Scandinavian Journal of Information Systems

Volume 35 | Issue 2 Article 2

12-31-2023

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Sebastian Reiners
University of Muenster, sebastian.reiners@ercis.uni-muenster.de

Andreas Hermann
University of Münster, andreas.hermann@ercis.uni-muenster.de

Ann-Kristin Cordes
University of Kiel, akc@informatik.uni-kiel.de

Torsten Gollhardt
University of Muenster, torsten.gollhardt@ercis.uni-muenster.de

Jörg Becker
University of Muenster, joerg.becker@ercis.uni-muenster.de

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Sebastian Reiners
University of Münster, Department for Information Systems, Germany
sebastian.reiners@ercis.uni-muenster.de

Andreas Hermann
University of Münster, Department for Information Systems, Germany
andreas.hermann@ercis.uni-muenster.de

Ann-Kristin Cordes
FHV University, Digital Business Transformation, Austria
ann-kristin.cordes@fhv.at

Torsten Gollhardt
University of Münster, Department for Information Systems, Germany
torsten.gollhardt@ercis.uni-muenster.de

Jörg Becker
University of Münster, Department for Information Systems, Germany
becker@ercis.uni-muenster.de

Abstract. The integration into digital platforms is a vital countermeasure for retailers to counter rising customer expectations, emerging competition, and rapid technological developments. To break down the behemoth of integration projects into smaller steps, we synthesized a procedure model incorporating requirements from scientific literature and practice. We applied design science research to derive a well-structured and scientifically sound artifact that was evaluated in eleven interviews with practitioners. Our analysis revealed that integrating retailers into digital platforms can be standardized for different types and depths following specific guidelines outlined in the proposed procedure model of this work. Furthermore, the integration shows many similarities to other domains, especially when considering small- and medium-sized organisations. However, there are some peculiarities for retailers that could rationalize a distinct view on the integration.

Key words: digital platform, integration, retail, procedure model, design science.

Accepting editor: Katrin Jonsson

1 Introduction

Retailers are confronted with accelerated technological developments in the digital transformation, including increasing technical and socio-economical expectations and emerging competition (Barann et al., 2019; Hagberg et al., 2017). To cope with these challenges and prevent loss of revenue and sales, various countermeasures such as digital innovations for enhancing the local shopping experience (Hagberg et al., 2017) or the pursue of omni-channel retailing (Adivar et al., 2019; Chen et al., 2018) were proposed. However, the digital transformation is a challenging process that often results in retailers exhibiting risk-aversion towards transformation and innovation caused by structural and cultural barriers (Ramos et al., 2022). In light of manifold possibilities, digital platforms emerged as the poster child of digital transformations for retailers (de Reuver et al., 2018; Pauwels et al., 2011). Utilizing network effects, digital platforms allow the acquisition of a wide range of potential customers while limiting the buy-in costs of individual participants (Hänninen et al., 2018). Buy-in costs, in this context, refer to the overhead associated with integrating the retailer into the digital platform (Chen et al., 2018).

However, the integration is far from trivial and entails many challenges known from system integration (Chester, 2001; Madni & Sievers, 2014). Further complicating, especially small and medium retailers have limited resources, knowledge gaps, or missing capabilities hindering such an endeavour (Brunswicker & Ehrenmann, 2013). Hence, a practical approach is needed that breaks down the behemoth of an integration project into manageable and easily understood action items (Barann et al., 2019). Addressing this need, this work's research objective is synthesizing a procedure that guides the integration of retailers' IT systems into a digital platform. This entails designing a sequence of logical steps capable of mediating the integration process in a time-logical manner.

We opted to design a procedure model, a widely used artifact pattern in information systems research, to present our results comprehensively. Following the design science research (DSR) methodology by Peffers et al. (2007), we designed a preliminary model by transforming requirements derived from scientific literature into actionable items, i.e., steps of the model (Möller et al., 2020). Adding a practical perspective (Hevner et al., 2004), the model and requirements were evaluated and refined in two iterative design science research phases in interviews with practitioners. Ultimately, we present nine requirements and the procedure model of digital platform integration consisting of five phases and several sub-steps.

The present article provides three significant contributions to the body of knowledge for platform integration:

1. We develop a new artifact dispensing steps and their order for integrating new complementors into a digital platform in a time-logical manner.

2. We disclose that the integration of retailers into digital platforms is less specific than described by literature. The integration process for digital platforms can be constructed rather generic and has only few retail-specific requirements.

3. We disclose possible directions for the digital transformation journey of retailers and small and medium-sized enterprises when faced with technological developments and pressure to innovate.

2 Theoretical background

2.1 Digital platforms

Generally, *platforms* can be conceptualized as a stable core with a variable periphery (Baldwin et al., 2009). Platforms that mediate between distinct groups are, likewise, denoted as multisided platforms (Boudreau & Hagiu, 2009). By linking distinct groups, these platforms foster so-called network effects (de Reuver et al., 2018), implying that as the adoption rate of a technology increases, so does its utility (Arthur, 1989). Using these basic concepts of platforms, it is possible to differentiate non-digital platforms and *digital platforms*. The former is typically illustrated as an over-arching design hierarchy, whereas the latter does not necessarily have a single owner dictating the design hierarchy (de Reuver et al., 2018; Henfridsson et al., 2014).

Research on digital platforms usually differentiates between a sociotechnical and a technological perspective (de Reuver et al., 2018). The technical view conceptualizes digital platforms as a static core with varying peripherals upon which third-party modules can be added (Tiwana, 2013; Zarnescu & Dunzer, 2021). The sociotechnical view describes digital platforms as a collection of technical elements and associated organisational processes and standards (de Reuver et al., 2018). Hence, at the centrepiece of digital platforms is a codebase that guarantees a platform's generativity, i.e., its general characteristic of being dynamic and malleable rather than fixed and immutable (Parker et al., 2016; Yoo et al., 2012). On the one hand, this can be advantageous as services can be extended in convergence to new technology-enabled innovations or trends. On the other hand, the advancements of the codebase challenge complementors to adapt

to the digital platform continuously. Furthermore, the partnership in digital platforms covers organisational arrangements between platform owners and complementors, such as entrance and existing rules, and especially the degree of openness of technologies such as interfaces (de Reuver et al., 2018).

From a customer perspective, digital platforms differ in the depth of offered services (Hagiu & Wright, 2015). For instance, some platforms have noticeable breaks between different systems, so a user might be redirected to another website or mobile app. However, failing to meet customer expectations, e.g., executing the shopping journey on one website, can lead to negative emotions and unsuccessful completion of a user journey (Huré et al., 2017). This platform type will be described as *semi-integrated*, whereas platforms where the customer is not redirected during the shopping process, will be described as *fully integrated*.

2.2 Digital transformation

The process of digital transformation is defined as improving an entity (e.g., organization) by triggering significant changes to its properties through technologies (Vial, 2021). In that regard, digital technologies act as enablers of change to alter the value-creation paths of organizations. However, a dualism of hindering and facilitating elements moderates this change (Mergel et al., 2019). Transformation processes can be delayed and limited by structural (e.g., legal, finance, time, skills) and cultural barriers (e.g., resistance to change, fear, trust) (Chesbrough, 2010; Weiner, 2009). Previous research identified confining elements, i.e., barriers, for retailers as a lack of structural resources such as personal capacity, missing digital skills, or financial resources (Love & Roper, 2015). Like other small and medium enterprises, small- and medium-sized retailers often exhibit risk-aversion towards transformation and innovation (Ramos et al., 2022). As a result, the average digital maturity is low across the retail domain resulting in problems when faced with unforeseen external events and disruptions (e.g., Covid-19) (Amankwah-Amoah et al., 2021; Remane et al., 2017). Universal countermeasures are not feasible due to heterogeneous structure of the retail domain.

The digital transformation of the retail sector has also changed how customers perceive retailing. Customers now expect to use channels interchangeably and coordinated on three main aspects: (1) *product availability*, (2) *price consistency*, (3) and *service continuity* (Huré et al., 2017). Channels in this scenario provide access points where customers and retailers can interact. Failing to meet consistency and quality of service across all channels can lead to negative emotions such as disappointment, impatience, anger, or frustration (Chen et al., 2018; Huré et al., 2017). This, in turn, can negatively influence

a retailer's relationship with its customers. Hence, technological advances have not only eased the pickup of new channels for retailers but also punished those that refused to adopt new strategies for channel management (Hagberg et al., 2017).

2.3 System integration

System integration refers, depending on the context, to different concepts such as application integration, process integration, or data integration (Silveira et al., 2008). Historically, the integration simply referred to unrestricted sharing of information enabled through technology between different applications of the same or distinct organization (Linthicum, 2000). The increasing digitalization, years later, has led to the fact that business and IT are indispensable (Lankhorst et al., 2009). This, in turn, requires coherent procedures and methods that consider both the business and technology side. Nowadays, system integration touches on manifold constructs such as automation, Business Process Management (BPM) or Workflow Management Systems (WfMS) (Romero & Vernadat, 2016).

We found modelling notions such as enterprise architecture relevant for system integration between complementors and digital platforms. From enterprise architecture perspective, platform integration is essentially the alignment of the various layers (e.g., processes and data) of an organization with the (enterprise) architecture of a digital platform (Al Mosawi et al., 2006). In the context of aligning an organization's processes with those of a digital platform, a proper management is vital as well (Ghazawneh & Henfridsson, 2015; Lankhorst et al., 2009; Schütte, 1998). For instance, the re-design of an organization's process to match the process flow of a digital platform is a relevant activity of integration endeavours. In addition to process design, i.e., conceptualizing and modeling, BPM is concerned with automation. Process automation essentially deals with the implementation and continuous enactment of business processes as workflows by developing and employing dedicated integrated systems, e.g., WfMSs.

2.4 Related work

Existing research has produced frameworks that commit to the planning and realization of information systems and facilitate their communication through transparent presentation (e.g., architecture of integrated information systems (ARIS) (Scheer, 1994), Retail-H (Becker & Schütte, 2004)). The primary aspiration of these frameworks is to guide the architecture of information systems. They do not mediate a sequence of log-

ical steps to achieve a pre-defined goal but provide a structure guiding the architecture of an information system or IT landscape.

Academia proposed different procedure models guiding organizations' digital transformation (e.g., Heikkilä et al., 2016; Sathananthan et al., 2017; Barann et al., 2019). When transforming an organization's business, such procedures suggest assessing the current as-is situation, including the (current) digital maturity (Barann et al., 2019). Academia and practice discussed a plethora of models to describe, prescribe and compare an organization's digital maturity (Berghaus & Back, 2016; de Bruin et al., 2005; Pöppelbuß & Röglinger, 2011). Following Becker et al. (2009, p. 213), "[a] maturity model consists of a sequence of maturity levels for a class of objects. It represents an anticipated, desired, or typical evolution path of these objects shaped as discrete stages". Thus, these models support an organization's digital transformation as they, for instance, help indicate specific weak points, desired outputs, or the overall progress of the digital transformation endeavor (Barann et al., 2019; Heberle et al., 2017; Ismail et al., 2017).

However, there is a lack of methods and measures describing how the challenges above of digital platform integration of retailers can be addressed. Especially small and medium-sized retailers, while less constrained, often have knowledge gaps or missing capabilities that hinder such a project (Barann et al., 2019; Brunswicker & Ehrenmann, 2013). Following the work of Barann et al. (2019), this article argues that retailers, especially those with limited resources, require a practical approach that breaks down the complexity of an integration project into manageable and easily understood action items. To that end, it seems reasonable to derive a set of generic procedures, rules, and standards to support owners and complementors in, e.g., activities related to platform integration and integration maintenance.

3 Research method

As an overarching research method, this article follows the Design Science Research (DSR) method by Peffers et al. (2007). In recent years, design science has been widely adopted as a paradigm for IS research to develop rich artifacts that solve real-world problems (Hevner et al., 2004). The first two activities of the build phase (i.e., problem identification and motivation and definition of the objectives for a solution) have already been conducted in the introduction section. In contrast, the last activity of the evaluation phase is meant to be carried out by publishing this very article. As it is possible to follow the DSR method in different fashions (Peffers et al., 2007), we decided

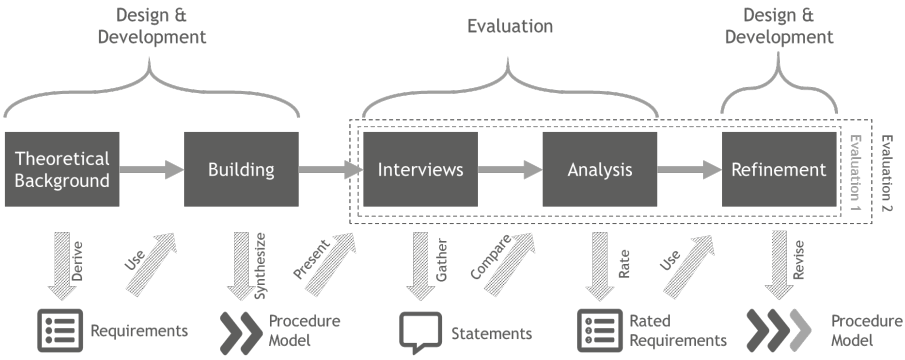

Figure 1. DSR method mapped to the structure of the article

not to carry out the *demonstration* activity for the procedure model. The focus of this research endeavour is on evaluation episodes, which not necessarily rely on demonstrating the artefact before its evaluation.

To inform the design and development of the procedure model, we derive *requirements* based on theoretical insights in the first step. These requirements promote necessities and exigencies for platform integration from different perspectives. The literature for deriving the requirements was collected using the hermeneutic approach by Boell and Cecez-Kecmanovic (2014). The goal was to recursively deepen our knowledge of retail, digital platforms, system integration, and IT architecture to uncover critical concepts and connections between the domains. We used *Scopus* and *Web of Science* as our databases because bibliometric research indicates that these databases are the most extensive scientific databases (Mongeon & Paul-Hus, 2016). That being said, we deem the construction of the artefact as the demonstration of our requirements following comments in previous research (Chandra Kruse et al., 2016; Chandra et al., 2015).

A preliminary procedure model was synthesized using the theoretically derived requirements for the building activity. Afterward, an iterative *evaluation* and refinement phase was carried out. We conducted semi-structured expert interviews to evaluate the artifact as they offered the required flexibility while providing a guideline for conducting the interviews (Mayer, 2013; Myers & Newman, 2007; vom Brocke & Sonnenberg, 2011). In the *first evaluation* (E1), the model and requirements were critically reviewed in interviews to discover opportunities and generate rich data and a deep understanding of a designed artifact, aiming to discover opportunities for improvement (Newton, 2010; Schultze & Avital, 2011). Finally, the refined version of the procedure model was designed. This cycle, i.e., interviews, analysis, and refinement, was repeated for a *second (ex-post) evaluation* (E2) and refinement (cf., Venable et al., 2016).

Group	*Acro-nym*	*Position*	*Industry*	*Age*	*Firm size*	*E1*	*E2*
Retailer	R1	Owner	Electronics	34	55	X	
Retailer	R2	Owner	Food	44	15		X
Retailer	R3	Co-Owner	Fabric	52	2		X
Operator	D1	Co-Founder	Retail & Service	n/a	144	X	
Operator	D2	Owner	Retail	53	2	X	
Operator	D3	Product Manager	Retail	46	800		X
Operator	D4	Owner	Retail & Service	43	5		X
Consultant	C1	Managing Consultant	Software & Consulting	48	200	X	X
Consultant	C2	Project Manager	Software & Consulting	44	160	X	
Consultant	C3	Data Architect	Consulting	42	506000		X

Table 1. Information on interview partners

For the interview approach, we adopt the method by Mayer (2013) for qualitative expert interviews. Mayer (2013) presents six steps that start with selecting *the interview partners*. As mentioned above, the interview partners in this work are representatives of specific groups. Accordingly, three distinct expert groups are defined: (1) *Retailers*, (2) *digital platform operators*, and (3) *consultants*. In total, 11 interviews were conducted for the evaluation with 3 retailers, 4 operators, and 3 consultants. Each interviewee has significant experience in the field of study and has worked in the domains for several years. The acronyms for each interviewee are presented in Table 1.

Additionally, background information on each interviewee is provided. Crosses in columns *E1* and *E2* indicate in which evaluation the interviewees participated. We decided not to include customers in our interviews, although some researchers see them as co-creations in platform ecosystems. We justify this in the fact that the integration of an individual retailer does not affect how a platform provides its service to the customers but only how much data, i.e., products, is available to the customer. In that regard, customers and digital platforms primarily have a service relationship. Similarly, other experts, such as industry analysts or retail associations, might have been able to provide

insights into the overall market. However, they were omitted as we did not identify them as core users of the procedure model.

In the second step, *examination of underlying concept*, preliminary considerations of the research topic, and searches for comparative research are carried out. This article evaluates Siemen et al. (2018) and Barann et al. (2019) as comparative research. Barann (2018) proposes qualitative interview guidelines in the context of omni-channel management, Barann et al. (2019) derives requirements from focus group discussions, and Siemen et al. (2018) conducts interviews in the context of a requirements elicitation in small and medium-sized retailers.

We developed a separate *interview guideline* for each expert group using insights from these papers. An overarching structure, i.e., a preliminary guideline, is the foundation for each group. Performing the step *development of interview guideline*, the preliminary guideline is enriched with specific questions to develop a final guideline for each expert group. The theoretically derived requirements inspire the domain-specific questions. The guideline is presented in Table 2.

Section	*Section goal*	*Exemplary question*
Introduction	Motivate the topic and overall goal of the model	/
Procedure Model	Present steps of the model and how the integration procedure is carried out over the steps and sub-steps	How do you assess the usefulness of this approach? Is it logical?
Digital Platforms	Determine the role of digital platforms for the interviewee	How would you classify the role of digital platforms for retail?
Expert Questions	Ask for expert knowledge on domain-specific topics	How do you rate specific types of digital platforms? To what extent do you use reference models?
Practice and Research	Determine the practical relevance of the procedure model	Is the model practical or rather theoretical?
Open Question	Determine if the interviewee wants to add something to the interview that was not asked	Did I not ask a question that you expected and would like to answer?

Table 2. Interview guidelines; sections, goals, and questions

Main Category	*Subcategory*	*Description*	*Example*
Procedure Model	Order & Flow	Rates the order of in the model. It does not matter if the rating is positive or negative or a suggestion for a different order.	I would do the data model before doing the process model.
	Complexity	Rates the model or procedure in terms of difficulty.	The whole thing is very complex at the first moment.
	Feature	Suggest new aspect that should be incorporated in the model.	I think that the model could be improved, with a kind of, I will call it checklist.
Rquirements	Evaluation	Implicitly or explicitly rates an existing requirement used in the integration procedure.	I like the idea of having steps in the model, but I think they are too big to be used for every retailer.
	Feature	Implicitly or explicitly suggest a new requirement relevant to the integration procedure.	You should be able to tailor the process to the needs of a retailer.

Table 3. Coding frame for interview analysis

The interviews were recorded after obtaining consent from the interviewees. They had a duration of 25-55 minutes, with an average of 36 minutes. Afterwards, they were transcribed and prepared for data analysis. The analysis was done following the qualitative content analysis procedure proposed by Schreier (2012). We choose this approach to consider only relevant information for improving the procedure model. Hence, explorative analysis, i.e., making data richer by producing more data, was not the goal of our analysis. We further choose the approach of subsumption (Mayring, 2015) for developing the coding frame described in Table 3 in a data driven way. The main and sub-categories were chosen based on the interview guideline in a first step as the guideline provided us with the primary categories from the start. After working through the transcribed interviews, we added the sub-category *feature* in both main categories. The description indicates when a unit of coding belongs to a category. We used coding frequencies in a matrix structure to rate multiple mentions of the same problem space

higher than one-time criticism. The overall interview methodology is depicted in Figure 2.

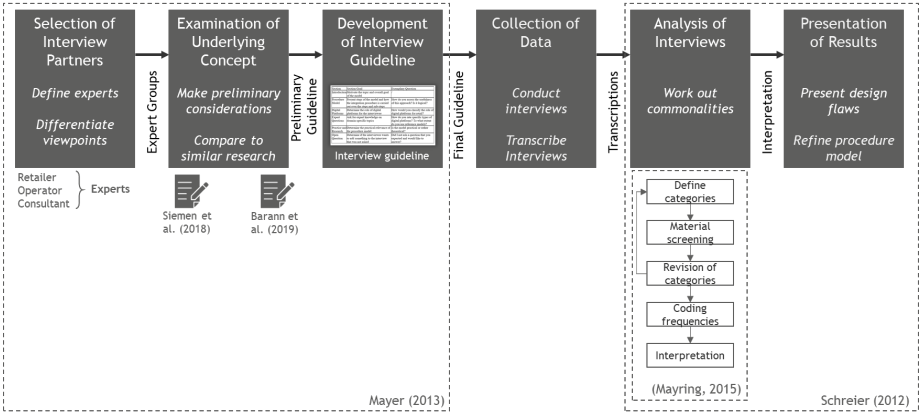

Figure 2. Interview methodology

4 Theoretical deduction

4.1 Requirements

Existing artifacts from the literature, such as frameworks or ontologies, as well as descriptive knowledge in case studies and lessons learned, were considered for deriving the intended requirements as formulated below. Thereby, the identified body of knowledge was dissected for aim, context, mechanisms, and rationale in an iterative manner to summarize the found contributions and harmonize their level of abstraction (Gregor et al., 2020; Gregor & Hevner, 2013). The iterative deduction process stopped when the research team agreed on the following requirements being mutually exclusive and collectively exhaustive within the addressed problem space.

We found seven *generic* requirements for integrating organizations into digital platforms. Additionally, we found one requirement *specific* to integrating retailers into digital platforms. Ultimately, we defined eight requirements for integrating retailers into digital platforms.

Generic Requirements

1. **Provide a factually and temporally logical sequence of steps for the integration procedure.** For organizations, integrating into digital platforms offers a promising opportunity to exploit network effects between buyer and supplier relationships (de Reuver et al., 2018; Hagberg et al., 2017; Tiwana, 2013). However, the underlying complexity of this integration needs to be wrapped into manageable and easily understood action items (Barann et al., 2019).

2. **Provide the possibility to execute the user journey on a fully integrated platform.** From a customer perspective, the integration level of digital platforms affects how the user journey is experienced (Hagiu & Wright, 2015). The integration should account for the fact that it should be possible to complete the entire journey on the digital platform (Chen et al., 2018; Hänninen et al., 2019; Huré et al., 2017).

3. **Obtain a process-oriented view of the organizations' activities and provide capability to re-design processes for the integration.** For the integration, it is required to acquire a deep understanding of the retailer's primary activities. However, this complex and time-consuming task is best addressed following specific rules, guidelines, and notations (Ghazawneh & Henfridsson, 2015; Lankhorst et al., 2009; Schütte, 1998). To limit the expected effort for an integration project, developing a holistic, process-oriented view can be an adequate starting point (Scheer, Thomas, et al., 2005). Based on such holistic views, more detailed models can be derived. For the integration, there is also a need to re-design processes if certain activities no longer fit the organizational goals or are carried out inefficiently (van der Aalst et al., 2003).

4. **Provide business processes as workflows to enable automation.** Service-intense industries should automate their business processes whenever possible (Revenaugh, 1994). In the context of integration, this can be achieved by implementing business processes in machine-readable workflows (Becker et al., 2013; Coalition, 1999). An integration should integrate items and steps that support the automation of business processes.

5. **Consider relevant information systems and their interfaces to enable data exchange between platform actors.** Modern organizations are maintaining a variety of IS to cope with increased customer expectations and changing market environments (Becker & Schütte, 2004; Huré et al., 2017; Schütte, 2017). However, very few systems can run in isolation but instead must communicate with other applications to exchange data along a business process (Scheer, 2012). On a technical level, this communication is enabled by interfaces and standards that regulate how data is exchanged (Fielding, 2000).

6. **Capture and describe data in its various types and purposes.** An efficient organization of data is required to deal with the vast amount of information (Becker & Schütte, 2004; Samaranayake, 2008; Scheer, 2012). Data models are needed to integrate *conceptual* and *logical* data perspectives (Scheer, Thomas, et al., 2005). This enables creating a basis on which data can be organized and exchanged.

7. **Provide evolutionary capability to continually maintain the integration.** ISs have an evolutionary character that requires regular management (Hafner & Winter, 2008). Without adequate maintenance, IS can degenerate and no longer support business processes with the required quality (Marsh, 2005). The same applies to the co-joined system of digital platforms and adherent organizations. Thus, the integration must also consider the aftermath of the integration and its maintenance.

Specific requirements

8. **Assure consistency in all channels for the aspects pricing, products, and service.** Customers expect to use communication and sales channels interchangeably without noticeable differences in the three aspects (1) *product availability*, (2) *price consistency*, (3) and *service continuity* (Barann, 2018; Bollweg et al., 2016; Hagberg et al., 2017; Huré et al., 2017). As the integration into a digital platform touches a retailer's channel management, the channels in use and channels enabled by the digital platform have to be considered. Consistency between all channels is crucial to avoid customer anger or frustration (Huré et al., 2017).

4.2 Preliminary model

The goal of the procedure model is to (1) abstract and visualize the integration procedure and (2) do this in a logical sequence of steps (Becker et al., 2013; Schütte, 1998). Figure 3 presents the *preliminary procedure model* synthesized from requirements 1-8 derived from literature. The model is organized into five main steps, each having multiple sub-steps. The main steps are, in sequential order, (1) *Defining a Functional View*, (2) *Designing a WfMS*, (3) *Defining and Mapping Transferable Data*, (4) *Transferring Data and Executing Workflows*, and (5) *Maintaining an Integrated System*.

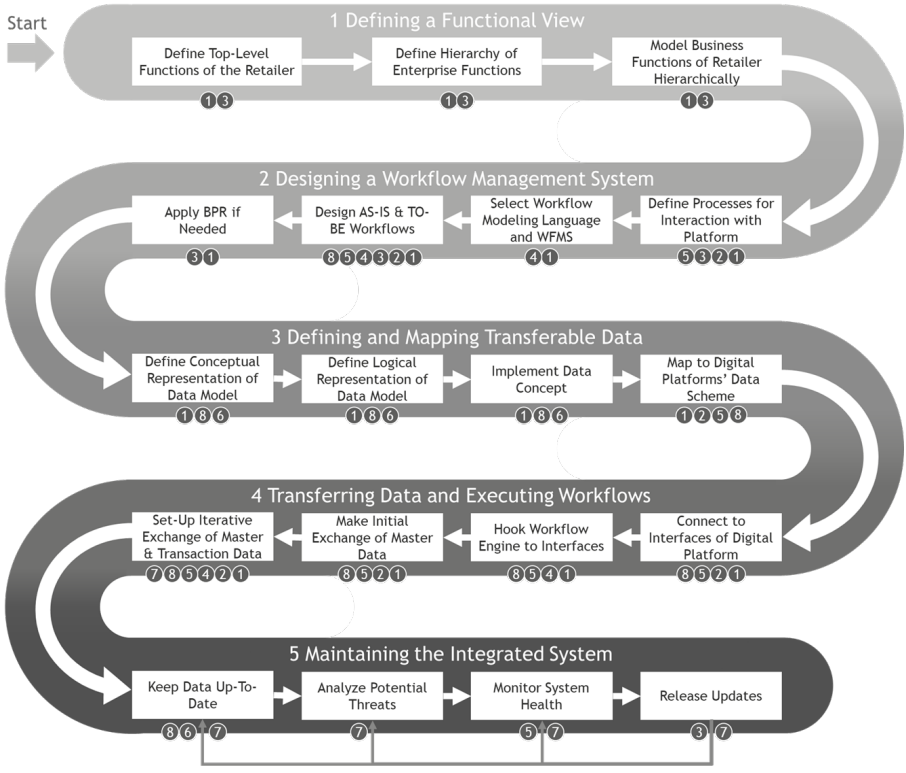

Figure 3. Preliminary procedure model for platform integration

As suggested and verified by related work, the order and sequence of these steps were concluded by critical thinking and structuring the main steps into smaller and more manageable action items (Barann et al., 2019; Becker et al., 2009; Scheer, Jost, et al., 2005; Wang et al., 2016). However, we also critically reflected on other frameworks and reference models to build initial versions of our procedure model. Most prominent, the

structure of main steps was derived from the reference model for project management in process management (Becker et al., 2012). However, this model lacked a data-view which we considered to be very important for system integration. Hence, we used the ARIS model to add this main step. The final synthesis of main and sub-steps was performed by combining requirements into actionable items and steps. The requirements used in creating the sub-step are placed in small circles with their respective number below the individual sub-step.

For the design of the model, the following aspects are represented implicitly or explicitly by the model:

Color coding. The procedure model gradually changes its color from top to bottom. While the main steps have the same color, the coloring changes when switching to the next step. In the course of the model, the color tone darkens. This is intended to show the gradual progress in the integration process similar to a filling vessel, where the vessel is a synonym for progress.

Arrangement of steps. The order of the main steps represents the connection between them. This illustrates the sequential nature of the integration. The main steps are connected by curved arrows, the sub-steps by straight ones. This is due to the property that specific steps build on or benefit from the results of previous steps. The fifth step is an exception to this rule as it is an iterative cycle of activities with no fixed time frame.

The first step, *Defining a Functional View*, aims to obtain a general overview of the retailer to be integrated. An attempt is made to capture the main functions and structure them hierarchically. This overall view is then used as a basis in the later stages of the integration and helps estimate further steps in terms of effort. The main step and action items are mainly derived from requirement 3, as this principle suggests obtaining a deep understanding of a retailer's main activities by first obtaining a holistic view. The arrangement of sub-steps was made by following the function view of the ARIS framework (Scheer, 1994). For the second main step, *Designing a WfMS*, the goal is to model the relevant processes of the retailer in such a way that automation with a WfMS is possible. To reduce the effort, it is essential not simply to model everything but to focus on relevant processes that describe the interaction with the digital platform. First, the business scenarios between the retailer and the digital platform must be described textually. Next, addressing requirement 4, a modeling notation and WfMS are selected. This is then concluded by modeling the workflows and re-engineering business processes if needed while best practices for the design of retail processes (e.g., the Retail-H

by Becker and Schütte (2004)) can be used as reference (Castela et al., 2002; Speck & Schnetgöke, 2003). The order of sub-steps is in sync with one iteration of the BPM lifecycle (Bernardo et al., 2017; van der Aalst et al., 2003).

The third step, *Defining and Mapping Transferable Data*, aims to digitize the retailers' product data to the extent that it can be easily adapted to the required data scheme of the digital platform. Therefore, the retailer's responsibility is to provide correct and up-to-date data to the digital platform. Similar to the procedure proposed by the ARIS framework and following requirement 6, the first three steps build the foundation for sub-step four, i.e., mapping the retailer's data to the digital platforms data scheme. This is done by defining data in three steps: (1) *Conceptual* model, (2) *logical* model, and (3) *implementation* (Scheer, Jost, et al., 2005). Additionally, the sub-steps are motivated by requirement 8, which promotes consistency across multiple channels. Moreover, requirement 5 motivates using pre-defined connection points to exchange data.

The goal of the fourth main step, *Transferring Data and Executing Workflows* is to automatically transfer the digitized data to the digital platform via the WfMS. It builds on the assets produced in steps one to three. For the first objective, which is the transmission of master and transaction data from and to the digital platform, it is necessary to connect the interfaces of the retailer's IS to the platform's interfaces. This should be done closely with the digital platform operator to evaluate whether the data mapping was done correctly. Finally, if both master and transaction data can be transferred via interfaces from and to the digital platform, the integration is finished, and the foundation is set to assure consistency and Data Quality (cf., requirements 5 and 8).

In summary, the combined objective of the first three main steps is to prepare the retailer from a technical and functional perspective to integrate with the digital platform. There are benefits to executing the first three steps in sequential order. First, creating a top-level overview of the enterprise helps understand the retailer comprehensively. For the design of processes and workflows, the insights from the first step help to identify relevant business processes and reduce the risk of modeling irrelevant ones. Similarly, by defining processes for interaction with the digital platform, only the data used in the interaction with the platform needs to be digitized. The fourth step then combines these results and completes the integration. Finally, the fifth step ensures that the integration remains functional and sustainable.

5 Evaluation and refinement

5.1 First iteration

For the first evaluation of the procedure model, five interviews were conducted with one retailer, two consultants, and two digital platform operators. In each interview, the *preliminary procedure model* was presented to the interviewees in a structured way, starting from top to bottom. Afterward, the interviewee was asked to evaluate the procedure model in terms of complexity, feasibility, and practical relevance (cf., section 3).

During the analysis of the *generic* requirements through statements from the interviews, it was concluded that requirements 1-6 are *verified*. For the *specific* requirements, results from the interviews suggest requirement 8 is *verified* as well. Verified implies that at least one interviewee explicitly or implicitly supported the requirement and no interviewee objected to the claims. Requirement 7 ('*Provide evolutionary capability to continually maintain the integration.*') was marked with a need for re-formulation as interviewees desired a controlling aspect for the integration:

7. Provide evolutionary capability to **control and** maintain the integration.

In addition, several interviewees issued concerns that the current model cannot differentiate between varying pre-conditions and digital maturity levels. It was suggested to skip certain parts of the procedure if the desired outcome of a step is already present. Depending on the digitalization level and digital maturity of the retailer, there "are certain steps you do not have to take" (C1). Following this thought, we highlight similarities to research on structural and cultural barriers that result in risk-aversion towards transformation (Chesbrough, 2010; Weiner, 2009). By accounting for integrations across varying maturity levels by supporting multiple starting points, the impact of confining elements are removed.

9. **Provide distinct entry points and consider different integration depths and types.** Organizations start the integration with varying digital maturity and pre-conditions (Heberle et al., 2017; Ismail et al., 2017). A model should account for different starting conditions and provide different entry points to break away from a fixed sequence of steps while still ensuring the integrity of the integration.

Refinement

To complete the first iteration, the new set of requirements is used to construct the *refined procedure model* (RPM). The changes are described below:

Considering the controlling aspect, step five was re-named to *Controlling and Maintaining the Integrated System*. Furthermore, the name of the sub-step four of main step four changed to *Release Updates for Models & System*. This change was made to signify the importance of updates for both the models and the system itself.

Additionally, we added small boxes positioned under some sub-steps. The boxes enable tailoring the procedure model to a retailer's digital maturity and pre-conditions. Accordingly, sub-steps can be marked in three categories:

Start point
If a sub-step is marked as a *start point*, the model explicitly supports using this sub-step as the first step in the integration process. Additionally, procedure-logical dependencies in main-steps are still valid when starting at sub-steps marked as a *start point*. Note that preceding main and sub-steps are not performed when initiating the procedure at a certain *start point*. Consequently, the digital maturity level and the available assets must be suitable for the use of certain *start points* in order not to jeopardize the integration. Therefore, the *start point* should be carefully selected and must not be chosen blindly.

Conditional
If a sub-step is marked as *conditional*, this sub-step can be skipped when certain conditions are fulfilled. These conditions represent necessary outcomes that are needed in later steps of the procedure. If such results are not available in the required quality or type, the step must not be skipped.

Optional
If a sub-step is marked as *optional*, this sub-step can be skipped without endangering the successful completion of the integration. The main difference to the *conditional* flag is that *optional* steps can be skipped no matter the pre-conditions, but only influence the level of integration depth that is achieved.

The categorization of sub-steps addresses two goals: (1) Increase the *flexibility* of the procedure model for adjusting the integration depth to situations found in practice and (2) reduce the complexity of the integration by allowing to skip certain steps without

endangering the integration. For instance, retailers following the presented model do not need to aim for the same level of automation (or any automation at all) for a successful integration project. Instead, it is possible to define a desired grade of integration and perform steps accordingly.

Therefore, certain sub-steps or entire main steps may be skipped. Adding different starting points allows a flexible entry into this logical (fixed) sequence of steps without questioning the integrity of the integration.

Define Top-Level Functions of the Retailer is the natural *start point* for executing the integration and following the procedure model in its entirety. The next *start point* is the first sub-step of the second main step. By starting here, the overview of the retailer, which would have been modeled in main step one, is not available. The third *start point* is one of the respective sub-steps flagged as *start point* in the third main step. By starting at this sub-step, neither a general overview nor workflows are created in the integration procedure. However, not defining workflows might be a problem as interactions with the digital platform are not defined. This starting point can also be chosen if workflows have already been modeled in a different project. In that case, automation is still possible. Conclusively, this starting point reduces the complexity of the integration even further, but can be a limiting factor towards automation goals and scaling potential. The fourth and last *start point* in the procedure model is: *Map to Digital Platforms' Data Scheme*. This step is the absolute minimum that must be completed as preparation before the actual implementation of the integration. Hence, the asset produced here, i.e., the mapping of data between retailer and platform, is crucial for the preparation of the integration.

Furthermore, three sub-steps are marked as *conditional*: (1) *Define Conceptual Representation of Data Model*, (2) *Define Logical Representation of Data Model*, (3) and *Implement Data Concept*. The steps are marked as *conditional* and not *optional* as the end result of these steps, i.e., data is digitally available in a structured and accessible way, is required for the integration.

The remaining category, *optional*, is used for two sub-steps: (1) *Apply BPR if Needed* and (2) *Hook Workflow Engine to Interfaces*. Executing these steps can benefit the integration, but should only be considered if time and resources are available. The assets and results produced in these steps are not necessarily needed in the later stages of the integration. For instance, not performing business process reengineering (BPR) will not change the outcome of the integration, but unused potentials might remain open.

5.2 Second iteration

For the second evaluation of the procedure model, 6 interviews were conducted with two retailers, consultants, and digital platform operators each. In the interview, the RPM was presented to the interviewees in a structured way, starting from top to bottom. Afterward, the interviewees were asked to evaluate the procedure model regarding complexity, feasibility, and practical relevance (cf., section 3).

The overall feedback for the RPM revealed fewer issues than the preliminary model. The changes, i.e., adding boxes below individual sub-steps and modifying the last main step, were well received. However, the interviews revealed room for improvement, mainly concerning the first main step, *Defining a Functional View*. While the main goal of this step, i.e., obtaining a general overview of the retailer to be integrated, is still valid, the sub-steps offer room for improvement. Specifically, interviewees questioned the need to build a functional view from scratch and instead suggested comparing the currently deployed functions with functions suggested by reference models. Similarly, the IT landscape can be assessed using pre-defined checklists that help assess the retailer's digital maturity. Addressing the critique and suggestions from the second evaluation, a new requirement was formulated:

10. **Assess the digital maturity and main functions with the help of standardized reference models and pre-defined maturity levels.**

Refinement

The final set of requirements, their type (generic/specific) and how they were developed (literature, first/second iteration) is displayed in Table 4. The structure of the model has remained the same and still consists of five main steps. In addition to the changes described in the first refinement, the second refinement has to account for the newly formulated requirement 10. Therefore, the detailed creation of a functional view is no longer the main objective of this main step. Instead, the goal is to understand (1) to what degree the retailer covers core (retail) capabilities and (2) how the digital assets of the retailer support these capabilities. Hence, we merged sub-steps two and three and created two new sub-steps. These new steps are *Compare Main Functions to Reference Model* and *Assess Digital Maturity*. *Compare Main Functions to Reference Model* is *optional* as it only helps plan the upcoming integration but is unnecessary for its execution. Conclusively, the sequence of steps begins by defining the top-level capabilities of the retailer to be integrated, comparing these to standardized retailer reference models (e.g., Retail-H by Becker and Schütte (2004)), and matching the competence to digital

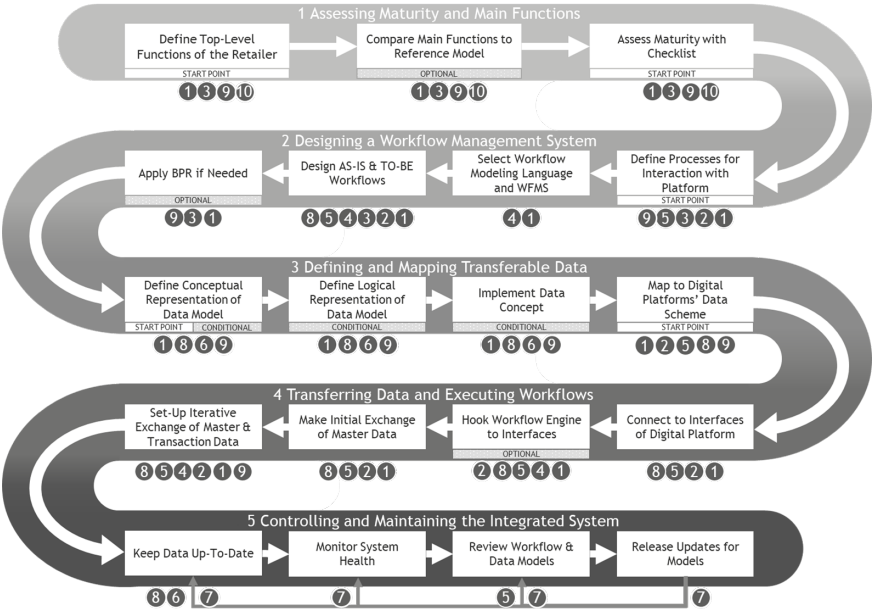

Figure 4. Final procedure model for platform integration

assets (e.g., with a checklist). The results and insights of this step are then used to define processes and workflows (main step two) and inform the creation of the data model (in main step three). Similarly, the results can help uncover what interfaces are available and to what extent processes need to be digitized for later stages.

6 Discussion and implications

6.1 Discussion

Generally, the procedure model was well received and the feedback suggests the model's practical relevance. In particular, the model appears relevant for digital platform operators and consultants. In this context, the interviewee remarks that "the model will probably help someone in a decision-making situation" (C2). However, it is also described as "very ambitious" (C1) and too "theoretical" (R1) to be fully understood by retailers. Understanding the terminology and concepts of scientific work proves difficult for people who do not often deal with similar constructs, e.g., reference models (Rowan, 1991). We attribute the model's current state to the synthetisation of requirements

#	*Type*	*Source*	*Requirement*
1	Generic	Literature	Provide a factually and temporally logical sequence of steps for the integration procedure.
2	Generic	Literature	Provide the possibility to execute the user journey on a fully-integrated platform
3	Generic	Literature	Obtain a process-oriented view of the organizations activities and provide capability to re-design processes for the integration
4	Generic	Literature	Provide business processes as workflows to enable automation
5	Generic	Literature	Consider relevant information systems and their interfaces to enable data exchange between actors of the platform
6	Generic	Literature	Capture and describe data in its various types and purposes
7	Generic	Literature & Iteration I	Provide evolutionary capability to control and maintain the integration
8	Specific	Literature	Assure consistency in all channels for the aspects pricing, products, and service
9	Generic	Iteration I	Provide distinct entry points and consider different integration depths and types
10	Generic	Iteration II	Assess the digital maturity and main functions with the help of standardized reference models and pre-defined maturity levels

Table 4. Final set of requirements

from literature. Thus, while enriched and evaluated by practice, the model's core is derived from the scientific literature. Simplifying the procedure model towards crowds of lower digital literacy could address a wider audience but might result in ambiguity, increasing the chance of failure. Therefore, the level of detail can be seen as a consideration of rigor and flexibility. Nevertheless, we question our initial set of potential applicants of the procedure model, i.e., retailers, consultants, and digital platform operators. Retailers with low digital literacy, which is the default among most retailers (Betzing et al., 2019), will have a more challenging time applying the procedure model than the average person from the other expert groups.

Initially, the integration of retailers into digital platforms was thought to have particularities that distinguish them from other domains (Barann et al., 2019; Hagberg et al., 2017). However, in the course of our theoretical deduction and practical evaluation of requirements, the particularities were found to be negligible. This means the majority

of requirements for digital platform integration of retailers are generic. Although, there are some specific requirements like consistent channel management for pricing, products, and service that distinguish them from other domains (Huré et al., 2017). Further elaborating on generalizability, the question arises whether the current model is specific for platforms at all. Adapting the system integration perspective, the model could also be used for inter-organizational IT integration projects. For example, it could be used as a blueprint to integrate the ERP-system of a retailer and that of a supplier. However, we emphasize some differences between platform and non-platform systems: Platforms generativity, i.e., its general characteristic of being dynamic and malleable rather than fixed and immutable, opens platform to technology-enabled innovations or trends (Aiken et al., 2007; Yoo et al., 2012). It promotes the inclusion of new actors into the ecosystem to 1) exploit network effects and 2) adjust to current trends. For example, during the Covid-19 pandemic, the demand for masks increased as virtually everyone needed them. Digital platforms needed existing retailers to supply these masks or integrate new retailers. A rather rudimentary integration (e.g., 'retailer offers mask on a platform'; 'customer orders mask on platform'; 'platforms send the order via mail'; 'retailer fulfils order') was satisfactory in terms of integration. In contrast, integrating two ERP-systems is more strenuous, time intensive, and requires a deeper technical understanding (Lämmer et al., 2008).

The evaluation also revealed the need for a tailored integration procedure depending on the digital maturity of the retailer. A retailer with high digital maturity requires a different kind of integration than a retailer where the level of digitalization is relatively low. However, measuring this maturity (e.g., checklists) is a rugged terrain that was only touched briefly in this work. Still, it appears of great interest for matching the integration to the retailer's needs and was discussed by other works (Barann, 2018; Lasrado et al., 2015; Mettler, 2009). However, considering this tailoring, it has to be noted that the individual steps build on the results of previous actions or benefit from the completion of preceding steps. In the case of main steps two and three, it can be beneficial to define the interfaces between the retailer and digital platform before the data models are created and implemented. This way, relevant data is identified and the chance that models have to be altered is reduced.

Lastly, we discuss the notion of facilitating and hindering factors within the process of the integration. The interviewees, both explicitly (platform providers, consultants) and implicitly (retailers), disclosed confining elements that occur in the process of digital transformation. Especially the intrinsic motivation to change/transform was critically mentioned by experts. At the same time, interviewees from the retail sector urged a fear of changing their technology due to time and skill constraints. Our inter-

view analysis, thus, supports earlier claims that small- and medium-sized retailers often exhibit risk-aversion towards digital transformation (Ramos et al., 2022). The resulting changes in the procedure model (i.e., tailoring, digital maturity checks, entry points) are the response to counter risk-aversive behaviour and promote intrinsic motivation by lowering the entry barrier for platform integration.

6.2 Implications

Our research contributes to theoretical and practical knowledge in different ways.

First, we reduce the complexity of a platform integration by breaking down the behemoth of a project into smaller chunks. A guide covering the main steps required for integration eases the corresponding project planning activities like cost estimation and scheduling. Therefore, the procedure model can be used as input for a retailer's digitization strategy and could support the design and implementation of such a strategy in an actual retail organization (Barann, 2018). Henceforth, our procedure model informs that a specific technology (e.g., digital platforms) can be applied in various contexts of the retail sector. Disclosing the required steps for a platform integration in a time-logical manner serves as a starting point for comparison and analysis of digitalization strategies for retailers. Additionally, digital platforms can verify their integration procedure and uncover potentials for improvement.

Second, our findings indicate that the digital platform integration of retailer of small and medium retailers should not be viewed as vastly different to the integration of other small- and medium sized organizations (Vial, 2021). The most prominent distinguishing factor for retailers as compared to other organizations is the management of channels in terms of product availability, price consistency, and service continuity (Huré et al., 2017). Despite, we emphasize that a platform integration is less strenuous as compared to integrating software systems of distinct organizations (e.g., two ERP-systems) (Lämmer et al., 2008). Moreover, the requirements derived from literature and verified by our evaluation can be used in the development of related frameworks and models. Especially the generic requirements offer a potential starting point for adjacent research endeavours.

Third, our evaluation results extend claims in the digital transformation literature regarding small and medium enterprises resisting change due to risk aversion (e.g., Ramos et al., 2022) to the retail sector. Hence, we support considering cultural barriers for the digital transformation of retailers which are not as established in current literature for retail (Chesbrough, 2010; Weiner, 2009).

7 Conclusion

The central DSR artifact of this article is a procedure model for integrating retailers into digital platforms. It consists of a total of five successive phases: (1) Assessing Maturity and Main Functions, (2) Designing a WfMS, (3) Defining and Mapping Transferable Data, (4) Transferring Data and Executing Workflows, and (5) Controlling and Maintaining the Integrated System. The model was designed based on requirements derived from the scientific literature on retail, digital platforms, and system integration. In addition, the model was refined and enhanced with findings from interviews with practitioners. In summary, the central propositions of the resulting model are:

- Guidance for different types of integration for retailers into digital platforms
- Standardization of the integration process for retailers into digital platforms
- Reference capability in the formulation of digitalization strategies for retailers
- Combination of insights from academia and practice

It was found that the integration process into digital platforms is not necessarily domain-specific but also consists of generic requirements applicable to other spheres. Although, there are some specific requirements peculiar to the retail domain.

The results presented in this article are subject to some limitations. First, with the DSR method being an iterative approach, it is possible to further evaluate and refine the procedure model (cf., section 3) by conducting more interviews. Similarly, a different research design or DSR approach might have yielded a slightly different artifact variation. Even though the interview partners are diversified, and from different backgrounds, further research has to be conducted to verify the findings of the interviews (Siemen et al., 2018). As assessed by the interviewees, the theoretical nature of the procedure model may pose challenges in terms of practical applicability. Thus, future research can derive dedicated versions of the procedure considering the peculiarities and needs of the different actors of a digital platform. In this context, it is also interesting to produce exemplary assets and artifacts along the steps of the procedure model to guide the integration. The procedure model is not necessarily retail-specific and can be applied to other domains. Hence, further research could focus on using the procedure in other disciplines and adapting the model to fit these integration scenarios. Finally, with the demonstration deliberately omitted from the research scope, the procedure model can be applied in real-world integration scenarios with retailers. This application could demonstrate the procedure model's usefulness and provide essential evaluation feedback, further strengthening the DSR artifact.

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Appendix 1

Theme	*No. of interviewees*	*Description / Examples*
1.1 Order & flow +	3	Logical; done similarly
1.2 Order & flow -	1	Critique on current procedure;
1.3 Complexity +	2	I understand the model
1.4 Complexity -	4	Too detailed for practice; too descriptive; theoretical
1.5 Features *checklist*	2	Start with consulting; understand the current state;
2.1 Evaluation *Req1* +	4	Linear procedure; breaking down the complexity; step-by-step
2.2 Evaluation *Req1* -	1	Hierarchical procedure model; iterative,
2.3 Evaluation *Req2* +	3	Platforms are useful; customers want easy access;
2.4 Evaluation *Req3* +	1	Sometimes you have to change processes
2.5 Evaluation *Req4* +	2	Stock needs to be automatically removed;
2.6 Evaluation *Req4* -	1	Not every retailer needs automation; too ambitious for small retailers
2.7 Evaluation *Req5* +	2	Several software systems in use; utilizing other platforms
2.8 Evaluation *Req6* +	3	Combine data from retailer and external sources; first step is to have stock digital
2.9 Evaluation *Req7* +	2	We need to update; a loop would be good
2.10 Evaluation *Req8* +	3	Product availability; unsuccessful shopping
2.12 Features *entry points*	4	Differentiate small and big retailers; start at step two or three; starting points to account for sequential and agile procedure
2.13 Features *tailoring*	3	Pick them up where they are; meetings; adapt procedure to state of retailer
2.14 Features *maturity*	1	I would like to see reference models being used more in practice

Table 5. Coding frequencies evaluation 1

Req[X] = Requirement 1-8 from chapter 4.1

+ indicates a positive statement

– indicates a negative statement

Theme	*No. of interviewees*	*Description / Examples*
1.1 Order & flow +	2	Logical; done similarly
1.2 Order & flow -	1	Doing it slightly different
1.3 Complexity +	1	I understand the model
1.4 Complexity -	3	Too detailed for practice; too descriptive; theoretical
2.1 Evaluation *Req1* +	1	Linear procedure; breaking down the complexity; step-by-step
2.3 Evaluation *Req2* +	2	Platforms are useful; customers want easy access;
2.6 Evaluation *Req4* -	2	Not every retailer needs automation; too ambitious for small retailers
2.7 Evaluation *Req5* +	2	Several software systems in use; utilizing other platforms;
2.8 Evaluation *Req6* +	2	Combine data from retailer and external sources; first step is to have stock digital
2.10 Evaluation *Req8* +	1	Product availability; unsuccessful shopping
2.11 Evaluation Req9 +	5	Differentiate small and big retailers; adapt digital maturity
2.14 Features *maturity*	4	Best practices; reference models
2.15 Features *teaching*	1	Schooling; learning programs; workshop

Table 6. Coding Frequencies Evaluation 2

Req[X] = Requirement 1-9 from chapters 4.1 & 5.1.

\+ indicates a positive statement

– indicates a negative statement

Removal in column "Theme" indicates construct was not mentioned in evaluation