K. (2005). Managing people to promote innovation. *Creativity and Innovation Management*, 14(2), 118–128. <https://doi.org/10.1111/j.1467-8691.2005.00332.x>
- Shipton, H., Sparrow, P., Budhwar, P., & Brown, A. (2017). HRM and innovation: Looking across levels. *Human Resource Management Journal*, 27(2), 246–263. <https://doi.org/10.1111/1748-8583.12102>
- Shipton, H., West, M. A., Dawson, J., Birdi, K., & Patterson, M. (2006). HRM as a predictor of innovation. *Human Resource Management Journal*, 16(1), 3–27. <https://doi.org/10.1111/j.1748-8583.2006.00002.x>
- Skaggs, B. C., & Youndt, M. (2004). Strategic positioning, human capital, and performance in service organizations: A customer interaction approach. *Strategic Management Journal*, 25(1), 85–99. <https://doi.org/10.1002/smj.365>
- Sørensen, F., Sundbo, J., & Mattsson, J. (2013). Organisational conditions for service encounter-based innovation. *Research Policy*, 42(8), 1446–1456. <https://doi.org/10.1016/j.respol.2013.04.003>
- Stake, R. E. (1978). The case study method in social inquiry. *Educational Researcher*, 7(2), 5–8. <https://doi.org/10.3102/0013189X007002005>
- Strauss, A., & Corbin, J. (1990). *Basics of qualitative research* (Vol. 15). Sage.
- Strauss, A., & Corbin, J. (1998). *Basics of qualitative research: Techniques and procedures for developing grounded theory*. Sage Publications, Inc.
- Sundbo, J. (2003). Innovation and strategic reflexivity: An evolutionary approach applied to services. In L. V. Shavinina (Eds.), *The international handbook on innovation* (pp. 97–114). Elsevier.
- Tirabeni, L., & Soderquist, K. E. (2019). Connecting the dots: Framing employee-driven innovation in open innovation contexts. *International Journal of Innovation and Technology Management*, 16(4), 1950031. <https://doi.org/10.1142/S0219877019500317>
- Veenendaal, A. A. R., & Bondarouk, T. V. (2015). Perceptions of HRM and their effect on dimensions of innovative work behaviour: Evidence from a manufacturing firm. *Management Revu*, 26(2), 138–160. <https://doi.org/10.5771/0935-9915-2015-2-138>

- Von Hippel, E. (1986). Lead users: A source of novel product concepts. *Management Science*, 32(7), 791–805. <https://doi.org/10.1287/mnsc.32.7.791>
- Vough, H. C., Bindl, U. K., & Parker, S. K. (2017). Proactivity routines: The role of social processes in how employees self-initiate change. *Human Relations*, 70(10), 1191–1216. <https://doi.org/10.1177/0018726716686819>
- Wang, T. T., & Zatzick, C. (2015). *The effect of human capital renewal on organizational innovation over time* [Paper presentation]. Paper Presented at the Academy of Management Annual Meeting, Vancouver.
- West, M. A., & Farr, J. L. (1989). Innovation at work: Psychological perspectives. *Social Behaviour*, 4(1), 15–30.
- Wood, S., Van Veldhoven, M., Croon, M., & De Menezes, L. M. (2012). Enriched job design, high involvement management and organizational performance: The mediating roles of job satisfaction and well-being. *Human Relations*, 65(4), 419–445. <https://doi.org/10.1177/0018726711432476>
- Yin, R. K. (2009). *Case study research: Design and methods*. SAGE Publications.
- Zahra, S. A., & George, G. (2002). Absorptive capacity: A review, reconceptualization, and extension. *Academy of Management Review*, 27(2), 185–203. <https://doi.org/10.5465/amr.2002.6587995>