7-8-2023

Creating Common Ground: Formalizing and Designing Employee-driven Innovation Processes with Decision Points

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Completed Research Paper

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Abstract

Striving for innovation and advancement, a phenomenon can be observed wherein organizations are progressively incorporating their 'ordinary' employees into the innovation process, capitalizing on their creativity, expertise, and knowledge to foster novel ideas. Such integration mandates formalized yet flexible processes to offer a common ground for both employees as idea contributors and managers as decision-makers, enabling control and governance. Despite this, a conspicuous knowledge gap exists within the realm of employee-driven innovation (EDI) concerning the design of EDI processes. In this paper, we present the outcomes of an action design research project conducted with a medium-sized organization, focusing on formalizing and designing an EDI process with decision points through three iterative cycles. This research contributes fourteen meta-requirements and eleven design principles for EDI process design, thereby expanding the theoretical (prescriptive) knowledge base. Additionally, the results offer practical implications, enabling organizations to adopt the EDI process accordingly.

Keywords: Employee-driven Innovation, Innovation Process, Action Design Research, Design Principles, Process Design

Introduction

In today's landscape, the notion of 'innovation' pervades across all sectors, typically associated with contemporary technologies and embedded within the vision and objectives of organizations (Kahn 2018; Yoo et al. 2010). This ubiquitous aspiration towards innovation, particularly pronounced in the era of digitalization, induces a mounting pressure on organizations to prioritize and integrate such themes within daily operations, catalyzing transformative alterations to their business models (Kohli and Melville 2019). The resulting dynamic market trends and compressed innovation cycles necessitate an adjustment or a fundamental shift in organizations' innovation strategies. Specifically, there is a need to orient more heavily towards digital innovations, harnessing their potential to maintain a competitive advantage (Lang and Baltes 2019; Nambisan et al. 2017). The democratization of digital technologies has not only reshaped but also invigorated the entrepreneurial culture, simultaneously diminishing barriers to participation (Ciriello et al. 2018; Yoo et al. 2010). This evolution has underscored the need for novel theoretical frameworks and explanatory knowledge embodying these distinctive attributes and phenomena (Hund et al. 2021).

Conventionally, organizational aspects like product or service development have been the responsibility of internal research and development departments (Høyrup et al. 2012). In their efforts to achieve optimal innovation capability, a myriad of phenomena have surfaced among organizations in recent years. Many of these phenomena are centered around devising novel channels for innovation as starting points of the innovation process or enhancing the efficiency of existing ones, often leveraging state-of-the-art technologies such as artificial intelligence. For example, Chesbrough (2006) introduced the open innovation approach, in which the boundaries of the innovation process are opened up to the external environment to benefit from fresh creative stimuli. Another example is the emerging small agile digital innovation units, comprised of (technical) experts who identify and exploit potentials for their organization arising from current trends and technologies to address existing challenges (Raabe et al. 2021). Our research is focused on 'ordinary' employees and employee-driven innovation (EDI), a concept with historical roots in the employee suggestion scheme. EDI has witnessed significant transformations in recent years, spurred by digitalization and socio-cultural shifts (Høyrup et al. 2012; Kesting and Ulhøi 2010; Opland et al. 2020). The aforementioned innovation channels can also be combined, exemplified in the work of Ludzay and Leible (2022), which integrates EDI with open innovation in the public sector context.

The foundational principle of EDI rests on amplifying an organization's innovative capacity by integrating the creativity of 'ordinary' employees into the innovation process (Hansen et al. 2017; Høyrup et al. 2012). Here, 'ordinary' employees refer to organizational members whose primary responsibility is not innovation-related (Kesting and Ulhøi 2010). This phenomenon has gained substantial traction within organizations in recent years and has elicited burgeoning interest in academic research (Opland et al. 2022). Nonetheless, the implementation of EDI processes presents complex challenges. For example, (1) decision-makers are required to screen and assess a vast array of submitted ideas at specific junctures based on specific criteria and available data, rendering decisions on which ideas to pursue or abandon (Aristodemou et al. 2020). (2) To stimulate employee participation in EDI processes, it is essential to create an environment fostering transparency, ideally enhanced with information technology (IT) support, and encompassing a formalized, controlled process that includes points of contact to support idea contributors (Ciriello et al. 2016; Høyrup et al. 2012; Opland et al. 2023). (3) Further considerations include acknowledging key antecedents of EDI, such as fostering autonomy within the EDI process facilitated by appropriate leadership styles and collaborative culture (Smith et al. 2012). (4) The integration of the EDI process within the organization's holistic innovation process is paramount, ensuring effective governance over the coexistence and interaction between diverse innovation channels (Bäckström and Bengtsson 2019). To navigate these challenges, organizations are recommended to establish EDI processes with transparent decision points.

This research project endeavors to generate managerial and information systems (IS) implications for designing EDI processes by inductively formalizing, developing, and implementing an existing but undocumented EDI process within a medium-sized consulting and software engineering organization in the banking sector. Furthermore, we aspire to design and demonstrate explicit decision points that function as transitions between process phases, thereby ensuring that prescriptive inputs are assessed according to predetermined criteria. In this context, we follow the action design research (ADR) paradigm, which focuses on the resolution of practical issues through the collaborative development of (IT) artifacts involving practitioners (Sein et al. 2011). In the process of formalizing and further refining the EDI process, we integrate perspectives from both the employee level, as the primary source of ideas, and the management level, responsible for decision-making, while supplementing these insights with findings from contemporary literature. The artifact resulting from this research aims to furnish normative guidelines for structuring EDI processes with distinct decision points in order to facilitate a common ground.

As a theoretical contribution, our study broadens the knowledge base in the research field of EDI by eliciting high-level meta-requirements (MRs) and design principles (DPs) for EDI processes. Consequently, practitioners gain valuable insights and approaches for creating EDI processes with decision points tailored to their organizations. Given the existing challenges associated with EDI processes, both Ciriello et al. (2016), through their case study, and Bäckström and Bengtsson (2019), via their meta-study, have identified a conspicuous scarcity of research dedicated to the design of these processes. This knowledge gap is also aligned with the findings of our research, and we will delve into relevant studies in the subsequent section. Notably, the ADR approach and the incorporation of an organization in our study provide a pragmatic perspective that enriches our understanding of the underlying challenges and corresponding real-world phenomena. Hence, this paper seeks to explore the following research question (RQ): *How can employee-driven innovation processes be designed with decision points as control and governance mechanisms?*

Theoretical Background

Employee-driven (Digital) Innovation

In recent years, EDI has received increasing attention as a phenomenon in practice and research (Opland et al. 2022). In an era marked by digitization, the frequency of repetitive work is declining, and employees are increasingly engaged in a lifelong learning cycle acquiring invaluable knowledge from complex occupational roles and tasks (Kesting and Ulhøi 2010). The ease of access to information, primarily via the Internet, has further augmented this trend. Consequently, with their creativity, knowledge, and experience, employees present immense potential for creating innovation and transitioning into active participants, initiating, supporting, or even driving and leading EDI processes (Høyrup et al. 2012). The term Employee-driven Digital Innovation (EDDI) has been coined recently, signifying the digital innovation output from the EDI process (Opland et al. 2020; Yoo et al. 2010). Expanding on this, Opland et al. (2022) further define EDDI as EDI processes that may not yield digital outcomes but wherein digital tools have been used in development or implementation. Given this interpretation, we perceive the evolution from EDI to EDDI as a natural progression, considering the steady rise of digital innovations and the ubiquitous use of digital tools in most innovation development processes. For the remainder of the paper, we will refer to EDI for simplicity, as the implications derived from our results apply irrespective of the perspective.

EDI has attracted an array of scholarly attention, contributing to multiple, albeit overlapping, research streams. The subsequent reappraisal offers a snapshot of this diversity without exhausting all relevant topics. A substantial portion of the research is oriented toward behavioral science, examining employees as key actors in EDI and investigating the means to activate and motivate them to contribute their creativity and ideas to organizational development (Bäckström and Lindberg 2018; Opland et al. 2023). Resulting synergies can enhance employees' sense of meaningfulness in their work and foster a stronger identification with the organization, particularly when employees are given a voice and a platform for active participation, such as idea champions (Clercq and Pereira 2021). A parallel stream investigates the role of IT in supporting EDI through digital tools, for example, idea management systems, digital participation processes, and innovation platforms (Bäckström and Lindberg 2019; Krejci et al. 2021; Leible and Ludzay 2022b). At the managerial level, research has explored effective work models and leadership practices that give employees the autonomy and time needed to engage in innovation activities alongside their routine tasks (Flocco et al. 2021; Hansen et al. 2017; Leible and Ludzay 2022a). Another significant stream investigates effective practices concerning EDI initiatives, methodologies, and case studies (Felstead et al. 2020; Holmquist and Johansson 2019). Reflecting Cohen and Levinthal's (1990) absorptive capacity theory, innovation in the context of EDI does not emerge from specific departments but pervades the entire workforce across hierarchical levels and departments. This perspective aligns with Acs et al.'s (2009) knowledge spillover theory of entrepreneurship, which posits that knowledge, rather than being compartmentalized, circulates throughout the organization, thereby stimulating innovation. Consequently, the holistic concept of EDI incorporates an array of theories and approaches.

Stage-Gate Process

For the design of the EDI process, particular focus is given to the decision points, adequately represented by the Stage-Gate processes developed by Cooper (1990). These processes, widely adopted in both academic and practical contexts, provide a framework for innovation, encompassing work phases (Stages) and decision points (Gateways) (Aristodemou et al. 2020; Cooper 2014). Gateways, where gatekeepers such as managers or decision-making boards determine the progression of a project or idea based on predefined (must-meed and should-meet) criteria, play a vital role in the process (Aristodemou et al. 2020; Cooper 2008). Typically, gateways consist of three domains: inputs, deliverables, and outputs (Cooper 1990). Work phases unfold between these decision points, during which idea contributors work on their projects and prepare the deliverables. While Cooper (1990, 2008) has outlined these phases and their activities in a generic sense, individual organizations devise bespoke offshoots and solutions conditioned by their unique contexts. In essence, the maturity of an innovation idea progressively amplifies at varying rates through iterative phases, ranging from idea generation to implementation, testing, and the final launch, or alternatively, it may be discontinued at a gateway. The assessment process must strike a balance between thoroughness and efficiency; while it must be rigorous enough to inform decision-making, it should not be so extensive as to tie up much valuable employee resources (Sethi and Iqbal 2008).

The popularity of the Scrum framework has led to the evolution of the Agile-Stage-Gate hybrid model, a variant of the traditionally static approach of the Stage-Gate process (Cooper and Sommer 2016). This hybrid model is designed to bolster the responsiveness of innovation processes to dynamic occurrences, such as fluctuating user expectations or market conditions captured by external feedback, for example, user tests (Edwards et al. 2019). Bianchi et al. (2020) attest to the added value of this model, highlighting enhancements in development speed, quality elevation, and improved user-centricity of the innovations developed. This variant of the Stage-Gate process is particularly pertinent to our case study, which necessitates a high degree of agility for incorporating feedback from internal test users and (external) customers. The intention is that through this integration, the quality of the innovation will be enhanced, and the ultimately implemented functionalities will meet the spectrum of user and customer expectations. Figure 1 presents an abstracted process featuring an idea/innovation funnel that has been mildly adapted for EDI. We have included a trigger (T) present in all idea submissions, roughly framed the gateways (G) as decision points, and applied an iterative approach within the stages, allowing ideas to be revised after negative decisions at the gateways.

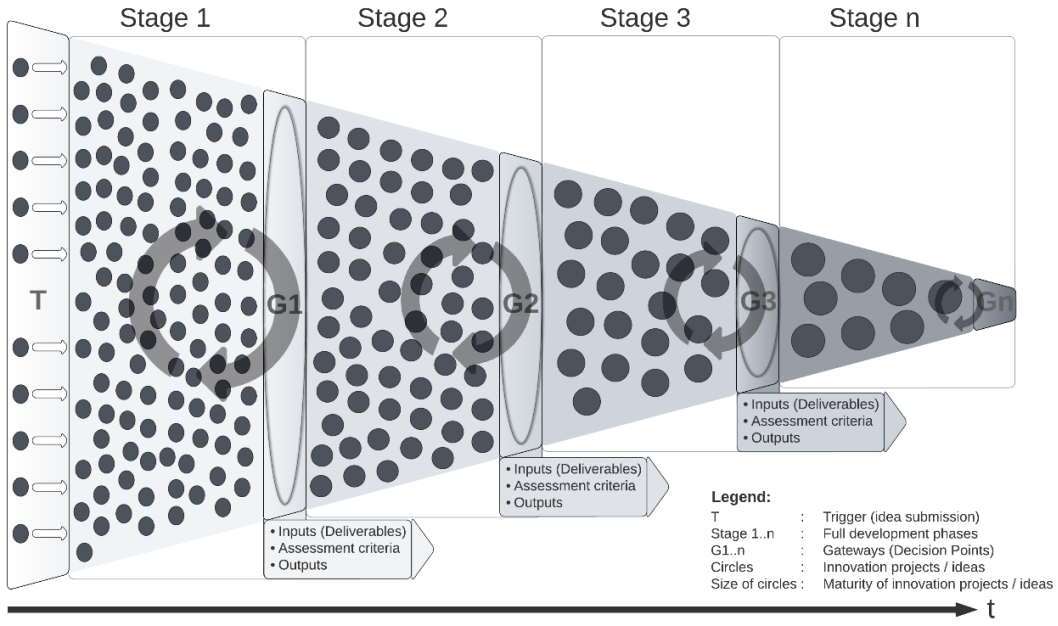

Figure 1. Generic Stage-Gate Idea Funnel in EDI Processes based on Giebel et al. (2009)

(Employee-driven) Innovation Processes with Decision Points

Innovation processes involve a conversion of ideas into, for example, new or enhanced products or services, culminating, upon successful commercialization, in their market launch (Kohli and Melville 2019). Such processes, however, are fraught with risks as they operate under incomplete information and may consume considerable resources, such as labor and capital, without necessarily resulting in successful innovations (Cooper 2014). Therefore, the incorporation of carefully crafted decision points is critical as these enable the assessment of innovation pursuits based on distinct decision mechanisms and bespoke criteria, optimizing resource usage while mitigating associated risks (Bianchi et al. 2020). Serving as gateways, these decision points involve decision-makers, such as management, who review and adjudicate the course of innovative ideas. In the context of EDI processes, decision points also function as synchronization nodes where idea contributors and decision-makers exchange information, fostering an innovation that meets stakeholder expectations. IT should be employed to streamline and facilitate idea submissions by employees and assessments by decision-makers (Ciriello et al. 2016; Opland et al. 2022). With an active EDI culture, the influx of ideas to be appraised is likely to be substantial, posing unique challenges, such as providing timely feedback to idea contributors (Ciriello and Richter 2019).

Despite increasing attention to EDI, there is a lack of research addressing the design of EDI processes, particularly with decision points as mechanisms for control and governance. Tirabeni et al. (2016) focus

primarily on managing the various roles in EDI processes and exploring good practices for their integration without explicitly discussing process design. Other notable studies have approached EDI processes from conceptual (Kesting and Ulhøi 2010; Smith et al. 2012) or empirical (El-Ella et al. 2013; Gambarotto and Cammozzo 2010) perspectives, but these examinations tend to be retrospective rather than concurrent with the implementation of such processes (Bäckström and Bengtsson 2019). Karlsson and Skålén (2015), for example, explored the roles of front-line employees in a service innovation process, while Parjanen et al. (2021) evaluated the impact of a handbook on the EDI process and its employees. However, previous research does not seem to have taken an ADR approach to accompany specifically the formalization and design of an EDI process, making this endeavor promising for new insights. This research project, therefore, heeds the calls of Bäckström and Bengtsson (2019), Weigt-Rohrbeck and Linneberg (2019), and Ciriello et al. (2016) to address this research gap, as aligned with the challenges and RQ elaborated in the Introduction.

Methodology

The research project carried out according to the ADR paradigm of Sein et al. (2011) took place within a consulting and software engineering organization for banking services. The practically-oriented goal is formalizing the existing non-documented EDI process within the organization and its further development, for example, through structured and transparent decision points and IT support. We aim to derive meta-requirements and design principles to generalize our findings (Sein et al. 2011). The ADR approach is particularly suitable for developing an artifact using iterative cycles with the collaboration of researchers, practitioners, and end users from the organization (Cronholm and Göbel 2022). In this process, the design, intervention, and evaluation of the data from which the (improved) artifact is created merge fluidly. In addition to the artifact, which is designed to solve the practical problem, the findings obtained in the process should expand the scientific body of knowledge, similar to the design science research paradigm (Gregor and Hevner 2013; Sein et al. 2011). The underlying problem is thereby classified into a superordinate problem class for which the contributed prescriptive knowledge can be used to design individual solutions, for example, in other organizations facing similar problems. Generated descriptive knowledge can produce valuable extensions about the state of knowledge on the phenomenon and the meaning-giving (scientific) regulations and classifications (Gregor and Hevner 2013). The ADR approach we follow contains a total of four stages: (1) Problem Formulation, (2) Building, Intervention, and Evaluation (BIE), (3) Reflection and Learning, and (4) Formalization of Learning, which we describe from a methodological perspective in the following paragraphs with reference to our research project.

For the research project, we formed an ADR team of four researchers and five experts from different departments at the operational and strategic levels. In the first ADR stage *(1) Problem Formulation*, interviews were conducted with the experts, according to Meuser and Nagel (2009), in order to develop an awareness of the problem. In the interviews, the underlying practical problem and the problem class to be addressed with the artifact were defined and agreed upon in terms of correctness for a researcher-practitioner agreement (Sein et al. 2011). Four experts are themselves running as users in the present EDI process of the organization, each with their own innovation project. One of the experts is also responsible for the holistic EDI strategy. Despite the iterative reflection, the problem did not need to be adjusted after its initial formulation, so it can be assumed that it was well captured.

In the second ADR stage *(2) BIE,* we followed the IT-dominant approach, as we designed a business process with the involvement of practitioners who either go through this process themselves or are decision-makers in it (Sein et al. 2011). Thus, they have a direct influence on the design process. An accompanying organizational commitment is to be achieved through regular and intensive exchange with the users (Petersson and Lundberg 2016). Based on the understanding and position of the problem, the current state-of-the-art was captured by a literature review, according to vom Brocke (2009), in order to design the first version of the artifact. Here, we collected search terms, including keywords from known and relevant research papers, and found papers via Google Scholar. From there, we formed the search term: *("innovation process" OR "employee-driven innovation") AND ("gates" OR "quality gates" OR "decision" OR "decision points").* This search term was used in the following databases "Science Direct," "Springer Link," "IEEE Xplore," "ACM DL," "JSTOR," "Taylor & Francis," "beluga," and "AISeL." Among other reasons, these databases have been selected by proximity to the subject area, recommendations from peers, or initial use of Google Scholar by relevant findings. Filtering was done in several phases, starting with the title, then the abstract, and finally, a full-text analysis. Overall, 28 papers were found to be relevant.

In total, three BIE cycles were conducted, while the evaluation method in the first cycle consisted of five interviews with experts from the ADR team. In the second cycle, an online focus group (FG), according to Stewart and Shamdasani (2017), was realized with thirteen individuals from inside and outside the ADR team to discuss potential enhancements of the EDI process, decision points, and deliverables. In the third cycle, interviews were conducted with three individuals outside the ADR team. All evaluation steps were audio recorded, transcribed, and coded for analysis. The overall approach and resulting contributions can be found illustrated in Figure 2. The individual steps from this figure are described in Table 1.

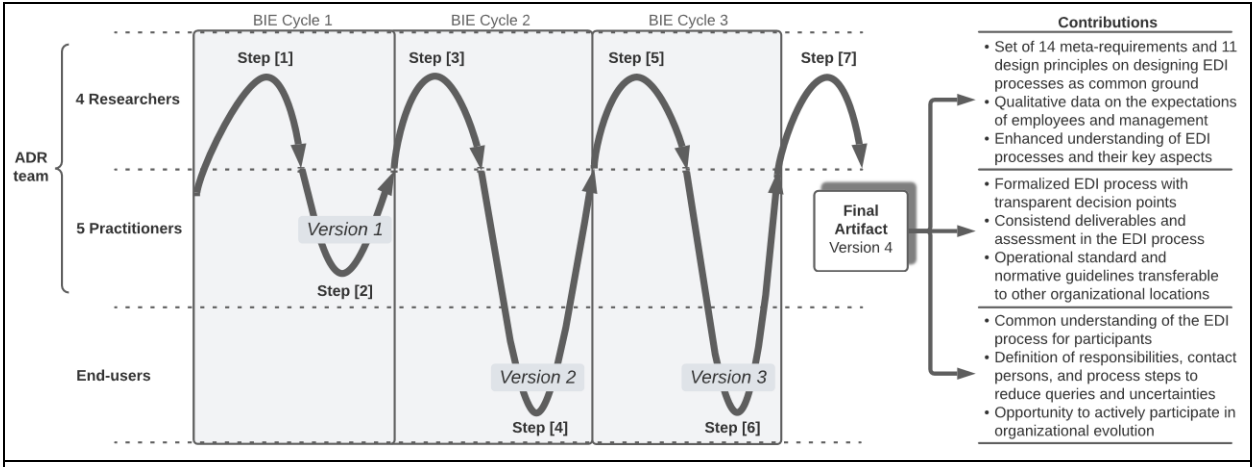

Figure 2. Project-related BIE Schema based on Sein et al. (2011)

Step	Data Input(s)	Processing	Data Output(s)
1	Formulated problems from stage (1) Problem Formulation	Literature review according to vom Brocke (2009)	Artifact V1 (EDI process with superficial tabular decision points)
2	Artifact V1 (EDI process with superficial tabular decision points)	Five expert interviews, according to Meuser and Nagel (2009), with experts in the ADR team	Evaluation data (interview feedback) for artifact V1 focused on deliverables, visualization, scope, and commitment
3	Evaluation data (interview feedback) for artifact V1	Refinement of the artifact according to the evaluation data to build V2	Artifact V2 (EDI process with superficial decision points). Increased level of detail
4	Artifact V2 (EDI process with superficial decision points)	Focus group discussion, according to Stewart and Shamdasani (2017), with thirteen participants	Evaluation data (group feedback) for artifact V2 focused on decision points. Detailed concepts for the three final decision points
5	Evaluation data (group feedback) for artifact V2. Detailed concepts for the three final decision points	Refinement of the artifact according to the evaluation data to build V3. Design of the decision points	Artifact V3 (EDI process with detailed decision points). Reduced complexity. Decision points with inputs, deliverables, and outputs
6	Artifact V3 (EDI process with detailed decision points)	Three expert interviews, according to Meuser and Nagel (2009), with experts outside of the ADR team	Evaluation data (interview feedback) for artifact V3 focused on governance, decision points, IT support, acceptance, and control
7	Evaluation data (interview feedback) for artifact V3	Refinement based on the evaluation data to build the final artifact	Final artifact (V4)

Table 1. Steps of the BIE Process with Data Input(s), Processing, and Data Output(s)

In the sense of the ADR stage *(3) Reflection and Learning*, accompanying after each BIE cycle, the data and the resulting findings were reflected to integrate them into the continuing artifact version in order to

improve it and to derivate learnings to be able to generalize the resulting solution (approaches) to the superordinate problem class. This ensures that we also contribute to the body of knowledge in addition to addressing a practical problem. Furthermore, the evaluation data was constantly checked to see if any adjustments to the original problem formulation had to be made, but this was not necessary. For the final ADR stage *(4) Formalization of Learning*, the results are lifted as a problem instance to a generic solution by defining MRs and DPs for EDI processes, which are considered and embedded in the final artifact.

Results

ADR-Stage 1: Problem Formulation

The organization in which the research project takes place is a family-run, medium-sized consulting and software engineering organization that is active in the banking sector and acts secondarily as a financial services provider. The headquarters is in Germany, but other locations are distributed in Europe. Our project is located at the headquarters. In five interviews [I1 - I5] with, among others, the person responsible for the EDI strategy, we derived and agreed on the problem and objective of the project, see Table 2. An EDI process is to be established in order to increase the (economic-oriented) innovation capability and the inclusion of the employees with their creativity [I1 - I5]. Participation in organizational development is desired to be integrated into the culture and become a matter of course [I4].

ID	Position Interviewee	Perspective	Duration
I1	Senior consultant in agile environments. Responsible for his own EDI project for a new consulting offering	User	34 minutes
I2	Consultant and developer in the field of legacy systems replacement. Responsible for a product enhancement	User	18 minutes
I3	Managing consultant and in charge of test automation. Responsible for a product enhancement	User	17 minutes
I4	Partner and in charge of a business unit. Also, the process owner and responsible for the EDI process itself	Management	36 minutes
I5	Managing consultant in project management. Responsible for a product and consulting service enhancement	User/ Management	30 minutes

Table 2. Interviews with Practitioners of the ADR Team for (1) Problem Formulation

Innovation ideas have been collected and initiated by directly approaching employees about this participation possibility [I1 - I3; I5], so an informal EDI process has been formed, which, however, is not documented and has no standardized structure and IT support. This leads to the problem that EDI projects are approached and assessed differently, no formalized documented and simple procedure can be disseminated, and trust and acceptance among employees suffer without transparency [I4]. In addition, there are no specific contact persons or defined expectations for innovative ideas, so coordination of running EDI projects is currently held with the direct supervisor in a siloed manner without any IS [I1; I3]. There are no defined timeframes or specifications; the idea contributors manage their projects entirely without additional resources or time support [I1 - I3]. For improvement, synchronization points should be introduced to fulfill an essential purpose; the management selects the ideas for the next phase in the positive case, thus committing support through encouragement, resources, and workload reduction in the operational area [I1; I3; I5]. The basic practical-oriented problem addressed by this research project is thus the capture and formalization of the existing informal EDI process and its further development with defined decision points for central governance and control gateways that synchronize the wishes and expectations of idea contributors and management. In doing so, however, we delineate our work in that we do not examine the selection process itself in terms of the appropriate mechanisms such as crowd voting, thumbs up/down, and qualitative or quantitative assessment procedures for their effectiveness as Ciriello et al. (2016) and Riedl et al. (2010) did. We focused on qualitative and finer-grained approaches to assessment in our EDI process. The deepening of this aspect would be a next step to expand our artifact.

In the scope of the literature review, the problem was also considered from a scientific point of view. The EDI approach addresses the core idea of improving innovative capability by establishing an innovation channel that involves employees and their creativity in the form of innovative (economic-oriented) ideas in

organizational development (Høyrup et al. 2012; Opland et al. 2020). A formalized and transparently sophisticated (IT-supported) process is advantageous for the control and governance of the project, but not a trivial endeavor to design one that is accepted, trusted, and effective (Bäckström and Lindberg 2019; Bianchi et al. 2020). Several related challenges that can occur are exemplified in the Introduction section. We approached our endeavor also EDI-oriented with, among others, employees currently going through the informal process themselves. They have already formed practical expectations and wishes that increase the quality of the statements and the probability of designing an accepted and trusted process. Overall, we have set the problem class to be identified and overarched on the *(organizational) challenge of designing an individual EDI process with decision points as control and governance mechanism*.

ADR-Stage 2: Building, Intervention, and Evaluation (BIE)

This section, which describes the consolidated results of the three BIE cycles, is divided into two subsections. In the first, the design of the EDI process is described and presented. In the second, the same is done for the decision points as sub-artifacts. For the evaluation, interviews and an online FG were conducted as described in the Methodology section. In order to obtain an overall view, all evaluation activities are listed in Table 3, sorted by BIE cycles, which will be referred to in this section using the IDs to link the statements. The BIE cycle number corresponds to the artifact version evaluated in it. The first BIE cycle interviews (I6-I10) are with the experts from the (1) Problem Formulation and ADR team. The online FG from the second BIE cycle is mixed with thirteen people from the ADR team and other potential users of the EDI process. It was moderated, recorded, and encoded by one of the researchers. The interviewees in the third BIE cycle (I11–I13) consist of people outside the ADR team.

ID	BIE Cycle	Position Interviewee(s)	Perspective	Duration
I6	1	Senior consultant in agile environments. Responsible for his own EDI project for a new consulting offering	User	25 minutes
I7	1	Consultant and developer in the field of legacy systems. Responsible for a product enhancement	User	16 minutes
I8	1	Managing consultant and in charge of test automation. Responsible for a product enhancement	User	15 minutes
I9	1	Partner and in charge of a business unit. Also, process owner and responsible for the EDI process	Management	23 minutes
I10	1	Managing consultant in project management. Responsible for a consulting service enhancement	User/ Management	30 minutes
FG	2	An online focus group (FG) with 13 participants on different hierarchical levels. There were also potential users of the EDI process included	User/ Management	90 minutes
I11	3	Managing consultant of digital banking. Responsible for innovation management in his business unit	Management	30 minutes
I12	3	Head of business development for the payment business unit. One of the responsible managers for the overall innovation process of the organization	Management	30 minutes
I13	3	Head of user experience in an open innovation collaboration lab. Responsible for unifying innovation processes and breaking down silos	Management	30 minutes + e-mail exchange

Table 3. Artifact Evaluation over the (2) three BIE Cycles

Artifact: Stage-Gate-based Employee-driven Innovation Process

In addition to a deeper understanding of the problem, the literature review was also conducted to identify appropriate approaches for designing the initial artifact. Based on the problem description, the ADR team agreed upon a Stage-Gate approach early on, which fulfills the framework of the desired EDI process with different stages, phases, and decision points as synchronization and control gates (Cooper and Sommer 2016). It also serves as the foundation to design a clear path from idea generation to implementation. As in the Stage-Gate approach, we use must-meet and should-meet criteria for the decision points in addition to the required deliverables to facilitate transparency and decision-making in the process (Aristodemou et al.

2020; Cooper 2008). Between the decision points are work phases in which we follow the theory of psychological ownership (You et al. 2022). You et al. (2022) state in their work that the employees' innovative behavior is motivated and activated by the transfer of responsibility of innovation, for example, in the form of intangible project management of their ideas, within the framework of the organizational innovation climate. Going further, this requires creating a high degree of autonomy for employees in the work phases of the Stage-Gate process. In this context, the study by Hansen et al. (2017) found that managers perceived this kind of leadership behavior as more demanding but efficient. This is underscored by the need to establish the necessary conditions through an innovation-friendly culture and leadership for the EDI process to be effective (Høyrup et al. 2012; Opland et al. 2023). Furthermore, as Felstead et al. (2020) note, it is beneficial to establish and encourage support and training accompanying EDI endeavors in the organization to familiarize employees with the process and the IT tools. In our case, we focus the process on time from the problem definition and idea generation and leave out the initiation (trigger).

The initial artifact model was kept simple to create a phase-based frame and then to capture and formalize the informal EDI process through interviews with the ADR team. The base models used were those of Mishra et al. (2020), Cooper and Sommer (2016), Tavernaro et al. (2021), Cooper et al. (2016), and our adapted Stage-Gate model, as seen in Figure 1. The funnel was adopted as a symbolic visualization of the idea funnel (Mishra et al. 2020). The decision points were mainly adopted from the model of Cooper et al. (2016). We also added a new phase titled prototyping, with the knowledge that the idea contributor does not necessarily do all the implementation but designs and tests with middle or high-fidelity (non-functional) prototypes. Such a phase is also found in the model of Tavernaro et al. (2021). Here, risk minimization plays a major role in order to ensure, as far as possible, that value is generated since, looking ahead, significantly more resources are released in the following phases.

During the evaluation steps, the artifact and sub-artifacts were demonstrated, implemented, and discussed. There was repeated encouragement regarding the formalization of the EDI process (I6; I8-I10; FG). Due to the focus on the economic exploitation of an EDI project in the organization, the potential analysis and the business model behind the idea should be addressed before prototyping (I8). Significant reference was made to the freedom between the stages to maintain the exploratory and experimental character (I6). There should also be contact persons, like idea mentors, who can provide support (I6; I8; I10; FG). The stages of the EDI process are fuzzy and should not represent a waterfall model; they may overlap and contain multiple iterations (I9). The concept of an idea repository was mentioned, which can be used, for example, for retained ideas or EDI-oriented events such as hackathons (I7; I9; FG). It is also mentioned that dedicated employees should be rewarded for their efforts, for instance, by reducing targets to achieve a bonus (I10). The goal of what kind of output an EDI project should produce is considered dynamic and should be treated as such, as ideas can transform during the innovation process (I6-I10). There are also upstream and downstream processes, which in turn have pre- and post-conditions that must be considered covering the complete picture of the organizational innovation process (I9-I10).

In the interviews in the third BIE cycle, people from management were interviewed. Statements were that innovation ideas should have an opportunity to move directly into the higher-level business unit for realization and implementation if they are of great relevance (I11-12). In the artifact and decision points, it should also emerge that only as the idea matures should customers or partners be involved, whose feedback should be based at least on that of a middle or high-fidelity prototype, for example, an extensive click dummy or mockup (I11-13). However, the issue of overengineering must be considered since it should not yet be an implementation effort. There was agreement, in particular for the final elements of the EDI process, in that a business model, a prototype, and proof of the idea's potential have to be available in order to make further decisions (I11-13). There should also be minimal barriers to participation, either formal or technical. Preferably the EDI process is accompanied by a holistic, easy-to-use IT tool like an innovation platform such as an idea management system to centralize activities and foster collaboration (I12-13). This further enables data analytics through IT tools. For example, the times between decision points could be measured to actively offer support to the EDI teams if they take an exceptionally long time for a stage and further continuously improve the EDI process (I13). The artifact's final version is shown in Figure 3. Given minimal changes in the last BIE cycle, subsequent cycles would likely only affect minor details.

The designed EDI process comprises three stages, four concrete work phases, and three decision points. The latter will be discussed in more detail in the next section. The coverage of the stages by in-process IT tools in our use case was fragmented. All work phases between decision points run with a high degree of

autonomy of the EDI teams, as highlighted by the theory of psychological ownership (You et al. 2022), and in an agile manner so that changes can be implemented in short times. For this purpose, the employees are internally encouraged to follow the Scrum approach (Schwaber and Sutherland 2020). They are already familiar with this procedure, so no friction or tension points are to be expected from an entirely new one (Dikert et al. 2016). This strategy mix is intended to reduce the disadvantages of a purely planning-driven approach in order to achieve practical advantages, for example, a higher customer centricity or faster time-to-market, as described by Port & Bui (2009) and Cooper (2014). Team size may change over time, especially as the respective EDI projects reach a higher level of maturity and more resources are allocated.

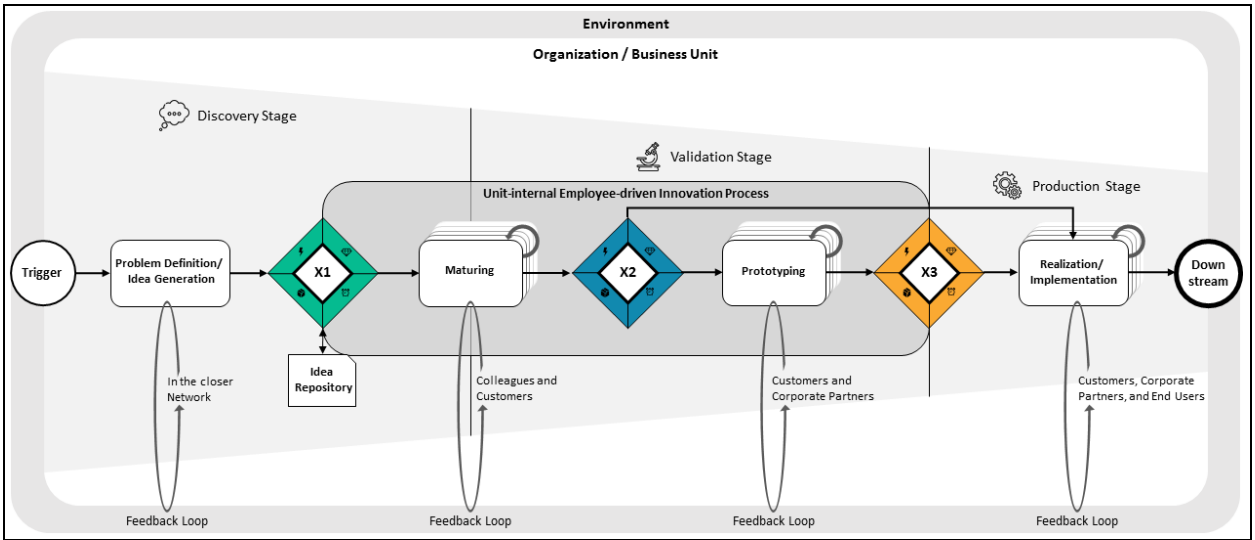

Figure 3. Final Artifact (Version 4) of the EDI Process based on Mishra et al. (2020), Cooper and Sommer (2016), Tavernaro et al. (2021), and Cooper et al. (2016)

The trigger as a start symbolizes an impulse by an internal or external event such as an idea competition, customer feedback, or a detected problem from the employees' daily work. The problem is then analyzed and defined in more detail, and an initial idea is worked out with feedback primarily from the internal network. During decision point 1 (X1), the idea can be transferred to the digital idea repository if, for example, the relevance is seen, but an economical or technical implementation is not yet recognized as possible, or the required know-how is missing. A positive X1 decision is followed by the unit-internal maturity phase, in which the idea evolves into an EDI project by proving its potential through market analyses and initial customer feedback. During decision point 2 (X2), a decision is made whether the EDI project will be developed further within the unit or transferred to a higher business unit because it is particularly relevant or requires resources that the unit itself cannot provide. Alternatively, the EDI project may undergo an iteration loop to mature further. In the prototyping phase, a medium to high-fidelity prototype is developed to evaluate and enhance it with customers and corporate partners and prove a direct demand. For decision point 3 (X3), additional people in the unit must be convinced of the EDI project. If iterations are no longer necessary, the fourth phase can be initiated for realization and implementation, in which a minimum viable product is developed. How things continue downstream depends on various factors. For example, the EDI project can be directly transferred into a revenue-generating project by a customer who has shown interest during the evaluation and stays unit-internal. The projects' outputs can also extend the organization's product range, after which downstream teams take over further steps.

Sub-Artifacts: Decision Points for the Employee-driven Innovation Process

Based on the literature analyzed, the decision points were also initially designed with transparent criteria, deliverables, inputs, and outputs. This aimed to ensure that a clear and transparent idea screening and assessment process is achieved for all decision points (Bäckström and Lindberg 2019; Ciriello et al. 2016). The breakdown of criteria and deliverables was taken into account by Cooper (1990, 2008, 2014) but slightly adapted because some of the information, such as scorecards, are not practical to fill in due to the assumed low information of an employee at the beginning of the EDI process. In the interviews, the decision

points were generally viewed positively as gateways for deciding on the course of action for EDI projects, the allocation of resources, and a reflection of the previous practice (I1; I3; I6). However, it was noted that this could also mean a restriction of creativity if it is already certain at the beginning of the process what the final result should be or if the focus is on feasibility early on (I1; I7; FG). In this context, attention should be paid to an abstract design and flexibility of the expected deliverables (I1-I2). In terms of complexity, care should be taken to ensure that the number of criteria is low and laid out in such a way that they can be discussed (I4; I8). They should also be clearly worded so there is no room to misinterpret the requirements (I1). Templates should be created and provided to employees so they can focus on creativity rather than layout (I1; I4-I5; FG). Risk considerations should also be included in the decision points to create awareness (I5). In terms of time, when an employee and the deliverables are ready, they should make a self-determined appointment with their supervisor to initiate the next decision point. Ideally, the complete decision process should be IT-supported, but this was not yet realized during our project. The resulting first decision point is exemplified in Figure 4. Due to space limitations, the second and third decision points and all artifact versions are provided via Zenodo (Leible et al. 2023).

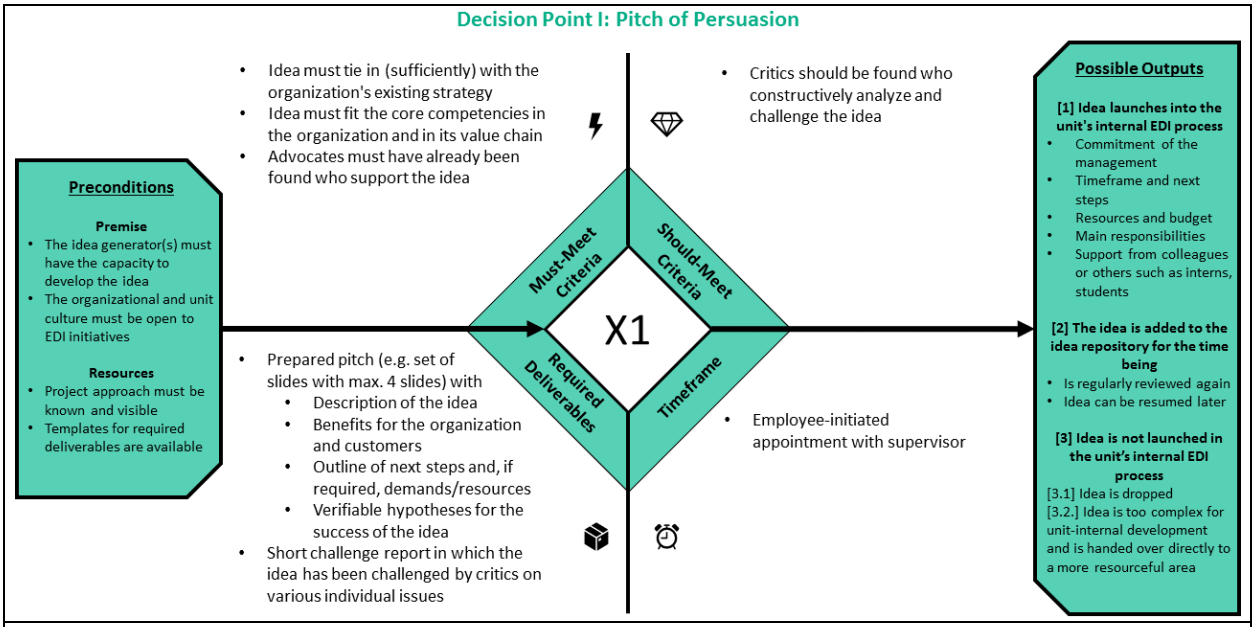

Figure 4. The Final Version of the first Decision Point of the EDI Process

ADR-Stage 3 and 4: Reflection, Learning, and Formalization

In this section, we merge the (3) Reflection and Learning and (4) Formalization of Learning ADR stages to consolidate our findings. Rigorous analysis was conducted across all BIE cycles, amalgamating insights from the literature review, interviews, and FG discussions. This iterative, reflective learning and formalization process facilitated the generation and refinement of pertinent MRs to address the RQ and problem class of designing EDI processes with decision points. These MRs provided the foundational rationale for our artifact's development, influencing its design and adaptation to the situational context of the organization under study. These MRs bear significance extending beyond the specific organizational context, offering a high-level perspective and serving as a common ground for designing EDI processes in various environments. Our comprehensive list of MRs and their description can be found in Table 4.

ID	MR-Name	Description
MR1	User-friendly Design	The EDI process should be user-friendly and intuitive, designed in a way that can be easily understood and used by all levels of employees, ensuring widespread adoption and use
MR2	Transparency and Accountability	The EDI process should ensure transparency and open communication, fostering trust among employees and managing expectations and responsibilities for all stakeholders

MR3	Goal-Oriented	The EDI process should be designed with clear goals that align with overarching organizational objectives and strategies
MR4	Idea Management	The EDI process should include an idea management system, including a repository for storing and revisiting promising ideas
MR5	Decision Points	The EDI process should include clearly defined decision points to ensure timely review, synchronization, and risk management
MR6	Empowerment	The EDI process should allow a high degree of autonomy during work phases, fostering creativity and ownership
MR7	Agile and Iterative	The EDI process should adopt an agile, iterative approach, enabling flexibility and adaptability to changing conditions or new findings
MR8	Internal and External Factors	The EDI process should take into account both internal and external environments, incorporating feedback, technological advancements, and market trends
MR9	Streamlined Process Flow	The EDI process should have a clearly defined scope, integrating seamlessly with upstream and downstream processes and defining distinct transfer conditions
MR10	IT Integration and Interoperability	The EDI process should be integrated with IT infrastructure, providing easy access, control, and governance capabilities and ensuring interoperability with existing IT systems to enhance information flow and collaboration
MR11	Analytics Capability	The EDI process and the utilized IT tools should incorporate analytic capabilities, enabling the tracking of key metrics and providing actionable insights for continuous improvement
MR12	Scalability and Efficiency	The EDI process should be scalable to manage varying volumes of ideas, ensuring timely and efficient evaluation and implementation
MR13	Employee Engagement and Acceptance	The EDI process should foster employee engagement and acceptance, encouraging active participation and contribution
MR14	User Training and Support	The EDI process should include provisions for adequate training and support, ensuring that employees can effectively participate in it and use the respective IT tools

Table 4. Overview of derived Meta-Requirements for EDI Processes

The MRs encapsulate central directives for the design of EDI processes with incorporated decision points serving as control and governance mechanisms. Subsequently, these MRs were analyzed thoroughly, focusing on their inherent challenges and intersecting themes. Through this analysis, design solutions were identified and consolidated from all data collated in our research project to address the MRs, resulting in a set of 11 DPs. These DPs offer prescriptive guidance, facilitating the design of bespoke EDI processes tailored to individual organizations while considering their unique circumstances. During our ADR project, we utilized these DPs in the development of the EDI process, working collaboratively with the organization involved. Table 5 lists the DPs and the respective MRs they address.

ID	**DP-Name**	**Description**	**MRs addressed**
DP1	Foster Employee Involvement	Engage employees at all levels in the design process to promote inclusivity and harness their diverse perspectives and expertise	MR1, MR2, MR13
DP2	Establish Transparent Process Phases	Define clear and comprehensible EDI process phases to facilitate process and output control as well as governance and a common ground	MR1, MR2, MR3
DP3	Set Clear Decision Points	Design decision points with goals, assessment criteria, deliverables, preconditions, and potential outputs to establish plain expectations for all stakeholders	MR2, MR3, MR5
DP4	Tailor Decision-Making Models	Utilize decision-making models that align with the expected effort for idea screening and assessment, considering appropriate criteria and scalability	MR5, MR12

DP5	Empower EDI Teams	Promote autonomy for EDI teams during agile and iterative work phases within defined goals and decision points while ensuring accessible support resources are available when needed	MR3, MR6, MR7, MR13
DP6	Embrace Knowledge Exchange	Incorporate the internal and external environments through various sources of knowledge and exchange to enrich the innovation process	MR6, MR8
DP7	Leverage IT Tools	Utilize interoperable IT tools for digital process control, idea management, governance, and data analytics, enabling efficient and streamlined operations as well as continuous improvement	MR4, MR9, MR10, MR11
DP8	Ensure Management and Resource Commitment	Assurance of management commitment to allocate necessary resources and responsibility for the further development and implementation of an EDI project when the idea gets approved	MR2, MR5, MR6, MR14
DP9	Define Involvement Rules	Establish explicit guidelines on when and at which maturity level of an idea what stakeholders should be involved in the EDI projects	MR2, MR8
DP10	Establish a Participatory Environment	Provide training, user guides, ongoing support, and communication channels for the EDI process and foster a culture of learning and innovation	MR6, MR13, MR14
DP11	Incorporate the Innovation Ecosystem	Define guidelines and conditions for transitioning EDI projects between downstream and upstream processes, promoting coordination, collaboration, and information flow in the innovation ecosystem	MR2, MR9

Table 5. Overview of derived Design Principles for EDI Processes

Discussion and Conclusion

Within this ADR-based project, we sought to address the RQ of designing EDI processes with decision points serving as control and governance mechanisms to create a common ground for all stakeholders involved. This was achieved through practical investigation adhering to the ADR stages over three BIE cycles within a banking sector consulting and software engineering organization. The outcome was an organization-specific EDI process equipped with decision points as sub-artifacts. All insights garnered from each stage were reflected upon, formalized, and generalized into fourteen MRs, with eleven corresponding DPs derived to address them. These form the primary contribution of our study, in alignment with the ADR paradigm (Sein et al. 2011), contributing prescriptive knowledge (Gregor and Hevner 2013).

As EDI is an interdisciplinary stream of research spanning disciplines such as management, innovation, and IS, our work traverses these domains. The literature revealed that the design of innovation processes is a well-established and expansive research field, abundant with anecdotal findings, some of which yield contradictory results (Bianchi et al. 2020). However, our focus was on EDI process design, leading us to several conceptual and empirical studies on related topics that enriched our understanding and informed our artifact design from multiple perspectives. For example, EDI-related studies focused on key antecedents of EDI (Smith et al. 2012), the concept and drivers of EDI (Kesting and Ulhøi 2010), participation factors in EDI processes (El-Ella et al. 2013), the employee voice in EDI endeavors (Gambarotto and Cammozzo 2010), employee roles in EDI processes (Tirabeni et al. 2016), and management practices promoting EDI (Hansen et al. 2017). Moreover, Bäckström and Bengtsson (2019) list EDI processes in their research agenda as under-researched. We also drew information from Stage-Gate-related literature, as we adapted from Giebel et al. (2009), a generic (funnel) process illustrated in Figure 1, as well as from Cooper (2008), the concept of decision points that informed the designed EDI process shown in Figure 3. By synthesizing EDI and Stage-Gate literature, our study addresses the identified research gap elucidated in the Introduction and Theoretical Background sections.

This research contributes notably to the extant literature and body of knowledge, primarily within the realms of EDI and ADR. It broadens the theoretical comprehension of EDI by devising an expansive set of

MRs and their corresponding DPs, furnishing explicit prescriptive guidelines for designing EDI processes that incorporate decision points as control and governance mechanisms within organizations. To the best of our knowledge, these represent the inaugural MRs and DPs in this context. Highlighting the IS research perspective, we emphasize the significance of comprehensive IT tool support to orchestrate the EDI process and harness the creative potential, corroborating Bäckström and Lindberg's (2019) observations. Our case study showed a fragmented IT toolchain that included only an idea repository, lacking a centralized digital management tool. This paucity posed substantial challenges to the process in terms of initiation, information retrieval, communication, and documentation. As expectedly, interviewees on the employee level stated that they prefer the incorporation of user-friendly IT tools into daily work routines over email-based idea submissions, thereby underscoring these tools' role as facilitators in the EDI process, aligning with Jarle Gressgård et al.'s (2014) findings. Echoing Ciriello and Richter's (2019) assertions, IT tools can substantially enhance idea screening and assessment efficiency, mitigating the potential bottleneck caused by an influx of idea submissions resulting from active employee participation (Opland et al. 2022). This resonates with our case study, wherein the time commitment from operational tasks consistently led management, acting as decision-makers, to extend the timeframe required for idea evaluation. As such, we advocate for targeted decision-making training for management to make difficult decisions, thereby circumventing the dilemma identified by Cooper (2008) and Behrens & Ernst (2014), where managers hesitate in halting ideas and projects due to personal attitudes or interpersonal relationships.

During the design phase of the EDI process, significant emphasis should be placed on discerning the deliverables expected at each decision point. This scenario underscores the profound influence of dependency, control, and governance mechanisms on the EDI process's design and outcome, a dynamic particularly emphasized in contemporary digitalized innovation processes, as per Nambisan et al. (2017). In this vein, our case study accentuated the importance of providing comprehensive training on the EDI process and the digital tools essential for fostering digital innovations. This educational component is crucial for bolstering employee learning and empowerment and promoting innovative behavior, as per the assertions of Clercq and Pereira (2021) and Holmquist and Johansson (2019). Furthermore, the established guidelines within the EDI process can be employed to incorporate elements of open innovation. This can be achieved by embedding contact between idea contributors and stakeholders, such as customers, corporate partners, or end-users, into the requirements of decision points enabling feedback on innovative ideas, a practice underscored by Dziallas and Blind (2019) as beneficial for fostering innovation processes.

From a practical view, we concur with the findings and expectations of Opland et al. (2022), projecting the proliferation and growing significance of the EDI phenomenon. This evolution is driven by our knowledge-oriented society and the democratization of innovation processes, where employees are increasingly equipped with IT tools that empower them to assume the role of innovators (Yoo et al. 2010). Concurrently, we anticipate a consistent reduction in repetitive tasks owing to emerging technologies such as robotic process automation and artificial intelligence. This shift will lead employees to grapple with more intricate tasks and engage in progressive job development, thereby fostering an ambidextrous mode of operation (Leible and Ludzay 2022a). For these evolving circumstances, our consolidated MRs and derived DPs can serve as a foundational framework to shape individual EDI processes within organizations. Our findings from the use case in the banking sector offer transferability to other economically oriented sectors, considering the high-level perspective provided by the MRs and DPs. Furthermore, the designed EDI process avails a customizable template that outlines decision points and their elements. A notable challenge during decision point design was to strike a delicate balance between ambiguity and precision.

Our research is not without limitations. A key constraint is the lack of long-term testing of the developed EDI process. Long-term testing could provide more in-depth insights through several run-throughs of EDI projects, thereby allowing for further refinements of the developed MRs and DPs. Our early focus was on a hybrid Stage-Gate model owing to practical issues and requirements, though we do not assert this model to be universally optimal for EDI processes. Within this context, we have presupposed its appropriateness; however, due to limited assessment data, we did not formulate MRs or DPs to advocate for a specific process model. The economic-centric EDI strategy followed by the organization in our case study means our results primarily concern EDI processes anticipated to yield commercial outputs. Hence, exploring EDI processes that enable non-economic innovations common within the public sector (Gambarotto and Cammozzo 2010; Opland et al. 2021) could be a compelling future research direction. Due to the fragmented IS coverage within the organization's EDI process, we recommend research to delve further into specific IS orientations. Methodologically, ADR projects present challenges in generalizing reflected results for transferring the

findings of individual problem instances to the higher-level problem class. Therefore, further research is warranted to apply, evaluate, and refine the MRs and DPs, thereby validating our results more robustly.

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