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**Title:** Toward a refined conceptualization of IS discontinuance : Reflection on the past and a way forward

**Year:** 2020

**Version:** Published version

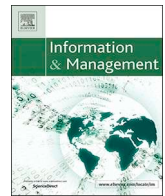
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**Please cite the original version:**

Soliman, W., & Rinta-Kahila, T. (2020). Toward a refined conceptualization of IS discontinuance : Reflection on the past and a way forward. *Information and Management*, 57(2), Article 103167. <https://doi.org/10.1016/j.im.2019.05.002>



# Toward a refined conceptualization of IS discontinuance: Reflection on the past and a way forward

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## ARTICLE INFO

### Keywords:

IS theory  
IS lifecycle  
IS discontinuance

## ABSTRACT

Interest in studying information systems discontinuance has been increasing lately, yet there is no consensus on what it means. To improve the situation, we conduct a comprehensive review of current literature on IS discontinuance and identify 55 studies published during 1991–2017 that specifically focus on the topic. Our conceptual analysis disentangles the process, content, and context of the phenomenon, revealing that over the course of a typical IS lifecycle, IS discontinuance may materialize at least in five distinct forms: rejection, regressive discontinuance, quitting, temporary discontinuance, and replacement. After elaborating their distinctions, we discuss their theoretical, methodological, and practical implications.

## 1. Introduction

Despite the fact that information systems (IS) discontinuance is a commonly occurring phenomenon, it has received far less attention among IS scholars than the voluminous adoption and acceptance research. Yet, individual users make decisions to discontinue their previously adopted ISs, and such behavior often involves motivations that are largely unacknowledged by the major IS adoption/usage theories (e.g., [1]). Additionally, industry reports show that low user retention and high churn rates are among the most critical challenges digital businesses face today [2,3]. Such high quitting rates pose a major existential threat to both large firms – such as Twitter [4] and Facebook [5,6] – and less affluent ones [7]. When it comes to managerial decision-making, the termination and replacement of old systems represents a recurrent and perilous challenge for organizational IS architecture management [8,9]. Moreover, organizations discontinue their seemingly up-to-date IS as well, for various reasons that may not be comprehensively explained with theories of IS adoption or usage [10]. For instance, recent media reports reveal that the food giant Lidl has decided to pull the plug on its SAP-based transformative inventory system project and revert to its old systems after seven years of development and pouring in an estimate of half a billion euros on the project [11,12]. Although the exact reasons for this seemingly abrupt regression might take years to reveal, a culture of “this-is-how-we-always-do-it” at Lidl has been blamed for this costly decision [13]. While the Lidl/SAP discontinuation story might be seen as an extreme case,

recent research suggests that discontinuing shadow systems that are not controlled by a central IT department may be the norm rather than the exception [14]. Thus, understanding what IS discontinuance means and how it may unfold in different contexts is critical for ensuring the success of any enterprise.

Academic interest in IS discontinuance is not a novelty. In fact, scholars have sensitized and studied it since the early 1990s. However, it is only recently (specifically, from 2010 onward) that IS scholars have started to pay more attention to the phenomenon. Yet, compared to the ample contributions made to the adoption/continuance literature (see, e.g., [15,16]), the number of studies on discontinuance remains incomparable. However, more importantly, there is no clear consensus on what IS discontinuance means beyond the simple notion of “not using” an IS. In fact, the term discontinuance is used in the IS literature to mean conceptually and temporally different things. For instance, the term describes abandoning a technology shortly after adopting it (aka *acceptance-discontinuance anomaly*, [17]) as well as quitting a technology after extended periods of continued use [18]. Still, the term is used to describe the act of permanently discontinuing a technology to switch to a competing alternative [19], in addition to the act of vacationing (i.e., temporarily taking a break) from a technology with the possibility of returning back some time in the future [20]. Somewhat surprisingly, even moderating one’s technology use by using it less has been referred to as IS discontinuance (see [18]). Hence, while IS discontinuance appears to have multidimensional meanings in the literature, no systematic efforts have been made to provide a

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<https://doi.org/10.1016/j.im.2019.05.002>

Received 30 April 2018; Received in revised form 3 May 2019; Accepted 18 May 2019

Available online 22 May 2019

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conceptualization of what these different meanings refer to.

At the peak of technology acceptance research – i.e., studies based on technology acceptance model (TAM, [21]) and its many variants – Benbasat and Barki [22] have warned that the heavy reliance on TAM, and the uncritical examination of IS/IT usage and its context, resulted in a situation that they described as “a state of theoretical confusion and chaos” (p. 212). At that point, Schwarz and Chin [23] proposed to take a “reflexive pause” and reexamine what the term IT acceptance actually meant. Their resultant classificatory work helped clarify the IT acceptance concept and, more importantly, was a foundation for richer and more sophisticated future empirical research on IT acceptance [24]. Following this line of reasoning, we believe that in the wake of increasing academic interest in discontinuous IS use behaviors, we need a reflexive pause and a reexamination of what we mean by “IS discontinuance.” Considering the criticality of IS discontinuance to the IS field, and the ambiguity in its characterization, we believe there is a need for analytic theorizing on the IS discontinuance phenomenon. We believe that gathering and synthesizing findings from previous research under an inclusive classificatory framework [25] can help us to obtain a much-needed conceptual clarity on the phenomenon as well as to provide an illuminating reference point for future research on the topic. Hence, the objective of this study is twofold. First, based on a disciplined literature review, we answer the question of what IS discontinuance means. Second, based on the resulting answer, we elaborate its implications to theory, methodology, and practice.

Against this backdrop, the paper is organized as follows: In Section 2, we discuss our analytic framework. In Section 3, we describe our methodological approach. In Section 4, we present and discuss the main findings. In Section 5, we provide implications for theory, methodology, and practice and discuss our study’s limitations and directions for future research. The final section provides a conclusion.

## 2. Analytic framework

Analytic theories (i.e., classificatory frameworks) are a fundamental first step in advancing any scientific discipline, as they answer the basic question of “what is” [25]. Such theories are typically referred to as theories of classification, which, unlike traditional modes of theorizing, focus primarily on ontological aspects of the phenomenon under study, i.e., they are motivated by the questions “what is it that we are studying?” and “what are its constituent components?” Exemplary work of this nature in the IS literature includes (Gregor’s [25,26]) work on the nature of “theory,” Schwarz and Chin’s [23] elaboration on the nature of “IS acceptance,” and Lee et al.’s [27] work on the nature of the “IS artifact,” to name a few.

In our attempt of making sense of the various literature on IS discontinuance through analytic theorizing, we developed a framework emphasizing the importance of process, content, and context. This framework is consistent in spirit with Pettigrew’s [30] contextualist approach. Whereas contextualist analysis is commonly used to make sense of empirical investigation of organizational change (e.g., [28]), it can provide a useful lens for literature analysis as well [29]. We find the distinction a contextualist framework makes between process, content, and context [30] exceptionally beneficial to our analytic purpose, considering that we are looking into multidimensional postadoption behaviors situated in various contexts and manifesting in different ways

(see, e.g. [31]). In his treatise of the contextualist approach, Pettigrew [30] noted that it was merely “an idealized view never to be completely realized and certainly to be tuned according to the vagaries and surprises of different contexts” (p. 63). In this sense, we adapt the framework, particularly the notions of process, content, and context as sensitizing devices [25] in our analysis. In the following subsections, we briefly discuss and clarify these three building blocks.

### 2.1. Process

A process in contextualist sense reflects the “interdependent, sequence of actions and events, which is being used to explain the origins, continuance, and outcome of some phenomena” ([30], p. 64). Broadly speaking, IS discontinuance has been commonly represented as the final stage in the technology use life cycle [32], temporally following the adoption and continued use stages [33,34]. These sequences reflect an archetypal life cycle process, with its phasic transitions through inception, growing, and maturing, before its eventual termination [35,36]. For instance, the user transformation model by Maier, Laumer, Weinert, et al. [34] describes a process that begins with an IS being adopted, after which it transits to being continuously or repeatedly used, and as the process matures, usage is eventually discontinued.

Then again, Rogers [37,60] describes a five-stage decision-making process in which the diffusion of an innovation may occur. These stages include knowledge, persuasion, decision, implementation, and confirmation. The first two stages precede adoption, as the potential user (whether an individual or a collective) becomes aware of the innovation’s existence and finds (persuasive) information about its characteristics – generally speaking becomes *exposed* to it. This is followed by a decision to adopt or reject the innovation. If the outcome is *adoption*, the user moves to implementation, which may include activities such as installation, configuration, and training of use. Finally, the user assesses whether the innovation fulfills the expectations set for it and evaluates one’s satisfaction with it. A full system use life cycle starts to take shape when we extend Rogers’ process model with the user transformation model by Maier, Laumer, Weinert, et al. [34]. The fulfillment or exceeding of expectations and high satisfaction experienced in system adoption are typically good indicators of a user moving to the state of *continued use* [17], which may include sporadic, routinized, habitual, and, in some cases, even excessive use behavior. Finally, the user would move to *discontinued use* by terminating system usage. Fig. 1 outlines the aforementioned process as an abstraction that can be applied for studying various adopting entities: individuals, groups, and organizations, among others.

Our initial conceptualization (i.e., pre-understanding, [38]) of the process was largely influenced by the “exposure → adoption → continued use → discontinued use” process. Specifically, this generic process view can help to conceptualize the various phases technology usage goes through from initiation until termination [35,36]. In particular, we believe that adopting such generic process view enabled us to construct a framework that captures both the static and the dynamic nature of IS discontinuance phenomenon [39,40]. However, Rogers notes that a user may reject or discontinue the innovation already in any of the five stages that precede continued use. Accordingly, as the reviewed literature reveals later, IS discontinuance takes several other forms (i.e., content) that may follow different paths (i.e., process).

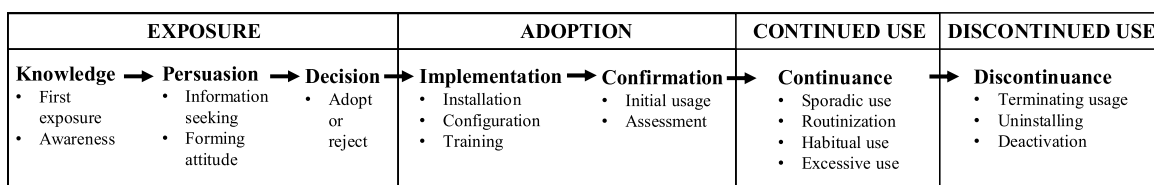


Fig. 1. Key stages in IS use lifecycle [34,60].

## 2.2. Content

One cannot understand a process in the absence of its content. Content may be described as a reflection of how a certain phenomenon transforms in substance as it transits through the phases of a change process [28]. For instance, continued IS use behavior has been suggested to encompass qualitatively different aspects, i.e., frequency, duration, intensity, and comprehensiveness of use [41,42]. In our case, we conceptualize content as the various forms IS discontinuance takes as it occurs at different stages in a typical IS usage life cycle and the terminology used to describe it. When investigating any of these forms, one can conceptualize and operationalize them in terms of behavioral intentions or actual behavior. This is an important division to consider, as it relates directly to the content of a given study. On the one hand, realization of intentions into actual behavior is not always certain or straightforward, questioning the validity of intentions as proxies for actual behavior [43,44]. In fact, Wu and Du's [133] meta-analysis on IS use research reveals that "BI [behavioral intention] is not a good surrogate for [actual] usage" (p. 692). On the other hand, examination of intentions, rather than behavior, can sometimes be well justified if actual behavior is irrelevant or beyond the scope of a given study, for instance, when intention formation is seen as a method of self-therapy or self-regulation (e.g., [1]). It is important to note that these content-specific considerations are highly contextual. For instance, in utilitarian IS use contexts, realization of discontinuance intentions may be abrupted by habit [45] or inertia [46] or because the user suddenly decides to replace the incumbent system without any prior intentions to do so, if a better alternative emerges. By contrast, in hedonic use contexts, desires or impulses may override otherwise strong intentions to discontinue excessive system use [47,48]. We discuss this further in the following sections.

## 2.3. Context

While process and content shed light on the sequence of events that explain the origin, continuance, and outcome of a particular phenomenon, context emphasizes salient aspects in the surrounding environment that shapes and is shaped by the process under study. Every IS use behavior, including discontinuance, occurs in a context, and acknowledging the implications of this is important [49]. However, it should be noted that "context" is a debatable concept that can refer to various things, including geographical context (place), temporal context (time), and cultural context (history), to name a few. While Davison and Martinson [49] encourage context-sensitivity and warn against making too universal claims, it is also noted that "abstracting too close to the context can lead to 'description' and 'local truths' while limiting the transferability of finding" ([50], p. 268). Thus, theorizing always involves finding the right balance between universalism and context-specificity.

For the purpose of our analysis, we focus primarily on two salient and interrelated dimensions shaping IS use context: immediate use context and system type. Immediate context reflects the surroundings that the system use is intended to take place in: whether the system serves the purposes of workplace activities (*work*) or a user's private leisure time (*nonwork*). Moreover, we divide systems into *utilitarian* and *hedonic* types [51], depending on what is their original purpose and typical nature of use. While the use of utilitarian ISs can occur in either professional work environments (e.g., enterprise-class systems) or private leisure contexts (e.g., mobile banking or map services), their use is typically argued to be mainly driven by extrinsic motivational factors, e.g., their perceived usefulness [21,52]. Hedonic ISs, by contrast, are largely driven by intrinsic motivations, e.g., the perceived enjoyment of spending time online or playing a game [53,51]. While the use of hedonic systems occurs mainly in private leisure environments, they can also be utilized within the work context, for instance, in the form of gamification components that provide a fun way of improving productivity of workers [54,55]. Hence, along with these two dimensions, we can see four largely distinct archetypical IS use contexts (Table 1).

The reader should note that this is merely an idealized framework for analytic purposes and that boundaries between these contexts are not as sharp as the archetypical framework purports – in real-life contexts, the lines between them may blur. For instance, some organizations thrive on a culture of "free control," where the traditional notions of immobility and physical boundaries are seen as constraints, rather than enablers, of objectives [56]. A culture of this nature combines aspects of both the work and nonwork contexts. In a similar vein, *mixed systems* [57] or *dual-purposed IS* [58] represents a class of IS that "have combined features from utilitarian and hedonic systems such that productive use and sense of fun can be realized simultaneously" ([57], p. 361). While this is indeed a limitation of the framework, it still offers a useful classification to conceptualize four largely dissimilar IS use contexts and, thus, represents an answer to recent calls for IS researchers to limit their universalistic claims and aspire to be more sensitive to context [49].

Another inherently contextual concern is the level of analysis. Considering that decisions to discontinue IS use occur at both *individual* and *organizational* levels, we need to distinguish these contrasting levels of analysis. While, at the individual level, users abandon systems they have previously adopted and used based on individual reasoning and/or emotions, organizational-level IS discontinuance is usually an outcome of collective and strategic decision-making that affects all those parts of the organization that are interacting with the system. Consistently, the literature shows that individual and organizational decisions are very different in nature [18,59], and typically, different theories are applied when studying each. However, certain frameworks such as the DOI [37,60] can be utilized at both individual and organizational levels [61].

**Table 1**  
Four Archetypical IS Use Contexts.

System type	Immediate context	
	Work	Nonwork
Utilitarian IS	<b>Context 1: Utilitarian IS use in work context</b> This context covers utilitarian IS use within workplace, e.g., ERP systems; group support systems; work e-mail. Both individual and organizational levels of analysis are expected to be studied.	<b>Context 2: Utilitarian IS use in nonwork context</b> This context covers utilitarian IS use outside/beyond workplace, e.g., mobile banking; antivirus on home PC; web browser. Only individual level of analysis is expected to be studied.
Hedonic IS	<b>Context 3: Hedonic IS use in work context</b> This context covers hedonic IS use within workplace, e.g., gamified organizational systems. Both individual and organizational levels of analysis are expected to be studied.	<b>Context 4: Hedonic IS use in nonwork context</b> This context covers hedonic IS use outside/beyond workplace, e.g., video games; entertainment services; social networking systems. Only individual level of analysis is expected to be studied.

### 3. Methodology

In this section, we provide a detailed discussion on the review procedures and the subsequent conceptual analysis of the gathered literature. As our purpose has been to conduct a predominantly theoretical literature review [62], it is important to highlight that our review represents a disciplined, rather than systematic, endeavor [63]. Gregor [25] emphasizes this position when she chooses relying on “considerable literature” rather than systematicity in developing her analytic classification of theories (p. 619). That said, our main objective has been to investigate how the IS literature has addressed the topic of IS discontinuance.

#### 3.1. Literature review

Our disciplined literature review has yielded a total of 55 studies published between 1991 and 2017 that specifically focus on the IS discontinuance topic. In this section, we detail our procedures and the rationale behind them. We initiated this research project in October 2015 and conducted several rounds of literature search, the latest of which was in November 2017. To ensure that our review is as extensive and inclusive as possible, we performed the search queries on two major databases, namely, *Scopus* and *Google Scholar*. We first performed the searches in *Scopus* with the following query: (TITLE-ABS-KEY (“IS” or “Information Systems” or “IT” or “Information Technology”) AND (“Discontinuance” or “Discontinue” or “Discontinued Use”)). Furthermore, we limited the search results to the English language and also excluded subject areas that are beyond the scope of our interest. For example, we excluded search results in peripheral domains such as medicine, biochemistry, dentistry, and environment. This search produced 473 results.

Executing an analysis of abstracts of our search results revealed that, despite applying specific filters in our search query, most of them discussed topics beyond the IS domain, such as agricultural, construction, and environmental studies; hence, those deemed irrelevant were dropped. One apparent reason for such non-IS studies turning up was most likely that IS and technologies have become increasingly ubiquitous in many domains; therefore, the keywords are often mentioned in studies that do not actually address the IS use phenomenon. Moreover, in many cases, the search code understandably interpreted the abbreviation “IS” as verb “is” and “IT” as pronoun “it”; this further contributed to the number of the irrelevant studies that emerged. This procedure resulted in altogether 72 studies to be analyzed in more detail.

From this pool of studies, altogether 39 were filtered out despite being IS studies either because a) they did not actually address the IS discontinuance phenomenon but referred to it only passingly (e.g., [64]) or b) although they claimed to provide an insight on IS discontinuance, their focus was fully on continued use (e.g. [65–67]). Thus, this first search stage resulted in discovering 33 studies that specifically addressed IS discontinuance. To complement this search, the same query was run in *Google Scholar*, and it produced three additional studies to be added into our sample.

In the second stage, consistent with Webster and Watson's [62] recommendations, we incorporated a backward and forward citation reviews of the 36 identified studies in our search procedure. Additionally, we were also open to ad-hoc additions and suggestions from our peers and colleagues, who might have been aware of articles that we missed. As we investigated these studies, we found references to other, potentially relevant, papers that were not captured among the hits produced by our search queries. This resulted in adding 16 new studies into the sample. Then, we went through our own academic libraries and scanned for potentially eligible studies to be considered, resulting in the addition of 11 more articles. Thus, the second search stage resulted in adding 27 more studies in our literature sample. However, eight studies were filtered out as they were found to be incomplete research-in-

progress papers (e.g., [68,69]), some of which more recent and complete versions had already been included in our sample (e.g., [70,103,71]). Thus, the overall search procedure resulted in the final sample of 55 relevant studies specifically discussing IS discontinuance. The selected studies are listed in [Appendix A](#), and [Appendix B](#) provides a descriptive overview of the sample.

#### 3.2. Conceptual analysis

Having identified the relevant studies for review in the search phase, we initiated our analysis phase. Our objective at this phase was twofold: first, to sensitize with the different meanings attached to the term “IS discontinuance” keeping in mind its multifaceted temporal connotations and, second, based on the resulting answer, to suggest areas for future research. Thus, we compiled a conceptual matrix [72] of the 55 studies, where we extracted information about methodology, theory, empirical context, unit of analysis, and IS characteristics used for each study. Moreover, we analyzed how discontinuance has been defined, conceptualized, and operationalized in the studies and made notes of other relevant issues such as interesting findings. Where relevant, we tabulated the independent and dependent variables reported in the studies to get an overall understanding of what kinds of constructs and relationships had been investigated in those studies.

As we sought to develop a clear conceptualization of the IS discontinuance behavior, the processual synthesis of our analytic framework played a key role in achieving this goal. Using our analytic framework as a sensitizing device, we analyzed the process, content, and context of each study. The primary question that occupied our thought while reviewing the literature was: *What does IS discontinuance mean at different stages of the IS lifecycle?* In line with Schwarz and Chin's [23] etymological investigation of the “IT acceptance” concept, we strived to (a) unfold the different meanings the term takes across the studies and (b) anchor these meanings to the IS lifecycle discussed in Section 2. Considering the tight interrelatedness of process and content, we examined them simultaneously, allowing each aspect to inform the other. Analysis of context then shed further light on the emerging insights.

Regarding *process*, we aimed to identify the temporal stage in which IS discontinuance behavior takes place. We applied the generic process described in our analytic framework, i.e., “exposure → adoption → continued use → discontinued use” ([Fig. 1](#)), bearing in mind that IS discontinuance may also occur through various other paths [60]. For instance, we found that, while some studies focus on discontinuance that occurs shortly after the adoption stage, others focus on discontinuance after extended periods of continued use. Furthermore, some studies discuss the stage of IS use in which the discontinuance occurs explicitly, whereas others are vaguer about it. For instance, time is a central component in the analysis in papers that focus on “early discontinuance” (e.g. [73–75]). Often, examining the sample selection criteria in the methodology section of empirical studies provided us further information about the temporal stage of focus. For instance, whereas Turel [1] gathers responses from incumbent and experienced SNS users, thus, arguably in the stage of continued use, Cenfetelli and Schwarz [76] study participants with no prior exposure to the IS in question, indicating that their focus is on the exposure stage.

In terms of *content*, we studied the meaning and implications of the behavior, e.g., whether the discontinuance decision means abandoning the system permanently or temporarily, whether the decision concerns the incumbent system alone or it incorporates the adoption or consideration of an alternative system, and whether the study focuses on intentions or behavior. To this end, we examined the conceptualizations of theoretical constructs used in the studies, the terminology used to describe them, and the measurement items applied to operationalize them.

Finally, we classified the studies according to their *context*, in line with the classificatory framework presented in [Table 1](#). First, we



**Table 2**  
Different forms of discontinuance.

Discontinuance form	Process path	Content: terms used to describe discontinuance	Contexts studied	Level of analysis (no. of studies)
Rejection	Exposure → Rejection	Continuous nonadopter [75]; Ourlight rejection [78]; Rejection [78,76,79,80,81,75]; Resister [74].	1,2	Individual (5); Organizational (3)
Regressive discontinuance	Exposure → Adoption → Regressive discontinuance	Discontinued use [81]; Early discontinuance [73]; Refector (post-adoption, [74]).	1,2	Individual (2); Organizational (1)
Quitting	Exposure → Adoption → Continued use → Quitting	Abandoning [82]; Decreased IT implementation [10]; Disadoption [83]; Discontinuance [73,84,85,86,82,87,88,75]; Discontinuation intentions [1,48]; Discontinued adopter, continuous nonadopter [75]; Discontinued use [84,89,90,91,92,93,94,95,96,80,97,10]; Discontinuer [74,87]; Discontinuous usage behavior [18]; Discontinuous usage intention [34,18]; Disenchantment discontinuance [98,148]; Inactive user [91]; Quitting [150,11]; Quitting intention [99]; Un-adoption [151].	1,2,4	Individual (27); Organizational (4)
Temporary discontinuance	Exposure → Adoption → Continued use → Temporary discontinuance	Discontinued adopter, returning adopter [75]; Reversion [75]; Stalling [97]; Rest-break [100]; Suspended activity [100]; Technological pause [101]; Temporary discontinuance [85,82,20]; Vacationing [20].	1,2,4	Individual (7)
Replacement	Exposure → Adoption → Continued use → Replacement	Backsourcing [149]; Churning [94]; Discontinuance intention [102]; Discontinuous usage intention [18,34]; Intention to use the new system [46]; Replacement discontinuance [98,19]; Replacement intention [33,153]; Switching intention [45]; Switching behavior [45,149,103].	1,2,4	Individual (8); Organizational (4)

captured the studied system's immediate use context by tapping on the environment in which the system was being used: at work or outside of work(place). Second, we identified the type of the system by differentiating between utilitarian and hedonic systems, drawing from how the authors of the original studies had presented (or framed) the system's type. Third, we captured the level of analysis taken in the studies, i.e., whether the discontinuance intentions and behaviors were studied at the level of an individual user or an organizational entity. For instance, [1] studies the social networking system Facebook from the perspective of an individual user. Whereas we acknowledge that Facebook could also be used at the workplace for utilitarian purposes, in Turel's studies, it is treated as a primarily hedonic system that is used (or at least intended to be used) at leisure time. Thus, we classify Turel's studies [1,48] to situate in *context 4*, i.e., hedonic system in nonwork environment studied at the individual level of analysis.

Analyzing each article in the lines of these questions led us to identify distinct forms of IS discontinuance that produce conceptually and temporally different behavioral outcomes. We present these findings in the following section.

#### 4. Findings

Our analysis led us to discover various forms of IS discontinuance discussed in the pool of studies. As we examined the processes that produced IS discontinuance, we were able to connect each discontinuous outcome to one of the three general stages in the IS use lifecycle: exposure, adoption, and continued use. Regarding content, these forms of discontinuance differed in their meaning and conceptualization. Further, we observed various terms used for IS discontinuance in the literature where it has been referred to as intention to discontinue, discontinued use, quitting, switching intentions, un-adoption, churning, and several others. Out of the 50 empirical studies in our sample, altogether 33 capture these outcomes in terms of actual behavior, while 17 in terms of intentions. Following the logic of temporal bracketing<sup>1</sup> [77], we found that the identified forms could be classified into five general categories depending on their process and content. Table 2 illustrates the different forms discontinuance can take during a typical IS lifecycle, outlining five major forms of IS discontinuance: rejection, regressive discontinuance, quitting, temporary discontinuance, and replacement.

Then, to gain a deeper understanding on the identified five forms, we examined the IS use context in each study. Consistent with the origins of technology acceptance research stream [21], utilitarian systems in the workplace use context (i.e., context 1) emerged as the dominant area of interest as altogether 17 studies situate within work (or study) context, where the focal system is provided for the users by their occupational institution. As an interesting notion, despite the dominance of organizational context in the selected studies, most of them actually investigate the phenomenon at the individual level of analysis (i.e., the IS user is an individual employee rather than a collective), leaving only nine studies that address organizational-level discontinuance decisions (e.g., top management strategic decision). It is noteworthy to mention that one context-1 study [80] discusses IS discontinuance at multiple levels of analysis: individual worker and project management.

Utilitarian systems used outside of the workplace (i.e., context 2) are getting attention too, including ISs such as online grocery shopping and location-based mobile services. While the discontinuance of home and mobile Internet has been a popular topic in the previous two decades, it is possible that this trend is already turning downward, as in

<sup>1</sup> Temporal bracketing is an analysis strategy for processual data. It is a technique used to temporally decompose a phenomenon into its constituent components in a successive manner," without presuming any progressive developmental logic" ([77], p. 703)

developed countries, Internet is being increasingly considered as a ubiquitously used basic commodity rather than a system meant for a specific purpose. Further, despite the soaring popularity of gamification, and the recognition that “organizations frequently have difficulty sustaining user engagement with a gamified information system” ([104], p. 268), we found no studies on IS discontinuance in context of hedonic system use at the workplace (i.e., context 3). However, beyond the workplace context, personal and hedonic motivations of system use (i.e., context 4) are gaining increasing momentum, as the recent attention in social networking services has spawned altogether 15 studies on SNS discontinuance, all of them published between 2012 and 2017.

We dedicate the following five subsections to discuss the different forms of IS discontinuance identified in the literature. We propose a temporal process path for each form, describe the content of discontinuance in terms of its meaning and implications, and analyze how the context shapes the antecedents and outcomes of the discontinuance.

#### 4.1. Rejection

IS discontinuance in the form of rejection may be seen as a two-stage process, beginning with exposure and immediately ending with a rejection decision. Rogers [60] discusses this process when he noted that after an individual is exposed to a new innovation (be it an IT, a tool, or even an idea), he/she “*may mentally apply the new idea to his or her present or anticipated future situation before deciding whether or not to try it*” (p. 175). We treat rejection as a special case of IS discontinuance, as such process emphasizes a lack of actual interaction between the technology and its potential users. As such, a rejection decision is often made based on mere expectations and assumptions. The archetypical process for IS rejection takes the form:

exposure → rejection

The concept of IS rejection may be traceable to the roots of technology acceptance and innovation diffusion research when the central question was why some employees refuse to adopt a system that would presumably make their work more productive (see e.g., [21,60]). While we are aware that some might not consider rejection as a form of discontinuance in the technical sense of the word (as the user did not adopt the innovation after all), for the sake of “analytic completeness” ([25], p. 631), we still include it as one potential outcome of post-exposure. Although our review procedure garnered only a limited number of studies on IS rejection ([76,78,74,75,79–81]), we note that a richer body of research could be found elsewhere under terms like “user resistance” (see [105] for a detailed review on the subject).

All the IS rejection studies included in our review are set in contexts 1 and 2, i.e., they focus on utilitarian ISs either at workplace (*context 1*) or at leisure time (*context 2*). Studies in *context 2* adopt the individual level of analysis [75,76,78]. Cenfetelli [78] refers to the phenomenon as “*outright rejection*” and highlights that such behavior is likely to occur when a user experiences the unfortunate combination of the presence of “high inhibitors” and “low enablers.” More specifically, adoption is unlikely to take place for an IS that combines high levels of inhibiting/negative attributes (e.g., intrusiveness) and low levels of positive/enabling attributes (e.g., information quality, [76,78]).

By contrast, the identified studies set in *context 1* view the rejection of workplace systems as an organizational-level decision [79–81]. Tully’s [81] study illustrates how various forms of organizational discontinuance decisions made sense at the distinct stages of the IS use lifecycle/process, with pre-adoption rejection being one of them when the system was considered incompatible with previous practices and needs of the organization. Sometimes IS adoption fails if it lacks the commitment of the staff or the support of the management, as illustrated by Miller et al. [80] who highlight the importance of gaining both individual- and organizational-level support. In their study, the implementation of a computer-aided design (CAD) system in a

construction project ended up being rejected by the organization because the staff were not convinced about its usability and benefits to their work. In a similar vein, Goode [79] finds that in addition to the aforementioned factors, organization’s insufficient resources, as well as commitment to its incumbent systems inhibit adoption when it comes to open source software (OSS).

Thus, studies on rejection suggest that the key impetus for IT rejection is rooted in pre-adoption expectations and perceptions about the IT itself. The main emphasis is on the balance between enablers and inhibitors of adoption, highlighting the importance of perceived compatibility with the user’s needs. Effective use of apt communication channels to provide knowledge and persuasion for the user [60] would thus be paramount in overcoming the rejection hurdle from happening at the exposure stage.

#### 4.2. Regressive discontinuance

Regressive discontinuance reflects a decision to discontinue an IS shortly after a first-hand use experience. Bhattacharjee [17] introduced the term “acceptance–discontinuance anomaly” to describe a behavior where “some users discontinue IS use after accepting it initially” (p. 352). Abraham and Hayward [106] describe this behavior as “regressive discontinuance” and explain that it generally happens when a user bases the initial adoption decision on misapprehensions about innovation characteristics, user’s own capabilities, or consequences of use.

From a process perspective, the key distinguishing characteristic about regressive discontinuance is that it occurs shortly after the adoption stage, before the user enters the continued use stage where the use could become routinized. Hence, an archetypical process for this type of discontinuance follows the form:

exposure → adoption → regressive discontinuance

Probably, the most recognized theoretical explanation for this phenomenon comes from the expectation (dis)confirmation theory (EDT, [107,108]). In its original form, the theory posits that satisfaction (resulting from positively disconfirmed expectations) is the key antecedent to repurchase behavior, while dissatisfaction (resulting from negatively disconfirmed expectations) is key to complaining and non-repurchase intention. Thus, researchers applying these core EDT ideas to IS contexts have argued that before adopting a certain technology (i.e., at the exposure stage), users form certain expectations, and discontinuance would occur when their first-hand experience (i.e., at the adoption stage, after implementation and confirmation; [60]) proves to be below these expectations [17,109,66,67].

Interestingly, while a significant number of IS discontinuance studies refer to acceptance–discontinuance anomaly [17], only three studies in our sample have actually captured this form of early discontinuance. Two of them address the phenomenon at the individual level of analysis ([73,74]). Graaf et al. [74] study the phenomenon in *context 2* and, in line with EDT, find that some adopters of a “home robot” regressively discontinued<sup>2</sup> it after a short period of initial use if the robot performed tasks not expected from it. On the other hand, in *context 1*, Aggarwal et al. [73] show how medical representatives high in self-perceived IT skills but low in actual IT skills adopt new technology fast and also discontinue it very quickly after the adoption and first trials. This finding demonstrates how “early discontinuance” may stem from misalignment between individual users’ self-perception and actual IT skills, hence highlighting the importance of considering user characteristics along with the ones of innovation. Furthermore, it is suggested that while misapprehensions about user’s own capabilities [106] may trigger rapid adoption of a technology, the same

<sup>2</sup> It is worth noting that these authors refer to this behavior as rejection in their study, while calling pre-adoption rejecters “resisters.”

misapprehensions may then cause its regressive discontinuance.

At the organizational level of decision-making in *context 1*, Tully [81] illustrates how one firm adopted an IT platform but abandoned it shortly after that due to incompatibility with its needs. Specifically, the employees did not understand how the system would help the organization to achieve its goals, and the system was discontinued only a few months after its adoption. Thus, it appears that, in line with EDT, disconfirmation of users' expectations takes a key role regarding discontinuance decisions. Once the IS has been adopted, a negative disconfirmation may trigger regressive discontinuance. Somewhat surprisingly, most of the studies referring to the acceptance–discontinuance anomaly appear to address a form of discontinuance that happens at a much later point in time, reflecting what is best described as “quitting.”

### 4.3. Quitting

Quitting is perhaps the most recognizable form of IS discontinuance, and it is, in fact, the most researched form of discontinuance in IS research; more than 50% of the reviewed articles focus on this form of discontinuance. From a process perspective, the key distinguishing factor between regressive discontinuance and quitting is whether or not a user has made a transition from the adoption stage to the continued use stage. As such, an archetypical process for IS quitting follows the form:

exposure → adoption → continued use → quitting

Here, the purpose of discontinuance is to abandon the IS altogether after a period of continued use, such as quitting the use of Facebook [18,34,1] or making an organizational-level decision to abandon a certain technology [10]. While quitting is frequently referred to as discontinuance or discontinued use, Whitacre and Rhinesmith [151] use the term “un-adoption.” Other terms have been used as well, including “disadoption” [83], “dropping” [110,111], and “continuous nonadoption of discontinued adopters” [75]. However, we find that the behavior of discontinuing an IS intendedly indefinitely (i.e., with the intention of *not* taking it back into use, at least at the time the quitting decision is made) is best described with the term “quitting” [1,99,112].

Typically, research focusing on this form of discontinuance investigates how and why discontinuance happens using theoretical lenses beyond the often-cited expectation disconfirmation theory and Bhattacharjee's [17] notion of acceptance–discontinuance anomaly. Accordingly, the studies in our sample leverage a wide range of theories, most often cited being diffusion of innovations, technology acceptance model, uses and gratifications, and theory of planned behavior. Considering that quitting is the most studied form of IS discontinuance, it is not surprising that both individual and organizational levels of analysis have been covered in all the different contexts of our analytic framework (with the exception of *context 3*, i.e., hedonic IS inside workplace).

At the individual level, it appears that system performance, institutional support, and social environment play key roles in explaining discontinued use in *context 1*, i.e., productivity-enhancing work systems [88,97]. Recker [88] suggests that intentions to quit using an inventory replenishment system are determined by the competing positive and negative beliefs about system performance. However, Pollard [97] finds that, while low reliability and poor task–technology fit predict discontinuance, the presence of a “champion” user prevents it.

In *context 2*, i.e., utilitarian systems used outside the workplace, quitting is often explained by “disenchantment” [74,98] or “dissatisfaction” with the system itself or the quality of service it facilitates [87,92,93]. Such disenchantment is more likely to happen with late adopters, as they may rely more on internal sources of information, like friends and family, regarding system's benefits [98]. Interestingly, Prendergast and Marr [148] find no support for the occurrence of

disenchantment discontinuance in the context of banking self-service technologies – they argue that the discontinuance of some users is better explained by diffusion saturation, which resonates with Cooper's [86] finding that accumulating experience of system use inhibits its discontinuance. Expectedly, technology breakdowns [113] and changing user needs [87] have been found to trigger users to quit their IT use. However, these decisions are often shaped by environmental factors like social influence [95,113]. Salo and Frank [150] focus specifically on the effect of the IS use environment on use behavior, and their findings suggest that users are more likely to entirely quit IS use if negatively perceived IS incidents happen indoors rather than outdoors or in a vehicle. Moreover, major life events were found to render the system useless in the case of online shopping [92].

The research on hedonic systems used outside the workplace (*context 4*) seems to exclusively focus on SNSs, most prominently Facebook. Satisfaction and dissatisfaction with the system play key roles also in this context. However, an interesting division can be observed within these studies, as some focus on the functional aspects of the technology and others address the consequences of system use on the individual's psychological welfare. When studying Twitter usage, Coursaris et al. [91] found that compared to continuers, discontinuers had different motivations for adopting the system in the first place, and this distinction determined users' post-adoption behavior. While continuers' adoption decisions were initially motivated by favorable characteristics of the system, such as relative advantage and popularity, discontinuers were incentivized by the potential for social interaction, which, however, the system did not offer them to a satisfying extent, causing them to discontinue using it (p. 73). By contrast, other studies consider the psychological burden from SNS use (aka, the dark side of IT) in the form of technostress [114,18], social overload [34], SNS fatigue [100,115], exhaustion [114], as well as frustration [116]. Dissatisfaction with SNS is often attributed to the aforementioned forms of psychological burden, and it has been found to invoke discontinuance intentions [115,116]. On that note, findings on how Facebook users cope with disturbances caused by their system use are particularly interesting. In addition to significantly reducing system usage time, the coping techniques include two distinct levels of quitting the system use: deactivating Facebook account and deleting the account for good [85,100]. In this context, guilt feelings from excessive SNS use have also been repeatedly found to contribute to SNS discontinuance intentions [1,48,112].

The organizational level of analysis understandably focuses mainly on *context 1* (i.e., utilitarian IS in the workplace), and there the fit between the IS and organization's strategy is paramount. Echoing Tully's [81] findings, Power and Gruner [10] find that companies abandon seemingly beneficial and current inter-organizational IT systems when the system implementation is no longer in line with the firms' strategies. While Tully finds that the shortly perceived misfit between the IS and organizational strategy caused a regressive discontinuance of the system, in Power and Gruner's study, systems that used to have a good fit with strategy are rendered incompatible with it due to organizational and economic changes. Moreover, also costs and operational disadvantages were identified as reasons for IT discontinuance. Furthermore, Fürstenau et al. [14] investigate why organizational shadow systems get discontinued and find that systems with narrow scope of use and low functional scope are more likely to get abandoned than those with higher organizational embeddedness. Moreover, changes in IT architectures and organizational conditions sometimes render systems useless if they are not robust against such changes. Boukef and Charki [84] and Charki et al. [89], by contrast, shed light on the ethical and legal reasons for discontinuing organizational systems: if the system use is not in line with the company's values or the rule of law, it may be discontinued. In addition, Tully's [81] study awoke the question of how quitting decisions relate to the extent of continued use: firms that adopted and continued using the system stayed in the cycle of continued use with varying success. For example, in one firm, the use of



the platform remained limited because the employees found it rather complex to operate. This notion may warrant further investigation: what is the relationship between the extent of system use [42] and its discontinuance?

Overall, the findings on IS quitting demonstrate the significance of temporal considerations: the system has been in continuous use, but changes in the user or the surroundings over time alter the situation so that discontinuance of that technology may follow. In other words, in contrast to rejection and regressive discontinuance, post-continuance quitting involves a “drastic” change in relatively long and stable history of interaction between the user and the focal IT. Thus, whether the change concerns a user who is no longer satisfied with oneself due to excessive SNS use or an organization that no longer has the resources to maintain a system that is not crucial for its operations, it appears that if certain developments take place during the continued use stage, the user may (re)consider the earlier motivations of system use as no longer valid and end up quitting the system use.

#### 4.4. Temporary discontinuance

Probably, one of the most interesting empirical findings shows that discontinuance is not always terminal because sometimes the discontinuing user returns to using the system after a temporary period of inactivity. Specifically, temporary discontinuance differs from quitting in that in the former, the IS discontinuance decision is associated with an intention of re-using it at a later point in time; quitting is not. Going back to using, the system returns the user to the continued use stage in the use lifecycle. From a process perspective, temporary discontinuance takes the form

exposure → adoption → continued use ⇌ temporary discontinuance

In line with Pollard [97], we define a temporary discontinuer as someone who has used a system and discontinued it but later returns to use it or intends to do so (p. 178). Thus, the key distinction between quitting and temporary discontinuance (or vacationing) is predominantly cognitive in nature. This practice has been described in the literature using various terms such as “vacationing” [20], “stalling” [97], and even “reinvention” [75]. In addition, the study by Geri and Naor-Elaiza [82], that surveyed students who had seemingly abandoned an online assignment submission system exhibits a likely case of temporary discontinuance (p. 231). In this particular case, the sample of students reported generally high intentions to use the system in the future, which indicates that their discontinuance may have been only temporary.

Five studies have explored temporary IS discontinuance, all of which have been conducted at the individual level of analysis, leaving the organizational level of analysis entirely unexplored. Similar to quitting research, contexts 1, 2, and 4 have enjoyed research attention. With utilitarian IS in the workplace (*context 1*), factors such as unavailability of the system, lack of institutional support, poor task–technology fit, and complexity were found to be the main causes of temporary discontinuance [82,97]. These studies indicate that the users tend to be willing to return to use the system if the identified problems get resolved. One explanation for employees and students reporting intentions to return to using the system in the future points out to a general understanding that the final decision to abandon the technology is ultimately an organizational one. Whether this is the case or not, it warrants future research.

Research on temporary discontinuance in hedonic use environments (*context 4*) focuses solely on social media in general and Facebook in particular. Here, temporary discontinuance, similar to quitting, tends to happen as a modest coping strategy to the system use becoming a bit of a disturbance or distraction in the user’s life. Specifically, Facebook can become a burden on personal time, cognitive, and social resources [20],

causing fatigue [100] or social turbulences [85] that were found to trigger the user to take a vacation from Facebook use. It would seem that users who opt for drastic coping measures, such as quitting (in contrast to vacationing), are those whose technology use has caused severe personal and social disturbances. Finally, Rosenbaum and Wong [101] find that users may resort to vacationing while on (actual) vacation. For instance, hotel guests were found to take a “technological pause” if they felt that the technology disturbed their holiday [101].

In sum, with organizational systems, users’ temporary discontinuance tends to occur if the system does not receive enough institutional support, resulting in a lack of incentives to use the system. However, in the case of hedonic IS, if the system use causes too much distraction in one’s life, the user may choose to remedy the situation by taking a break from its use. From a process perspective, temporary discontinuance represents an interesting phenomenon: a discontinuance behavior that occurs parallel with the continued use stage, as the user may keep looping between the two stages. In fact, it was found that users may take either short rest-breaks from SNS or suspend its use for a longer time [100]. This points out to a question that may warrant further investigation: what is the relationship between the extent of system use prior to the break, the length of the break, and the resulting effects?

#### 4.5. Replacement

The final form of IS discontinuance we identified is replacement, representing the event in which an incumbent IS is replaced with a new, presumably more advanced or attractive one [19,33,45,46,117,118]. Generally speaking, in replacement discontinuance, one IS use lifecycle comes to an end and another begins as the user exits the use lifecycle of the incumbent system and shifts into a new one. Thus, in its core, the process of replacing a previously adopted system would take the following form:

exposure → adoption → continued use → replacement

Contrary to examining why users might stop an IS use behavior entirely (whether this refers to getting off the grid by discontinuing Internet contract or alleviating social overload by discontinuing SNS use), studies on IS replacement are typically concerned with situations where users continue performing the same behavior as before but with a different IS artifact. For instance, discontinuing the use of the incumbent Internet Explorer web browser and adopting the Opera browser [45] is a typical example of IS replacement where an incumbent system is replaced with a corresponding but potentially more advanced alternative system. Then again, in other studies, the incumbent IS is replaced with a very different kind of IS. For instance, Polites and Karahanna [46] study how students replace e-mail with Google Docs as the medium of choice for collaborating and exchanging files in group projects; Maier, Laumer, Weinert, et al. [34] study how SNS users continue their social activities by using other IS after discontinuing their SNS use; and Furneaux and Wade [33,152] discuss replacing old organizational systems with drastically different new IT solutions.

We note that there exists a large body of IS switching research, of which only a few representative studies appeared in our sample, including examples of both individual- and organizational-level decision-making. Such studies (e.g., [45]) tend to focus on factors that determine the adoption of an alternative IS to replace the old one, thus highlighting the beginning of the alternative IS’s use lifecycle. Recker [88] argues that such approach offers only limited insight on the reasons why the incumbent IS gets abandoned, and thus, extending our search procedure with IS switching would have been unlikely to provide significant insight into our focal interest: IS discontinuance. Nonetheless, it is evident that replacement is one special case of discontinuance, consisting of two parallel processes: discontinuing an incumbent IS and adopting an alternative IS (however, not necessarily in this order, and the stages of these two processes may intertwine).

Individual-level replacement studies often leverage the push–pull–mooring (PPM) framework owing to its suitability in studying migration in general [119]. However, as the adoption of an alternative IS tends to have a focal role in the replacement literature, combinations of DOI, EDT, and TAM have been applied. Almost all the individual-level studies in our sample that focus exclusively on replacement discuss utilitarian systems outside workplace (*context 2*), with the exception of one SNS-migration study (*context 4*, [117]). Although some attempt to chart user characteristics that predict IS switching [94], typically the most important explanatory factors focus on alternatives and their advantages. Examples include “relative advantage of alternative IS” [19,45,46,117,118], “availability of alternatives” [19,86,98], and “attraction from alternatives” [87,117]. It is also worth noting that satisfaction with the incumbent system [45,118] and switching costs [18] tend to impede replacement decisions, but dissatisfaction might cause the user to switch to an alternative [117].

At the organizational level, [102,33,152] investigate the factors that explain replacing an incumbent IS with a new one, concentrating on the end part of incumbent IS’s lifecycle. They find that organizational IS replacement decisions are mainly driven by system capability shortcomings, while system support availability, high technical integration, and replacement risk inhibit discontinuance intentions. Whitten et al. [149] bring yet another perspective into the discussion as they describe two different kinds of organizational-level IS replacement. As an example of more conventional type of replacement, they find that approximately 25% of the respondent companies had switched their IT outsourcing vendor. However, the study also demonstrates a more special type of replacement: some companies discontinue their IT outsourcing contract altogether and bring the IT function back in-house; a practice commonly referred to as “backsourcing.” Different types of switching costs, such as in-house learning costs, were the key in understanding why companies chose to undertake either of these two distinct decisions.

In sum, like in quitting, also in replacement, changes occurring either in the needs of an IS user or in its use environment explain discontinuance behavior. Logically, in replacement cases, environmental changes often relate to the emergence of notable alternative IS that may not have been available during the adoption stage. On the other hand, changed circumstances may also elevate the level of user’s requirements for the IS, and this may result in the incumbent IS being seen as inadequate to fill its intended purpose. A focal consideration divides replacement decisions into two distinct types: switching the current IS into another corresponding one (e.g., one e-mail service to another

[120]), or replacing the current IS with a disrupting alternative (e.g., moving from using feature phone to using smartphone [121]).

## 5. Discussion

This article has been primarily motivated by the question “What does IS discontinuance mean?” We argued that analytic theorizing provides one approach to answer this question. As noted before, this type of work – what Gregor [25] calls “*Type I*” theory – represents the most basic form of theory, as they are more concerned with classifying or typifying the dimensions of a relatively under-researched phenomenon (ibid). The findings we presented in the previous section demonstrate that IS discontinuance cannot be understood by merely referring to the notion of usage cessation. Of course, this aspect (i.e., an IS not being used by its intended user) is a critical element of the definition. However, as the findings show, IS discontinuance is a multifaceted phenomenon composed of at least three core components: process, content, and context. First, **process** fundamentally emphasizes the temporal element of IS discontinuance, i.e., IS discontinuance is a socio-technical phenomenon, where different historical paths lead to qualitatively different manifestations. These different manifestations are the focal interest of the second element: content. Here, **content** is a matter of form, i.e., the five forms of IS discontinuance discussed earlier. These five forms of IS discontinuance are seen as distinctly different behavioral (or intentional) outcomes that occur in different temporal stages of the IS use lifecycle. Finally, **context** emphasizes the situatedness of the phenomenon, that is, the meaning of IS discontinuance will alter significantly depending on the immediate use context (e.g., at home vs. at work), as well as on the nature of IS itself (e.g., videogame vs. accounting system).

Fig. 2 illustrates the various forms that IS discontinuance takes during an IS use lifecycle that encompasses three general stages in the IS acceptance and use process: exposure, adoption, and continued use. The circular arrows in each stage represent that users engage in recurring activities in that stage, whether they are about merely being aware of the IS; trialing the IS; training the IS use; using the IS in a sporadic or habitual manner. **Rejection** represents the first and shortest process where the decision is made shortly after exposure. Generally, a decision to reject an IT is entirely made based on assumptions, as it emphasizes a lack of actual interaction between the technology and its potential users. **Regressive discontinuance** may be seen as an extended version of rejection with the main difference being having an actual experience with the IT. EDT [107,108] serves as the most used

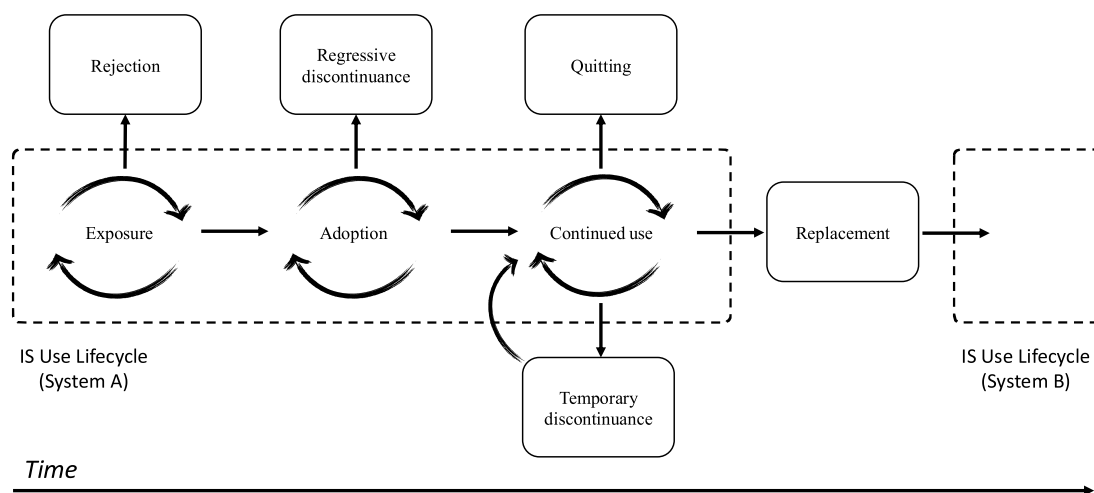


Fig. 2. Different Forms of Discontinuance in a Typical IS Lifecycle.

theoretical explanation for this form of discontinuance. Generally speaking, regressive discontinuance is likely to occur when actual experience with the IT at the adoption stage fails to meet the user's expectations formed at the exposure stage, or as EDT would state it, due to dissatisfaction resulting from negatively disconfirmed expectations. **Quitting** represents a rather unique form of discontinuance as, contrary to the two previous forms, it involves a break in a relatively long and stable relationship between the user and the IT. Here, investigators are expected to find out how and why users decide to abandon a once-satisfactory IT. **Temporary discontinuance** is the fourth form of discontinuance we identified. It is interesting that this form of discontinuance reflects the co-occurrence of both IS use continuance and discontinuance stages as users exhibiting this form of discontinuance tend to alternate between periods of "vacationing" from IS use and "returning" back. **Replacement** is the final form of discontinuance we identified, and despite some commonality with quitting, replacement typically involves a comparison between a focal IT and an alternative in the user's environment. Such conceptual clarification has important implications for theory, methodology, as well as practice, as we will point out next.

### 5.1. Theoretical implications

We have demonstrated that IS discontinuance can materialize in various forms, and thus, we echo Pollard's [97] and Turel's [48] notion that this phenomenon is more than simply the flipside of "IT use," and it merits its own theorizing. One of the central theoretical implications of our work is demonstrating that IS discontinuance may manifest in at least five distinct forms, each of which follows a different path or process (namely rejection, regressive discontinuance, quitting, temporary discontinuance, and replacement). This is not to say that there are no other forms of discontinuance, but rather that our classification serves as a first step toward providing conceptual clarity. Next, we provide our key implications to theory.

We find that while some recent literature has acknowledged the importance of making a distinction between the various forms of IS discontinuance [100], mainstream IS research remains insensitive to these distinctions. This concern is especially visible in recent work on SNS discontinuance [114,18,115,116], where it is customary to aggregate conceptually distinct behaviors (e.g., taking a temporary break from SNS use; switching to use another SNS; and quitting SNS use entirely) in the same theoretical construct (i.e., the dependent variable). Such frequently used constructs include "discontinuous usage intention" [34,115] or "discontinuance intention" [114,116]. From a conceptual standpoint, however, it should be noted that quitting an IS use entirely is a different decision to replacing the IS with a competing alternative. For instance, while quitting SNS use can be an effective way to alleviate technostress [18], it is not clear why switching SNS to another one would have a corresponding effect. Moreover, especially the act of decreasing the extent of one's IS use is conceptually related to the continued use of the system rather than discontinued use: one's use duration, frequency, or intensity [42] just becomes lower. Thus, while decreasing usage could be a significant predictor of IS discontinuance behavior [94], we argue that it should not be considered as a reflection of discontinuance. Our concern is that conflating behaviors of such different nature will inhibit the emergence of rich insights regarding the IS discontinuance behavior.

Second, our analysis points to the need for multi-level theorizing while studying IS discontinuance. While we acknowledged the level of analysis through the traditional individual/organizational classification relating to the IS user, we discovered that other important multilevel considerations exist too, most prominently the level of analysis concerning the IS artifact. For instance, when a particular system (e.g., a web browser) or service (e.g., an Internet service provider) gets replaced with a corresponding one (e.g., another web browser or another Internet service provider), the previously adopted technology or

innovation itself (i.e., web browsers in general; Internet connection in general) continues to be used – just with a different device or service. In this sense, if we view the IS use lifecycle from a higher-order perspective of a technology or an innovation, replacement would happen only when the user switches into using a system that is fundamentally different. In such broad view of technology use lifecycle, replacing one web browser or ERP system with another corresponding one would not qualify as discontinuance as the user would still remain in the stage of continued use of that technology. This insight raises an important question: what kind of IS qualifies as fundamentally different or disruptive enough so that its adoption would mean the end of previous technology's lifecycle? For instance, when talking about mobile phone switching, what kind of behavior constitutes as disruptive: is it switching between smartphones or switching from feature phone to a smartphone (as in [121]) or are all mobile phone technologies similar enough to be considered belonging into the same technology lifecycle? Most articles dismiss the significance of these different levels or acknowledge them only implicitly. While several articles focused on IS quitting acknowledge that it is possible that users who discontinue the specific IS would switch into using similar competing alternatives (e.g. [91,114,115]); they rarely attempt to verify whether this is the case and what implications that could have on their results. Future research could benefit from a more explicit consideration, both conceptually and methodologically, of what IS discontinuance means regarding the incumbent IS artifact, its affordances, and the technology behind them. Thus, an interesting direction of research would be to investigate the discontinuance of specific IT/IS affordances, e.g., as the popularity of a particular SNS declines [6], do service providers simply switch the SNS platform, or will they move to an alternative IS medium (e.g., a web page), or possibly revert back to traditional media (e.g., local newspapers; outdoor advertising)?

Third, we emphasize the importance of context [49,122], and our contextualist framework (see Table 1) provides an avenue for future research to be more context-sensitive. Specifically, we identify four different IS use contexts based on two widely recognized dimensions in the IS field: immediate use context and system type. The framework we advance opens up directions beyond the traditional utilitarian/hedonic IS dichotomy [51] and points to gaps in our current body of knowledge. For instance, we note a lack of research exploring discontinuance (in any of its five forms) of hedonic IS in organizational context, despite the notable surge in interest in introducing game-like mechanisms (i.e., gamification) in nongame contexts such as organizations [54,55]. In fact, Suh et al. [104] have recently recognized the struggle that organizations face with sustaining employees' interest in using gamified IS, thus stressing, though only implicitly, the importance of studying IS discontinuance in such contexts. Research of this nature is much needed, since in addition to consuming large resources (e.g., implementation, communication, training, etc.), gamification efforts also require radical changes in management philosophy [123]. Considering such serious dedication, it is critical to explore whether discontinuance of these efforts occur, in what form (e.g., rejection, regressive discontinuance, quitting, etc.), and most importantly, why? Our classification, however, is by no means the only way to capture context, and future researchers are welcome to propose their own conceptualizations.

Fourth, our work also points to an interesting paradox with theoretical implication in the cases of problematic IS use. In such context, in addition to its negative and direct impact on discontinuance intentions, satisfaction with the system was reported to have a positive but indirect impact on discontinuance intentions, through formation of habit, addiction, and guilt [1]. This notion could be explained by the distinction between "(dis)satisfaction with the technology" and "(dis)satisfaction with the self." This distinction is particularly critical for technologies that offer multiple options and functionalities. For example, a Facebook user might be satisfied with the "instant messaging" functionality while dissatisfied with a sense of "loss of privacy." Najmul Islam's [153] theoretical treatment of the sources of satisfaction and dissatisfaction

offers a notable starting point for future investigations.

Finally, while the current literature is mostly focused on antecedents of IS discontinuance, only a few studies address the implications of such decisions [83,85,87]. Reaching beyond adoption and continuance, IS discontinuance studies have complemented our understanding of the overall IS use phenomenon. Going still further by investigating the implications of discontinuance behavior could yield significant insights. For instance, does permanent or temporary SNS discontinuance improve the quality of life for those who need a break from its excessive use?

## 5.2. Methodological implications

The first methodological implication relates to the importance of distinguishing the different discontinuance forms in the operationalization of constructs. As noted earlier, some studies conflate these forms on conceptual level, and this seems to be the case also in their operationalization. For instance, Maier et al. [18] operationalize the construct “discontinuous usage intention” using the following three items: “I will unregister Facebook,” “In the future, I will use another social network site,” and “In the future, I will use Facebook far less than today.” Although the authors claim that they used reflective indicators, they are in fact formative: the indicators define the construct, they are not interchangeable, and they do not necessarily possess the same antecedents and consequences [124]. This is an example of a misspecification of a structural model common in IS literature, where a construct of formative nature is modeled as reflective ([124], p. 633). Similar misspecification occurs in Wirth et al.'s [116] work as well. Yet, other studies [114,115] that follow similar operationalization fail to even report whether their corresponding constructs have been modeled as reflective or formative. While the appropriateness of using formative measurement in theory testing research is already a subject of debate in itself (see, e.g. [125–128]), we encourage researchers to pay close attention to construct specification and be explicit about their modeling approach when reporting their methods.

Second, it is obvious that the IS discontinuance phenomenon is a fertile ground for theory development [129,130] and requires more qualitative and contextual research efforts in order to be able to convey those “untold stories” to the wide IS audiences [131]. Evidently, current research is dominated by a static, variable-centered paradigm, and typically tested in cross-sectional settings [24]. It has been argued that overemphasis on studying “variables” at the expense of “actors” and their “actions” has contributed to the widening gap between research and practice [131]. Another concern is that while the variable-centered approach enables us to identify the key factors responsible for a certain behavioral outcome at a certain point in time, its main shortcoming is that it omits the impact of time on behavior change. For instance, as we demonstrated with the archetypical processes, each form of IS discontinuance follows a different path, thus warranting the developing of different theories for the different paths [132]. As a starting point, one should keep in mind that these different processes emphasize that even if users adopt an IS, they might regressively discontinue it shortly after. However, if they continue using the IS after adoption, they can be considered to have moved to the stage of continued use, which might vary in length and use intensity depending on the type of IS and its use context. The lifecycle comes to an end when the user quits the IS use or replaces it with an alternative IS. Sometimes discontinuance is not permanent as the user may return to use the system after a period of discontinued use.

Finally, we would like to highlight the choice of dependent variable in IS discontinuance studies. While we found that most studies attempt to capture actual discontinuance behavior, many recent studies are still limited to measuring discontinuance intentions, even in contexts where addressing actual behavior is arguably more important to study. Such examples include studies in *context 4*, where habit, addiction, and hedonic rewards from system use can powerfully obstruct the realization

of discontinuance intentions, rendering them as potentially insufficient proxies for actual behavioral outcomes. Thus, we join Wu and Du [133] in their call for future researchers to move beyond mere intentions and try to identify novel ways to capture actual behavior. However, we understand that this is a common challenge in survey-based research, where researchers may only have a limited access to research subjects' self-reported, cross-sectional behavior. Building on the concept of *behavioral expectation* [42,111] could be one approach to tackle this challenge.

## 5.3. Practical implications

It is safe to argue that, in most cases, the ultimate purpose of IS is for it to be used (as long as possible), and to delay the different forms of discontinuance (as much as possible) in its typical lifecycle. Especially, both the provider and user of an IS are probably motivated to inhibit the *premature* discontinuance of their product or service, since they have both invested in the IS, whether by developing it or by spending money and/or time on it. This should not, however, distract us from noting that some forms of IS discontinuance are indeed a desired outcome. From a user's perspective, discontinuing an IT (in any form) might be in her or his best interest if the said technology is deemed inconvenient, disruptive, or even harmful. A fine balance exists there: while it is in the IT provider's interest to keep their customers “locked-in,” moral and ethical considerations must not be overlooked in the way.

Our articulation about process, content, and context provides a useful framework for both system providers and their users (whether individuals or organizations) to evaluate whether IS discontinuance is premature and needs to be prevented, overdue and needs to be facilitated, or somewhere in between. To be precise, strategies to inhibit early discontinuance due to negatively disconfirmed expectations (regressive discontinuance) can be very different from those to counter later discontinuance that is triggered by a desire to switch into using an alternative IS (replacement). In the former case, an IS provider might opt to revise its marketing, so that the expectations it creates are in line with what the IS delivers, whereas in the latter case, the provider might be better off developing mechanisms that induce customer lock-in or perhaps positioning the IS more sharply against competition. For example, a social networking site should distinguish between measures aimed to maintain users who choose to abandon an IS because that lacks useful features and those who wish to quit because addiction-like symptoms are disrupting their lives. In the former case, the service provider should probably aim to improve the platform's networking capabilities to better suit the needs of its users. However, in the latter case, such approach could make the IS even more life-disrupting as its attachment-increasing properties would be even more effective than before. Instead, in such cases, the IS provider may want to incorporate life-management features, such as opportunities to limit one's screen time, into the IS that would allow one to use the system in a more sustainable manner. This will undoubtedly raise a number of conflicts that need to be resolved at a strategic level. For example, whereas several IS enable users to deactivate their user accounts without permanently deleting them, should IS providers introduce corresponding mechanisms that would enable the user to temporarily discontinue using only *certain core features* of the IS in a user-friendly manner, while still keeping the access to other features available and active? This is arguably a risky strategy but worth considering in a time where hedonically oriented systems such as SNSs [134] and video games [135] are permeating their users lives to the extent that it becomes a problem.

Our framework has practical implications for enterprise-level IS as well. At the organizational level, effective use of IS represents a concurrent challenge for organizations, and there are currently only few practical theories that organizations can turn to for guidance when trying to make the most of their IS [136]. Considering that nowadays most IS implementations encompass the discontinuance of an old IS,



there is a pressing need for contextualized theories regarding IS discontinuance too. Our contextualist framework and the resultant analytic theory provide a scaffold for more informed managerial decision-making. Our conceptualization may help managers in grasping the relevant processual and contextual considerations that should be taken into account when engaging with such complex projects. Furthermore, when considering organizational IS architecture management, discontinuing internally used systems presents a growingly prominent practical challenge for managers. For instance, many organizations wish to kill their old legacy systems and replace them with new ones, but often fail in this or lack the means to even begin the process [9,137]. A mindful contextualist analysis of such challenging discontinuance projects may inform the subsequent decision-making and improve the likelihood of succeeding in the projects. Such analysis could include considering what process, content, and context mean for the different stakeholders of the IS that is to be discontinued, whether they are end-user customers, employee end-users, system administrators, or the organization as a whole. Indeed, understanding the multi-level nature of the IS use lifecycle points to the insight that sometimes the end of system life is a matter of perspective. While customers who stop using a certain digital service appear as discontinuers to the service provider, the customers themselves may not consider their behavior as discontinuance if they simply switched service provider, especially in the case of digital services where switching can happen almost seamlessly. In addition, practitioners should be aware of the general state of technology lifecycle behind their products and services to understand whether the potential risk of customers discontinuing relates to attractive competing alternatives or the overall obsolescence of the technology.

#### 5.4. Limitations and future research directions

It is important to note that this paper comes with a number of limitations that should be acknowledged. First, although we made a thorough effort to obtain the relevant literature on IS discontinuance, it is possible that we have missed some studies that our methodology might have failed to capture. Second, we acknowledge that we did not expand our search procedure beyond the IS domain. We are aware that the discontinuance phenomenon is a topic of interest for scholars in various other domains, such as healthcare research [138,139], and it is possible that a wider search scope could provide further insight on the topic. Third, we would like to highlight that while our proposed IS lifecycle model comprises the main forms of IS use and discontinuance behaviors that could be identified in our sample of literature, it is by no means a perfect illustration of the IS use (discontinuance) phenomenon, and indeed future research is invited to identify other forms that our synthesis does not capture. For instance, an organization may mandate systems' use at the workplace, and if workers are reluctant to use it, they may look for workarounds [140,141]. Our framework does not capture this level of granularity, since workarounds reflect a special case of an IS being used at the organizational level, whereas some of its features are not used at the individual level. With that being said, it could be revealing to study the connection between workarounds and IS discontinuance by both individuals and organizations. For instance, it could be that workarounds inhibit managerial decisions to take down otherwise dissatisfactory organizational systems, as work routines can be accomplished by working around the way the system was intended to be used. Finally, our proposed framework of the five different discontinuance forms calls for further inquiry and empirical validation. It would be enlightening to investigate how the precursors of these distinct outcomes vary in different contexts, e.g., studying whether quitting and temporary discontinuance of SNS share the same antecedents

or are some of the predictors unique to either form. Moreover, different levels of certain discontinuance forms could be further examined, such as differences between deactivation of SNS account and permanent elimination of the account, or the impacts of different lengths of temporary discontinuance periods. Another interesting question to address would be whether we could widen our perspective on IS replacement by studying the temporal sequence of events as well as considering the fate of incumbent IS: does the adoption of an alternative system happen before or after abandoning the incumbent IS? In either case, is the incumbent IS always abandoned for good or does it sometimes remain in use parallel to the new IS? And why?

We hope that our work will inspire future researchers to take into account the temporal dimension of IS discontinuance. For instance, whereas literature on organizational IS change has unpacked temporal path dependencies in IS implementation processes (e.g., [142]), current literature on organizational IS discontinuance has largely neglected this dimension. Our generic model paves way for future attempts to identify and untangle the various temporal stages that result in different forms of IS discontinuance, whether in the case of users' efforts to mitigate undesired outcomes of IS use [143,144] or in organizations' engagements in complex IS discontinuance projects [137,145]. Furthermore, the IS field is experiencing a "shifting discourse" from universal or general theories to those that are context-specific [136]. Our contextualist framework may help future research in finding an appropriate balance between making universal claims and being context-sensitive [49,122,136], which will hopefully result in more practically useful contextualized theories.

#### 6. Conclusion

In this paper, we have set out to investigate the IS discontinuance phenomenon with two central questions in mind: (1) What does IS discontinuance mean in different IS studies? and (2) What implications does the answer has on theory and practice? Our review has resulted in a total of 55 studies published between 1991 and 2017 that give explicit attention to the topic with varying levels of depth and focus. Analysis of this literature has shown that there exists multiple forms and varying conceptualizations of IS discontinuance leading to potentially differing outcomes. While in most parts the past research on the topic has been relatively clear in describing the behavior under investigation, a lack of overarching synthesis has resulted in terminological inconsistency. Our classificatory work has sought to unify the inconsistent terminology under an inclusive framework that provides a potentially useful anchoring point for future inquiries. Moreover, we have uncovered crucial gaps and biases in the current literature that future research on the topic may take into consideration.

Our analysis has demonstrated that process, content, and context shape the origins and outcomes of IS discontinuance decisions, and thus, they should be accounted for to gain a comprehensive understanding of IS discontinuance behavior. Examining the process and content of IS discontinuance has led us to synthesize the different conceptualizations into five forms of discontinuance: rejection, regressive discontinuance, quitting, temporary discontinuance, and replacement (see Section 4). We have elaborated them with a visualized model illustrating how different types of discontinuance decisions may take place at any phase of the IS use lifecycle (see Fig. 2). Our analysis of IS use context contributes to the understanding of the antecedents of discontinuance and the mechanisms that produce discontinuous outcomes. Finally, we wish to emphasize that a mindful consideration of the different possible discontinuance forms we have identified in this article could enable future researchers to achieve an even richer understanding of the phenomenon.

## Appendix A. Summary of the studies included in this review

No.	Reference	Discontinuance form	Method	Theory/literature background	IS	Main Findings/Arguments	Context
1	Charki et al. [89]	Quitting	Qualitative	Rational choice theory	ORA: online, real-time dynamic auction	Legal intervention may mitigate unethical use of information technology through influencing users' cost-benefit analysis of use.	1
2	de Graaf et al. [74]	Rejection, Regressive discontinuance, Quitting	Mixed	HRI literature and technology acceptance theories	Home robot	People reject, regressively discontinue, and quit home robot use for distinct reasons.	2;4
3	Furneaux & Wade [152]	Replacement	Quantitative	Protection motivation theory	Organizational systems	Replacement risk, system complexity, system investment, and institutional norms are impediments to organizational IS replacement intentions.	1
4	Luqman et al. [114]	Quitting, Temporary discontinuance, Replacement	Quantitative	The SOR model: stimuli (S) that affect the internal states (O) of people, which, in turn, drive their behavioral responses (R)	Facebook	Environmental stimuli from excessive SNS use create an internal state of technostress and SNS-exhaustion, which trigger a behavioral response in the form of discontinuance intentions.	4
5	Salo & Frank [150]	Quitting	Mixed	Literature on IS-related incidents, situational context, and post-experience behaviors	Mobile applications	Negatively perceived incidents may cause mobile IS users to discontinue application use, but discontinuance is less likely to happen in the incident that takes place outdoors.	2;4
6	Vaghefi & Qahri-Saremi [112]	Quitting	Quantitative	IT addiction, cognitive dissonance theory	SNS	Guilt feelings and self-efficacy to discontinue influence SNS discontinuance intentions.	4
7	Furstenau et al. [14]	Quitting, Replacement	Qualitative	Categorizations of shadow systems	Several organizational shadow systems	Shadow systems with small functional scope and narrow scope of use are more likely to get discontinued than larger systems.	1
8	Lu and Gallupe [99]	Quitting, Replacement	Conceptual	Intentional and habitual perspectives to post-adoption	SNS	The authors propose a process model of SNS quitting and switching.	4
9	Recker [88]	Quitting	Quantitative	Technology acceptance model, status quo bias, inertia	Inventory replenishment system	Positive and negative beliefs about system performance drive continuance and discontinuance intentions, respectively.	1
10	Turel [48]	Quitting	Quantitative	Theory of planned behavior, guilt	SNS	Guilt feelings, subjective norms regarding discontinuance, and attitude toward discontinuance have positive effects of discontinuance intentions. Guilt moderates the influences of subjective norms and attitude.	4
11	Whitacre & Rhinesmith [151]	Quitting	Quantitative	Prior literature on barriers to adoption and rationale behind nonadoption	Home broadband	Socio-economic factors such as low income and old age were identified as main predictors of home broadband discontinuance.	2
12	Zhang et al. [115]	Quitting, Temporary discontinuance, Replacement	Quantitative	SNS overload and fatigue	SNS	Three types of overload contribute to social network fatigue and dissatisfaction, which turn into discontinuance intentions.	4
13	Aggarwal et al. [73]	Regressive discontinuance, Quitting	Quantitative	U-shaped relationship between self-perceived and actual knowledge	CRM system in a medical firm	Users low in actual IT knowledge are both early to adopt as well as early to discontinue.	1
14	Chesney & Lawson [90]	Quitting, Replacement	Quantitative	Critical mass theory	SNS	If the number of discontinuers reaches a critical mass, it may cause an SNS to fail. The influence of critical mass can be facilitated by network structure.	4
15	Cho [85]	Quitting, Temporary discontinuance	Qualitative	Heideggerian theory	Facebook	Discontinuance is a potential result of modifying technological practices after experiencing technical and/or social turbulences.	4
16	Khan et al. [94]	Replacement	Quantitative	Prior literature on churning	Mobile phone contracts	Inactivity of using the mobile service was found to be a strong predictor of discontinuance.	2
17	Lehrer, C. [87]	Quitting, Replacement	Mixed	IS success model, IS replacement, word-of-mouth	Mobile location-based services	Discontinuance because of finding a better alternative leads to postdiscontinuance dissatisfaction, which translates into negative word-of-mouth.	2;4

18	Maier et al. [34]	Quitting; Replacement	Mixed	Technostress	Facebook	SNS-exhaustion contributes to discontinuance intentions, whereas switching-exhaustion hinders them. Intention to discontinue leads to actual discontinuance.	4
19	Maier et al. [18]	Quitting	Mixed	Social support theory	Facebook	Social overload contributes to SNS discontinuance intentions.	4
20	Power & Gruner [10]	Quitting	Mixed	Diffusion of innovations	GS1 standards-based inter-organizational IT	Several firms abandon IT over time because of low satisfaction with the results of the systems, as well as because changes in circumstances make discontinuing the IT the most beneficial choice for firms.	1
21	Rosenbaum et al. [101]	Temporary discontinuance	Mixed	Diffusion of innovations; literature on self-service technologies in hospitality industry	Hotel self-service kiosk	Customers avoid hotel self-service technologies when on holiday.	2
22	Tully [81]	Rejection, Regressive discontinuance	Qualitative	Diffusion of innovations	Ushahidi crowdsourcing platform	Incompatibility with needs was identified as a key antecedent of discontinuance, also limited support and insufficient commitment to the system caused failures in adoption.	1
23	Turel [1]	Quitting	Quantitative	Social cognitive theory	Facebook	Guilt feelings and self-efficacy to discontinue Facebook use have a positive effect on discontinuance intentions, while satisfaction with the site has a negative effect.	4
24	Wirth et al. [116]	Quitting	Quantitative	Technology acceptance model, social aspects of SNS	Facebook	Frustration and dissatisfaction with SNS determine discontinuance intentions.	4
25	York & Turcotte [20]	Temporary discontinuance	Quantitative	Diffusion of innovations	Facebook	Facebook users perceive the site as a burden on personal time and resources, and because of this temporarily discontinue its use.	4
26	Boukef & Charki [84]	Quitting	Qualitative	Reflective sensemaking	B2B online reverse auctions	Users enact their use through their interaction with the IT as they engage in reflective sensemaking, which may result in discontinuance.	1
27	Ravindran et al. [100]	Quitting, Temporary discontinuance	Mixed	Fatigue literature	Facebook	Social network fatigue may lead to taking SNS break, moderating SNS use, or deactivating SNS account.	4
28	Xu et al. [117]	Replacement	Quantitative	Push-pull-mooring framework	Several SNSs	Dissatisfaction with the site and attraction of alternatives contribute to replacement intentions.	4
29	Coursaris et al. [91]	Quitting	Quantitative	Uses and gratifications, diffusion of innovations	Twitter	Inactive users' adoption and continuance are motivated by user-related needs, whereas active users' are motivated by technology characteristics.	4
30	Bhattacharjee et al. [45]	Replacement	Quantitative	Expectation-disconfirmation theory, unified theory of acceptance and use of technology, diffusion of innovations	Web browser switching	Relative advantage and satisfaction with prior IT were found to determine IT switching intention, which was found to determine IT switching behavior.	2
31	Park et al. [113]	Quitting, Replacement	Qualitative	Theory of Emotion Process	Discussion forum about tablets, laptops, desktop, printing equipment, and servers to consumers and businesses	IT provider's failure to solve user's problems leads to user's emotion process, which may result into discontinued use of the IT.	2,4
32	Polites & Karahanna [46]	Replacement	Quantitative	Technology acceptance model, diffusion of innovations, habit, inertia	E-mail	Intention to replace the old system is determined by attitudinal beliefs (relative advantage and perceived ease of use), normative beliefs (subjective norm), and inertia (which is determined by habit, sunk costs, and transition costs)	1
33	Cenfetelli & Schwarz [76]	Rejection	Quantitative	IS success model, technology acceptance model	Travel websites	Inhibitors of technology adoption are distinct from enablers of adoption.	2
34	Furneaux & Wade [33]	Replacement	Mixed	Technology-organization-environment framework	Organizational information systems	Organizational IS replacement intentions are driven by system capability shortcomings, whereas system support availability and technical integration inhibit them.	1
35	Kim [96]	Quitting	Quantitative	Diffusion of innovations	Internet	Social status affects the discontinuance so that less privileged individuals are more likely to discontinue internet use.	2
36	Furneaux & Wade [102]	Replacement	Conceptual	Technology-organization-environment framework	Organizational information systems	The authors propose a conceptual model to explain organizational IS discontinuance.	1

37	Whitten et al. [149]	Replacement	Quantitative	Switching costs	Organizational IT operations	Different types of switching costs shape how IT operations are outsourced.	1
38	Hand et al. [92]	Quitting	Mixed	Diffusion of innovations, literature on adoption and situational factors	Online grocery shopping	Some users seem to discontinue online grocery shopping once the initial trigger, which made them to adopt it, has disappeared or they have experienced a problem with the service. The triggers relate to life-events such as having a baby or developing health problems.	2
39	Miller et al. [80]	Rejection, Quitting	Qualitative	Diffusion of innovations, technology acceptance model	CAD in construction	Low perception of value, benefit and usability cause rejection, discontinued use, or neglect.	1
40	Geri & Naor-Elaiza [82]	Quitting, Temporary discontinuance	Quantitative	Technology acceptance model, diffusion of innovations	Online Assignment Submission System	Four most frequent reasons for abandoning the system were: system is not offered on the courses (41.4%), not compatible with needs (27.4%), not consistent with teachers' guidelines, i.e., does not allow late submission although teacher would give extra time (8.9%), complexity (8.3%), not mandatory to use (7.0%).	1
41	Kim et al. [95]	Quitting	Quantitative	Technology acceptance model, diffusion of innovations	Mobile data services use	The study compares the effect of factors that determine behavioral intention by running a multigroup analysis between continuers and discontinuers.	2
42	Spiller et al. [19]	Replacement	Quantitative	Expectation-confirmation theory, diffusion of innovations	ISP	Reliability of the service, payment options, and cost affect discontinuance of ISP service demographic factors had no effect.	2
43	Gokhale & Narayanaswamy [147]	Quitting, Replacement	Conceptual	Literature on innovation use experience	IT applications	Satisfaction and compatibility determine discontinuance intentions.	NA
44	Ye et al. [103]	Replacement	Quantitative	Diffusion of innovations, technology acceptance model, unified theory of acceptance and use of technology literature in switching	Web browser switching	User satisfaction and breadth of use of the incumbent browser had a negative effect on switching behavior, whereas perceived ease of use, relative advantage, and perceived security of the substitute (as compared to the incumbent) had a positive impact.	2
45	Goode [79]	Rejection	Qualitative	Inhibitor determination methodology	Open source software	Organizations reject open source software because it is not found relevant, it lacks system support, or its adoption is not necessary. Resource constraints and commitment to incumbent systems also drive rejection.	1
46	Cenfetelli [78]	Rejection	Conceptual	Use enablers and inhibitors	Not specified	Inhibiting and enabling perceptions of technology use are qualitatively different from each other, independent, and can coexist.	NA
47	Hogan et al. [83]	Quitting, Replacement	Quantitative	Diffusion of innovations	Not specified	The impact of a lost customer on the profitability of the firm depends on whether the customer defects to a competitor firm or disadopts the technology altogether, and on whether the customer is early or late adopter.	2
48	Pollard [97]	Quitting, Temporary discontinuance	Qualitative	Diffusion of innovations	Organizational Group Support System	Low complexity, low reliability, and poor task-technology fit were found to cause discontinuance, whereas institutional support such as accessibility of a champion prevented it.	1
49	Danaher [110]	Quitting	Quantitative	Price and attrition elasticities	Telecommunication service	Changes in access price and usage price cause some consumers to drop a service.	2
50	Lemon et al. [111]	Quitting, Replacement	Quantitative	Literature on keep/drop decisions	Interactive television entertainment service/online grocery store delivery service	Consumers who consider the possibility of regret from discontinuing a service relationship are less likely to drop it than those who do not.	2;4
51	Zhu & He [75]	Rejection, Quitting, Temporary discontinuance	Quantitative	Diffusion of innovations, uses and gratifications	Internet	Adoption and use of the Internet found to be two distinct processes that are influenced by different forces. Perceived popularity and perceived characteristics of Internet were found to determine its adoption, whereas perceived need for Internet impacted its continued use.	2



52	Hoxmeier & DiCesare [93]	Quitting	Quantitative	Prior research on system response time	Browser-based software application	Slow response time has a negative effect on satisfaction with IS, and dissatisfaction will increase discontinuance intentions.	2
53	Parthasarathy & Bhattacharjee [98]	Quitting, Replacement	Quantitative	Diffusion of innovations	Online service	Reasons for discontinuance can stem from disenchantment with the innovation or replacement with another innovation. Later adopters are more likely to discontinue because of disenchantment than replacement, and rely more on interpersonal sources of information.	2;4
54	Prendergast & Marr [148]	Quitting	Quantitative	Diffusion of innovations	Self-service banking (ATMs, etc.)	The study found no support for disenchantment discontinuance in the context of self-service banking. The authors argue that the discontinuance of some users is better explained by diffusion saturation.	2
55	Cooper [86]	Replacement	Quantitative	Diffusion of innovations	Organizational office tool (IBM PROFS)	Knowledge and access to alternative systems caused participants to drop the system. Long experience of system use and social influence inhibited discontinuance.	1

## Appendix B. General overview

The earliest study in our sample has been published in 1991; we were unable to find suitable publications prior to that year. This is understandable as the IS adoption research only started to take off in the late 1980s (e.g., [21,146]), while academic interest in IS discontinuance phenomenon was still at its nascence. The vast majority (64%) of the sampled studies have been published during the 2010s, which speaks for the recent surge of interest on the topic. Our sample's most recent works have appeared in 2017, as that was the year when we conducted the final literature search for this review.

Table C1 shows that altogether 43 of the studies in our sample have been published in peer-reviewed journals, and 12 in conference proceedings. Especially, the leading IS journals appear to show explicit interest in the topic. The rest of the journal papers are distributed between various outlets, of which some operate in the IS domain, but others are specialized in related fields such as marketing, operations, communications, and social science. When it comes to methodology (Table C2), a majority of 31 papers use quantitative analysis; 9 are qualitative inquiries; and 11 apply mixed methodology. Altogether, four papers are conceptual theory development papers [78,99,102,147]. While most of the papers rely on empirical evidence gathered by the authors, some apply statistical modeling to secondary survey data [96] or customer data [83,94,110], and one even applies simulation [90]. Finally, Table C3 outlines the data collection methods utilized in the 49 empirical studies. While a notable number of studies draw their data from multiple sources, the research paradigm is heavily dominated by survey-based research.

**Table C1**  
Outlets of the studies.

Journal	Count
Information & Management	5
Information Systems Research	3
European Journal of Information Systems	3
MIS Quarterly	2
Journal of Strategic Information Systems	2
Information Systems Journal	2
Others*	26
Total	43
Conference	Count
AMCIS	3
ICIS	2
ECIS	2
Others*	5
Total	12

**Note:** \*Only one relevant publication per journal/conference.

**Table C2**  
Methodology applied in studies.

Methodology	No. of studies
Quantitative	31
Mixed	11
Qualitative	9
Conceptual	4

**Table C3**  
Data collection methods.

Data collection method	
Survey	28
Various methods (survey, interviews, observations, etc.)	13
Interviews	5
User data	3
Virtual ethnography	1

## References

- [1] O. Turel, Quitting the use of a habituated hedonic information system: a theoretical model and empirical examination of facebook users, *Eur. J. Inf. Syst.* 4 (24) (2015) 431–446, <https://doi.org/10.1057/ejis.2014.19>.
- [2] T. Gryta, AT&T risks losing prized wireless customers, *Wall Street J.* (2014) Retrieved from <http://www.wsj.com/articles/at-t-risks-losing-prized-wireless-customers-1414180784>.
- [3] K. Yoree, Only 11% of new twitter users in 2012 are still tweeting, *Wall Street J.* (2014) Retrieved from <http://blogs.wsj.com/digits/2014/03/21/new-report-spotlights-twitters-retention-problem/>.
- [4] P. Cashmore, 60% of Twitter Users Quit Within the First Month, Retrieved from Mashable website (2009) <http://mashable.com/2009/04/28/twitter-quitters/#Oc5fxbO5waqX>.
- [5] A. Griffin, Facebook posts becoming less personal as site looks to encourage people to post about their lives, *Independent*, (2016) April 9, Retrieved from <https://www.independent.co.uk/life-style/gadgets-and-tech/news/facebook-posts-becoming-less-personal-as-site-looks-to-encourage-people-to-post-about-their-lives-a6976551.html>.
- [6] A. Sulleyman, Facebook losing its grip on young people, who are quitting the site in their millions, *Independent*, (2018) Retrieved from <https://www.independent.co.uk/life-style/gadgets-and-tech/news/facebook-quit-young-people-social-media-snapchat-instagram-emarketer-a8206486.html>.
- [7] A. Chen, New Data Shows Losing 80% of Mobile Users Is Normal, and Why the Best Apps Do Better, (2015).
- [8] CRN, How To Kill Off Legacy Systems, Retrieved from TheChannelCo, 2012, <https://www.crn.com/blogs-op-ed/channel-voices/240000330/how-to-kill-off-legacy-systems.htm>.
- [9] A. Schneider, When companies become prisoners of legacy systems, *Wall Street J.* (October) (2013) CIO Insights and Analysis from Deloitte.
- [10] D. Power, R.L. Gruner, Exploring reduced global standards-based inter-organizational information technology adoption, *Int. J. Oper. Prod. Manage.* 35 (11) (2015), <https://doi.org/10.1108/EL-01-2014-0022>.
- [11] K. Bosteels, Lidl's Failed IT-project Cost Half a Billion. *Retail Detail*, September 27, Retrieved from (2018) <https://www.retaildetail.eu/en/news/food/lidls-failed-it-project-cost-half-billion>.
- [12] Consultancy.uk, Lidl Cancels SAP Introduction Having Sunk ?500 Million into It, August 13, Retrieved from (2018) <https://www.consultancy.uk/news/18243/lidl-cancels-sap-introduction-having-sunk-500-million-into-it>.
- [13] F. Kolb, C. Kerkmann, PROGRAMMED FOR DISASTER. Lidl Software Disaster Another Example of Germany's Digital Failure, July 30, Retrieved from Handelsblatt, 2018, <https://www.handelsblatt.com/today/companies/programmed-for-disaster-lidl-software-disaster-another-example-of-germanys-digital-failure/23582902.html?ticket=ST-15171-Ylx3LTtyPKoKet4ofJlf-ap1>.
- [14] D. Fürstenau, M. Sandner, D. Anapliotis, Why do shadow systems fail? An expert study on determinants of discontinuation, *ECIS 2016 Proceedings*, (2016), pp. 1–16 May.
- [15] P. Legris, J. Ingham, P. Collette, Why do people use information technology? A critical review of the technology acceptance model, *Inf. Manag.* 40 (3) (2003) 191–204, [https://doi.org/10.1016/S0378-7206\(01\)00143-4](https://doi.org/10.1016/S0378-7206(01)00143-4).
- [16] A.A. Shaikh, H. Karjalainen, Making the most of information technology & systems usage: a literature review, framework and future research agenda, *Comput. Human Behav.* 49 (2015) 541–566, <https://doi.org/10.1016/j.chb.2015.03.059>.
- [17] A. Bhattacharjee, Understanding information systems continuance: an expectation-confirmation model, *MIS Q.* 25 (3) (2001) 351–370.
- [18] C. Maier, S. Laumer, A. Eckhardt, T. Weitzel, Giving too much social support: social overload on social networking sites, *Eur. J. Inf. Syst.* 24 (5) (2015) 447–464.
- [19] J. Spiller, A. Vlasic, P. Yetton, Post-adoption behavior of users of internet service providers, *Inf. Manag.* 44 (6) (2007) 513–523.
- [20] C. York, J. Turcotte, Vacationing from Facebook: Adoption, Temporary Discontinuance, and Readoption of an Innovation, *Commun. Res. Rep.* 32 (1) (2015) 54–62, <https://doi.org/10.1080/08824096.2014.989975>.
- [21] F.D. Davis, Perceived usefulness, perceived ease of use, and user acceptance of information technology, *MIS Q.* 13 (1989) 319–340, <https://doi.org/10.2307/249008>.
- [22] I. Benbasat, H. Barki, Quo vadis, TAM? *J. AIS* 8 (4) (2007) 211–218.
- [23] A. Schwarz, W. Chin, Looking Forward : Toward an Understanding of the Nature and Definition of IT Acceptance, *J. Assoc. Inf. Syst.* 8 (4) (2007) 230–243 <https://doi.org/Article>.
- [24] A. Schwarz, W.W. Chin, R. Hirschheim, C. Schwarz, Toward a process-based view of information technology acceptance, *J. Inf. Technol.* 29 (1) (2014) 73–96, <https://doi.org/10.1057/jit.2013.31>.
- [25] S. Gregor, The nature of theory in information systems, *MIS Q.* 30 (3) (2006) 611–642.
- [26] S. Gregor, A theory of theories in information systems, *Inf. Syst. Foundations* (2002) 1–18.
- [27] A.S. Lee, M. Thomas, R.L. Baskerville, Going back to basics in design science: from the information technology artifact to the information systems artifact, *Inf. Syst. J.* 25 (1) (2015) 5–21, <https://doi.org/10.1111/isj.12054>.
- [28] N.P. Napier, L. Mathiassen, D. Robey, Building contextual ambidexterity in a software company to improve firm-level coordination, *Eur. J. Inf. Syst.* 20 (6) (2011) 674–690, <https://doi.org/10.1057/ejis.2011.32>.
- [29] V. Mindel, L. Mathiassen, Contextualist inquiry into IT-enabled hospital revenue cycle management: bridging research and practice, *J. Assoc. Inf. Syst.* 16 (12) (2015) 1016–1057.
- [30] A.M. Pettigrew, Contextualist research and the study of organizational change processes, *Res. Methods Inf. Syst.* (1985) 53–78.
- [31] C. Middleton, R. Scheepers, V.K. Tuunainen, When mobile is the norm: researching mobile information systems and mobility as post-adoption phenomena, *Eur. J. Inf. Syst.* 23 (5) (2014) 503–512, <https://doi.org/10.1057/ejis.2014.21>.
- [32] E.B. Swanson, E. Dans, System life expectancy and the maintenance effort: exploring their equilibration, *MIS Q.* 24 (2) (2000) 277–297, <https://doi.org/10.2307/3250939>.
- [33] B. Furneaux, M. Wade, An exploration of organizational level information systems discontinuance intentions, *MIS Q.* 35 (3) (2011) 573–598.
- [34] C. Maier, S. Laumer, C. Weinert, T. Weitzel, The effects of technostress and switching stress on discontinued use of social networking services: a study of facebook use, *Inf. Syst. J.* 25 (3) (2015) 275–308, <https://doi.org/10.1111/isj.12068>.
- [35] A.H. Van de Ven, Suggestions for studying strategy process: a research note, *Strat. Manag. J.* 13 (Special Issue: Strategy Process: Managing Corporate Self-Renewal (Summer, 1992)) (1992) 169–191.
- [36] A.H. Van de Ven, M.S. Poole, Explaining development and change in organizations, *Acad. Manag. Rev.* 20 (3) (1995) 510–540.
- [37] E.M. Rogers, *Diffusion of Innovations*, 1st ed., Free Press of Glencoe, New York, 1962.
- [38] T. Butler, Towards a hermeneutic method for interpretive research in information systems, *J. Inf. Technol.* 13 (1998) 285–300, [https://doi.org/10.1007/978-3-319-29269-4\\_2](https://doi.org/10.1007/978-3-319-29269-4_2).
- [39] T. Shaw, S. Jarvenpää, Process models in information systems, *Inf. Syst. Qual. Res.* (1997) 70–100, <https://doi.org/10.1007/978-0-387-35309-8>.
- [40] A.H. Van de Ven, M.S. Poole, Alternative approaches for studying organizational change, *Organ. Stud.* 26 (9) (2005) 1377–1404, <https://doi.org/10.1177/0170840605056907>.
- [41] O. Turel, An empirical examination of the “Vicious cycle” of facebook addiction, *J. Comput. Inf. Syst.* 55 (3) (2015) 83–91.
- [42] V. Venkatesh, S.A. Brown, L.M. Maruping, H. Bala, Predicting different conceptualizations of system use: the competing roles of behavioral intention, facilitating conditions, and behavioral expectation, *MIS Q.* 32 (3) (2008) 483–502.

- [43] M. Limayem, S.G. Hirt, C.M.K. Cheung, How habit limits the predictive power intention: the case of information systems continuance, *MIS Q.* 31 (4) (2007) 705–737.
- [44] R. Schwarzer, Modeling health behavior change: how to predict and modify the adoption and maintenance of health behaviors, *Appl. Psychol.* 57 (1) (2008) 1–29, <https://doi.org/10.1111/j.1464-0597.2007.00325.x>.
- [45] A. Bhattacherjee, M. Limayem, C.M.K. Cheung, User switching of information technology: a theoretical synthesis and empirical test, *Inf. Manag.* 49 (7–8) (2012) 327–333, <https://doi.org/10.1016/j.im.2012.06.002>.
- [46] G. Polites, E. Karahanna, Shackled to the status quo: the inhibiting effects of incumbent system habit, switching costs, and inertia on new system acceptance, *MIS Q.* 36 (1) (2012) 21–42 Retrieved from <http://aisel.aisnet.org/cgi/viewcontent.cgi?article=3006&context=misq>.
- [47] A.A. Soror, B.I. Hammer, Z.R. Steelman, F.D. Davis, M.M. Limayem, Good habits gone bad: explaining negative consequences associated with the use of mobile phones from a dual-systems perspective, *Inf. Syst. J.* 25 (4) (2015) 403–427, <https://doi.org/10.1111/isj.12065>.
- [48] O. Turel, Untangling the complex role of guilt in rational decisions to discontinue the use of a hedonic information system, *Eur. J. Inf. Syst.* (April) (2016), <https://doi.org/10.1057/s41303-016-0002-5>.
- [49] R.M. Davison, M.G. Martinsons, Context is king! Considering particularism in research design and reporting, *J. Inf. Technol.* 31 (2016) 241–249, <https://doi.org/10.1057/s41265-016-0002-x>.
- [50] M.G. Martinsons, R.M. Davison, People, places and time in research design and reporting: responding to commentaries on particularism, *J. Inf. Technol.* 31 (3) (2016) 267–268, <https://doi.org/10.1057/s41265-016-0006-6>.
- [51] H. van der Heijden, User acceptance of hedonic information systems, *MIS Q.* 28 (4) (2004) 695–704.
- [52] E. Karahanna, D.W. Straub, N.L. Chervany, Information technology adoption across time: a cross-sectional comparison of pre-adoption and post-adoption beliefs, *MIS Q.* 23 (2) (1999) 183, <https://doi.org/10.2307/249751>.
- [53] C.P. Lin, A. Bhattacherjee, Extending technology usage models to interactive hedonic technologies: a theoretical model and empirical test, *Inf. Syst. J.* 20 (2) (2010) 163–181, <https://doi.org/10.1111/j.1365-2575.2007.00265.x>.
- [54] I. Blohm, J.M. Leimeister, Gamification: design of IT-based enhancing services for motivational support and behavioral change, *Bus. Inf. Syst. Eng.* 5 (4) (2013) 275–278, <https://doi.org/10.1007/s12599-013-0273-5>.
- [55] J. Hamari, J. Koivisto, H. Sarsa, Does gamification work? - A literature review of empirical studies on gamification, *Proceedings of the Annual Hawaii International Conference on System Sciences* (2014) 3025–3034, <https://doi.org/10.1109/HICSS.2014.377>.
- [56] A. Leclercq-Vandelannoite, H. Isaac, M. Kalika, Mobile information systems and organisational control: beyond the panopticon metaphor, *Eur. J. Inf. Syst.* 23 (5) (2014) 543–557, <https://doi.org/10.1057/ejis.2014.11>.
- [57] J.E. Gerow, R. Ayyagari, J.B. Thatcher, P.L. Roth, Can we have fun @ work? The role of intrinsic motivation for utilitarian systems, *Eur. J. Inf. Syst.* 22 (3) (2013) 360–380, <https://doi.org/10.1057/ejis.2012.25>.
- [58] J. Wu, X. Lu, Effects of extrinsic and intrinsic motivators on using utilitarian, hedonic, and dual-purposed information systems: a meta-analysis, *J. Assoc. Inf. Syst.* 14 (3) (2013) 153–191.
- [59] M.D. Williams, Y.K. Dwivedi, B. Lal, A. Schwarz, Contemporary trends and issues in IT adoption and diffusion research, *J. Inf. Technol.* 24 (1) (2009) 1–10, <https://doi.org/10.1057/jit.2008.30>.
- [60] E.M. Rogers, *Diffusion of Innovations*, 5th edition (5th ed.), Free Press, New York, 2003.
- [61] A. Jeyaraj, J.W. Rottman, M.C. Lacity, A review of the predictors, linkages, and biases in IT innovation adoption research, *J. Inf. Technol.* 21 (1) (2006) 1–23, <https://doi.org/10.1057/palgrave.jit.2000056>.
- [62] G. Paré, M.C. Trudel, M. Jaana, S. Kitsiou, Synthesizing information systems knowledge: a typology of literature reviews, *Inf. Manag.* 52 (2) (2015) 183–199, <https://doi.org/10.1016/j.im.2014.08.008>.
- [63] F. Rowe, What literature review is not: diversity, boundaries and recommendations, *Eur. J. Inf. Syst.* 23 (3) (2014) 241–255, <https://doi.org/10.1057/ejis.2014.7>.
- [64] R.O. Briggs, B.A. Reinig, G.-J. de Vreede, The yield shift theory of satisfaction and its application to the IS/IT domain, *J. Assoc. Inf. Syst.* 9 (5) (2008) 267–293.
- [65] S. Chea, M.M. Luo, Cognition, emotion, satisfaction, and Post-adoption behaviors of E-service customers, *Proceedings of the 40th Hawaii International Conference on System Sciences (HICSS'07)*, (2007), pp. 1–10.
- [66] M.-C. Lee, Explaining and predicting users' continuance intention toward e-learning: an extension of the expectation-confirmation model, *Comput. Educ.* 54 (2) (2010) 506–516, <https://doi.org/10.1016/j.compedu.2009.09.002>.
- [67] Y. Zhao, S. Deng, R. Zhou, Understanding mobile library apps continuance usage in China: a theoretical framework and empirical study, *Libri* 65 (3) (2015) 161–173, <https://doi.org/10.1515/libri-2014-0148>.
- [68] M.M. Alam, C. Wagner, "Facebook distress": a model to investigate discontinuation of social networking site use, *PACIS 2013 Proceedings*, (2013) Retrieved from <http://aisel.aisnet.org/pacis2013/179>.
- [69] Y. Bian, B. Bengler, J. Zhao, J. Wu, L. Liang, Cloud computing deployment as a dual decision of discontinuance and adoption, *PACIS 2015 Proceedings*, (2015) Retrieved from <http://aisel.aisnet.org/pacis2015/47>.
- [70] J. Recker, Towards a theory of individual-level discontinuance of information systems use, *Thirty Fifth International Conference on Information Systems*, (2014), pp. 1–12.
- [71] P. Yettton, A. Vlasic, J. Spiller, Post-adoption behavior of users of internet service providers, *PACIS 2005 Proceedings*, (2005).
- [72] J. Webster, R. Watson, Analyzing the past to prepare for the future: writing a literature review, *MIS Q.* 26 (2) (2002) xiii–xxiii.
- [73] R. Aggarwal, D. Kryscynski, V. Midha, H. Singh, Early to adopt and early to discontinue: the impact of self-perceived and actual IT knowledge on technology use behaviors of end users, *Inf. Syst. Res.* 26 (1) (2015) 127–144, <https://doi.org/10.1287/isre.2014.0564>.
- [74] M. de Graaf, S. Ben Allouch, J. van Dijk, Why do they refuse to use my robot? Reasons for non-use derived from a long-term home study, *Proceedings of the 2017 ACM/IEEE International Conference on Human-Robot Interaction - HRI '17* (2017) 224–233, <https://doi.org/10.1145/2909824.3020236>.
- [75] J.J.H. Zhu, Z. He, Perceived characteristics, perceived needs, and perceived popularity: adoption and use of the internet in China, *Commun. Res.* 29 (4) (2002) 466–495, <https://doi.org/10.1177/0093650202029004005>.
- [76] R.T. Cenfetelli, A. Schwarz, Identifying and testing the inhibitors of technology usage intentions, *Inf. Syst. Res.* 22 (4) (2011) 808–823, <https://doi.org/10.1287/isre.1100.0295>.
- [77] A. Langley, *Strategies for theorizing from process data*, *Acad. Manag. Rev.* 24 (4) (1999) 691–710.
- [78] R.T. Cenfetelli, Inhibitors and enablers as dual factor concepts in technology usage, *J. Assoc. Inf. Syst.* 5 (11–12) (2004) 472–492 <https://doi.org/Article>.
- [79] S. Goode, Something for nothing: management rejection of open source software in Australia's top firms, *Inf. Manag.* 42 (5) (2005) 669–681, <https://doi.org/10.1016/j.im.2004.01.011>.
- [80] A. Miller, D. Radcliffe, E. Isokangas, A perception-influence model for the management of technology implementation in construction, *Constr. Innov.* 9 (2) (2009) 168–183.
- [81] M. Tully, Investigating the role of innovation attributes in the adoption, rejection, and discontinued use of open source software for development, *Inf. Technol. Int. Dev.* 11 (3) (2015) 55–69.
- [82] N. Geri, O. Naor-Elaiza, Beyond adoption: barriers to an online assignment submission system continued use, *Interdiscip. J. E-Learning Learning Objects* 4 (1) (2008) 225–241 Retrieved from <http://www.editlib.org/p/44857>.
- [83] J.E. Hogan, K.N. Lemon, B. Libai, What Is the True Value of a Lost Customer? *J. Serv. Res.* 5 (3) (2003) 196–208, <https://doi.org/10.1177/1094670502238915>.
- [84] N. Boukef, M. Charki, When the dark side of post-adoptive use leads to IT discontinuance: an exploration of the role of intervention, *Twentieth Americas Conference on Information Systems* (2014) 1–9.
- [85] I.H. Cho, Facebook discontinuance: discontinuance as a temporal settlement of the constant interplay between disturbance and coping, *Qual. Quant.* 49 (4) (2015) 1531–1548, <https://doi.org/10.1007/s11135-015-0225-x>.
- [86] M.D. Cooper, Failure time analysis of office system use, *J. Am. Soc. Inf. Sci.* 42 (9) (1991) 644–656, [https://doi.org/10.1002/\(SICI\)1097-4571\(199110\)42:9<644::AID-ASIS>3.0.CO;2-K](https://doi.org/10.1002/(SICI)1097-4571(199110)42:9<644::AID-ASIS>3.0.CO;2-K).
- [87] C. Lehrer, Examining discontinuers' word-of-mouth behaviour in the context of mobile location-based services, *European Conference on Information Systems (ECIS)*, (2015).
- [88] J. Recker, Reasoning about discontinuance of information system use, *J. Inf. Technol. Theory Appl.* 17 (1) (2016) 41–66.
- [89] M.H. Charki, E. Josserand, N. Boukef, The paradoxical effects of legal intervention over unethical information technology use: a rational choice theory perspective, *J. Strat. Inf. Syst.* 26 (1) (2017) 58–76, <https://doi.org/10.1016/j.jsis.2016.07.001>.
- [90] T. Chesney, S. Lawson, Critical mass and discontinued use of social media, *Syst. Res. Behav. Sci.* 32 (2015) 376–387, <https://doi.org/10.1002/sres.2231>.
- [91] C.K. Coursaris, W. Van Osch, J. Sung, Y. Yun, Disentangling Twitter's adoption and use (dis)continuance: a theoretical and empirical amalgamation of uses and gratifications and diffusion of innovations, *AIS Trans. Hum. Interact.* 1 (5) (2013) 57–83, <https://doi.org/10.5121/ijfcs.2014.4403>.
- [92] C. Hand, F. Dall'Olmo Riley, P. Harris, J. Singh, R. Rettie, Online Grocery Shopping: the influence of situational factors, *Eur. J. Mark.* 43 (9/10) (2009) 1205–1219, <https://doi.org/10.1108/JFM-03-2013-0017>.
- [93] J.A. Hoxmeier, C. DiCesare, System response time and user satisfaction: {An} experimental study of browser-based applications, *AMCIS 2000 Proceedings*, (2000), p. 347 Retrieved from <http://aisel.aisnet.org/cgi/viewcontent.cgi?article=1799&context=amcis2000>.
- [94] M.R. Khan, J. Manoj, A. Singh, J. Blumenstock, Behavioral modeling for churn prediction: early indicators and accurate predictors of custom defection and Loyalty, *International Congress on Big Data (BigData Congress)* (2015) 677–680, <https://doi.org/10.1109/BigDataCongress.2015.107>.
- [95] H. Kim, I. Lee, J. Kim, Maintaining continuers vs. Converting discontinuers: relative importance of post-adoption factors for mobile data services, *Int. J. Mobile Commun.* 6 (1) (2008) 108–132, <https://doi.org/10.1504/IJMC.2008.016007>.
- [96] S. Kim, The diffusion of the Internet: trend and causes, *Soc. Sci. Res.* 40 (2) (2011) 602–613, <https://doi.org/10.1016/j.sres.2010.07.005>.
- [97] C. Pollard, Exploring continued and discontinued use of IT: A case study of OptionFinder, a group support system, *Group Decis. Negot.* 12 (2003) 171–193.
- [98] M. Parthasarathy, A. Bhattacherjee, Understanding post-adoption behavior in the context of online services, *Inf. Syst. J.* 9 (4) (1998) 362–379.
- [99] Y. Lu, R.B. Gallepe, Post-adoption of social network sites: a literature review and a process framework, *PACIS 2016 Proceedings*, (2016), p. Paper 329.
- [100] T. Ravindran, A.C.Y. Kuan, D.G.H. Lian, Antecedents and effects of social network fatigue, *J. Assoc. Inf. Sci. Technol.* 65 (11) (2014) 2306–2320, <https://doi.org/10.1002/asi>.
- [101] M.S. Rosenbaum, I.K.A. Wong, If you install it, will they use it? Understanding why hospitality customers take "technological pauses" from self-service technology, *J. Bus. Res.* 68 (9) (2015) 1862–1868, <https://doi.org/10.1016/j.jbusres.2015.01.014>.

- [102] B. Furneaux, M. Wade, The end of the information system life: a model of IS discontinuance, *Data Base Adv. Inf. Syst.* 41 (2) (2010) 45–69, <https://doi.org/10.1145/1795377.1795381>.
- [103] C. Ye, D. Seo, K. Desouza, S. Sangareddy, S. Jha, Post-adoption switching between technology substitutes: the case of web browsers, *International Conference on Information Systems (ICIS)*, (2006), pp. 1941–1958.
- [104] A. Suh, C.M.K. Cheung, M. Ahuja, G. Wagner, Gamification in the workplace: the central role of the aesthetic experience, *J. Manag. Inf. Syst.* 34 (1) (2017) 268–305, <https://doi.org/10.1080/07421222.2017.1297642>.
- [105] M. Ali, L. Zhou, L. Miller, P. Ieromonachou, User resistance in IT: a literature review, *Int. J. Inf. Manage.* 36 (1) (2016) 35–43, <https://doi.org/10.1016/j.ijinfomgt.2015.09.007>.
- [106] S.C.S. Abraham, G. Hayward, Understanding discontinuance: towards a more realistic model of technological innovation and industrial adoption in Britain, *Technovation* 2 (3) (1984) 209–231, [https://doi.org/10.1016/0166-4972\(84\)90004-X](https://doi.org/10.1016/0166-4972(84)90004-X).
- [107] R.L. Oliver, Effect of expectation and disconfirmation on postexposure product evaluations: an alternative interpretation, *J. Appl. Psychol.* 62 (4) (1977) 480–486.
- [108] R.L. Oliver, W.S. DeSarbo, Response determinants in satisfaction judgments, *J. Consum. Res.* 14 (1988) 495–507.
- [109] C.-C. Chang, Examining users' intention to continue using social network games: A flow experience perspective, *Telemat. Inform.* 30 (4) (2013) 311–321.
- [110] P.J. Danaher, Optimal pricing of new subscription services: analysis of a market experiment, *Mark. Sci.* 21 (2) (2002) 119–138, <https://doi.org/10.1287/mksc.21.2.119.147>.
- [111] K.N. Lemon, T.B. White, R.S. Winer, Dynamic customer relationship management: incorporating future considerations into the service retention decision, *J. Mark.* 66 (1) (2002) 1–14, <https://doi.org/10.1509/jmk.66.1.1.18447>.
- [112] I. Vaghefi, H. Qahri-Saremi, From IT addiction to discontinued use: a cognitive dissonance perspective, *Proceedings of the 50th Hawaii International Conference on Systems Sciences* (2017) 5650–5659, <https://doi.org/10.24251/HICSS.2017.681>.
- [113] E.H. Park, G. Im, V. Storey, Repurchase intentions of information technology: an emotion process perspective, *International Conference on Information Systems (ICIS)*, (2012), pp. 1–20.
- [114] A. Luqman, X. Cao, A. Ali, A. Masood, L. Yu, Empirical investigation of Facebook discontinues usage intentions based on SOR paradigm, *Comput. Human Behav.* 70 (2017) 544–555, <https://doi.org/10.1016/j.chb.2017.01.020>.
- [115] S. Zhang, L. Zhao, Y. Lu, J. Yang, Do you get tired of socializing? An empirical explanation of discontinuous usage behaviour in social network services, *Inf. Manag.* 53 (7) (2016) 904–914, <https://doi.org/10.1016/j.im.2016.03.006>.
- [116] J. Wirth, S. Laumer, C. Maier, T. Weitzel, Drivers and Consequences of Frustration When Using Social Networking Services : A Quantitative Analysis of Facebook Users Full Paper, *Amcis*, 2015, pp. 1–14.
- [117] Y. (Calvin) Xu, Y. Yang, Z. Cheng, J. Lim, Retaining and attracting users in social networking services: an empirical investigation of cyber migration, *J. Strateg. Inf. Syst.* 23 (3) (2014) 239–253 doi:10.1016/j.jsis.2014.03.002.
- [118] C. Ye, D.B. Seo, K.C. Desouza, S. Papagari, S. Jha, Post-Adoption Switching Between Technology Options: Research in Progress, *Aisel.Aisnet.Org*, Retrieved from (2006), pp. 1050–1053 <http://aisel.aisnet.org/cgi/viewcontent.cgi?article=1688&context=amcis2006>.
- [119] H.S. Bansal, "Migrating" to new service providers: toward a unifying framework of consumers' switching behaviors, *J. Acad. Mark. Sci.* 33 (1) (2005) 96–115, <https://doi.org/10.1177/0092070304267928>.
- [120] G. Kim, B. Shin, H.G. Lee, A study of factors that affect user intentions toward email service switching, *Inf. Manag.* 43 (7) (2006) 884–893, <https://doi.org/10.1016/j.im.2006.08.004>.
- [121] L. Fan, Y.H. Suh, Why do users switch to a disruptive technology? An empirical study based on expectation-disconfirmation theory, *Inf. Manag.* 51 (2) (2014) 240–248, <https://doi.org/10.1016/j.im.2013.12.004>.
- [122] C. Urquhart, Response to Davison and Martinsons: Context is king! Yes and no - It's still all about theory (building), *J. Inf. Technol.* 31 (2016) 254–256, <https://doi.org/10.1057/s41265-016-0002-x>.
- [123] S.P. Singh, Gamification: a strategic tool for organizational effectiveness, *Int. J. Manage.* 1 (1) (2012) 108–113.
- [124] S. Petter, D. Straub, A. Rai, Specifying formative constructs in information systems research, *MIS Q.* 31 (4) (2007) 623–656.
- [125] R.P. Bagozzi, On the meaning of formative measurement and how it differs from reflective measurement: comment on Howell, Breivik, and Wilcox (2007), *Psychol. Methods* 12 (2) (2007) 229–237, <https://doi.org/10.1037/1082-989X.12.2.229>.
- [126] R.D. Howell, E. Breivik, J.B. Wilcox, Reconsidering formative measurement, *Psychol. Methods* 12 (2) (2007) 205–218, <https://doi.org/10.1037/1082-989X.12.2.205>.
- [127] N. Lee, J.W. Cadogan, L. Chamberlain, The MIMIC model and formative variables: problems and solutions, *AMS Rev.* 3 (1) (2013) 3–17, <https://doi.org/10.1007/s13162-013-0033-1>.
- [128] J.B. Wilcox, R.D. Howell, E. Breivik, Questions about formative measurement, *J. Bus. Res.* 61 (12) (2008) 1219–1228, <https://doi.org/10.1016/j.jbusres.2008.01.010>.
- [129] K.M. Eisenhardt, M.E. Graebner, Theory building from cases: opportunities and challenges, *Acad. Manag. J.* 50 (1) (2007) 25–32.
- [130] S. Gregor, On theory, in: R. Galliers, M.-K. Stein (Eds.), *The Routledge Companion to Management Information Systems*, 2017.
- [131] N.C. Ramiller, B.T. Pentland, Management implications in information systems research: the untold story, *J. Assoc. Inf. Syst.* 10 (6) (2009) 474–494 Retrieved from <http://aisel.aisnet.org>.
- [132] B.T. Pentland, Building process theory with narrative: From description to explanation, *Acad. Manag. Rev.* 24 (4) (1999) 711–724, <https://doi.org/10.2307/259350>.
- [133] J. Wu, H. Du, Toward a better understanding of behavioral intention and system usage constructs, *Eur. J. Inf. Syst.* 21 (6) (2012) 680–698, <https://doi.org/10.1057/ejis.2012.15>.
- [134] G. Wågström, Is Social Media Addiction Worse Than Cigarettes? November 21, Retrieved from Forbes, 2018, <https://www.forbes.com/sites/forbestechcouncil/2018/11/21/is-social-media-addiction-worse-than-cigarettes/#7e76d6b05d64>.
- [135] G. Lopez, Video Game Addiction is Real, Rare, and Poorly Understood, December 6, Retrieved from Vox, 2018, <https://www.vox.com/science-and-health/2018/12/6/18050680/video-game-addiction-gaming-disorder-who>.
- [136] A. Burton-Jones, O. Volkoff, How can we develop contextualized theories of effective use? A demonstration in the context of community-care electronic health records, *Inf. Syst. Res.* 28 (3) (2017) 468–489, <https://doi.org/10.1287/isre.2017.0702>.
- [137] M.H. Rezazade Mehrizi, J.R. Modol, M.Z. Nezhad, Intensifying to cease: unpacking the process of information systems discontinuance, *MIS Q.* (2019) Forthcoming.
- [138] M.L. Riemer-Reiss, R.R. Wacker, Assistive technology use and abandonment among college students with disabilities, *Int. Electr. J. Leadership Learn.* 3 (23) (1999).
- [139] M.L. Riemer-Reiss, R.R. Wacker, Factors associated with assistive technology discontinuance among individuals with disabilities, *J. Rehabil.* 66 (3) (2000) 44–50.
- [140] S. Alter, Theory of workarounds, *Commun. AIS* 34 (55) (2014) 1041–1066.
- [141] E. Ferneley, P. Sobreperes, Resist, comply or workaround? An examination of different facets of user engagement with information systems, *Eur. J. Inf. Syst.* 15 (4) (2006) 345–356, <https://doi.org/10.1057/palgrave.ejis.3000629>.
- [142] K. Lyytinen, M. Newman, A.R.A. Al-Muharfi, Institutionalizing enterprise resource planning in the Saudi steel industry: a punctuated socio-technical analysis, *J. Inf. Technol.* 24 (4) (2009) 286–304, <https://doi.org/10.1057/jit.2009.14>.
- [143] T. Rinta-Kahila, E. Penttinen, A. Salovaara, W. Soliman, Consequences of discontinuing knowledge work automation – surfacing of deskilling effects and methods of recovery, *Proceedings of the 51st Hawaii International Conference on System Sciences*, (2018), pp. 5244–5253.
- [144] M. Tarafdar, C.L. Cooper, J.F. Stich, The technostress trifecta - techno eustress, techno distress and design: Theoretical directions and an agenda for research, *Inf. Syst. J.* 29 (September 2017) (2017) 6–42, <https://doi.org/10.1111/isj.12169>.
- [145] T. Rinta-Kahila, Caught in between: how an organization became a prisoner of its legacy system after IS change, *International Conference on Information Systems (ICIS)*, (2018), pp. 1–17.
- [146] F.D. Davis, R.P. Bagozzi, P.R. Warshaw, User acceptance of computer technology: a comparison of two theoretical models, *Manage. Sci.* 35 (8) (1989) 982–1003.
- [147] R.A. Gokhale, R.S. Narayanaswamy, The role of experience in discontinuance of IT innovation, *Proceedings of the 2006 Southern Association for Information Systems Conference*, (2006), pp. 1–7 Retrieved from <http://sais.aisnet.org/2006/Gokhale-SAIS2006-paper.pdf>.
- [148] G.P. Prendergast, N.E. Marr, Disenchantment discontinuance in the diffusion of self-service technologies in the services industry: a case study in retailing banking, *Journal of International Consumer Marketing* 7 (2) (1994) 25–40.
- [149] D. Whitten, S. Chakrabarty, R. Wakefield, The strategic choice to continue outsourcing, switch vendors, or backsource: do switching costs matter? *Information and Management* 47 (3) (2010) 167–175.
- [150] M. Salo, L. Frank, User behaviours after critical mobile application incidents: the relationship with situational context, *Information Systems Journal* 27 (1) (2017) 5–30.
- [151] B. Whitacre, C. Rhinesmith, Broadband un-adapters, *Telecommunications Policy* 40 (1) (2016) 1–13. Available at: <https://doi.org/10.1016/j.telpol.2015.11.008>.
- [152] B. Furneaux, M. Wade, Impediments to information systems replacement: A calculus of discontinuance, *Journal of Management Information Systems* 34 (3) (2017) 902–932. Available at: <https://doi.org/10.1080/07421222.2017.1373013>.
- [153] A.K.M. Najmul Islam, Sources of satisfaction and dissatisfaction with a learning management system in post-adoption stage: A critical incident technique approach, *Computers in Human Behavior* 30 (2014) 249–261, <https://doi.org/10.1016/j.chb.2013.09.010>.

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