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Abstract

Feedback is essential for learning and progress. However, the concept of feedback is used for a multitude of purposes in an overwhelming diversity of fields such as performance management, education, and information retrieval. Given a fragmented landscape and lack of coherence, it remains unclear how the concept of feedback is used in the existing body of information systems (IS) research. This problem is addressed by conducting a systematic literature review that queries the AISel database and the Senior Scholar Basket of journals. In total, 144 articles were analyzed to explore different domains in which the concept of feedback is adopted within IS research. The results highlight seven feedback domains: (1) product and service feedback, (2) machine performance feedback, (3) human performance feedback, (4) community contribution feedback, (5) educational feedback, (6) everyday life activity feedback, and (7) system (use) feedback. By providing an overview of seven domains and by discussing the roles which feedback plays in these domains, complexity is reduced. Further, this article provides a foundation for scholars to assess their feedback domain and inspires scholars to transfer knowledge in between these domains.

Keywords

Feedback, systematic literature review, information systems research.

1 Introduction

Given its multifaceted informational and motivational functions, feedback is key for learning and improvement of human (Hattie & Timperley, 2007; Ilgen, Fisher, & Taylor, 1979; Latham & Locke, 1990) and machine actors (Kaelbling, 1993; Sutton & Barto, 1998). Today, many aspects of our everyday life include exchanging feedback. For example, getting and responding to feedback prompts has become a daily reality whenever visiting restaurants, staying in hotels, driving with Uber and flying with airlines. In turn, seeking and acting on customer feedback is a crucial managerial task for organizations. However, customer feedback is only one particular variation among many types of feedback examined in the field of information systems (IS) research. In fact, the concept of *feedback* is used in such diverse ways so that scholars, for instance, refer to feedback in terms of outcome feedback (Balzer, Doherty, & Others, 1989), cognitive feedback of decision support systems (Kayande, De Bruyn, Lilien, Rangaswamy, & van Bruggen, 2009), feedback about the task, processing of the task, self-regulation or feedback about the self as a person (Hattie & Timperley, 2007). Due to its socio-technical nature, IS research includes, but is not limited to these above-mentioned forms of feedback. In result, prior research on feedback in IS research has to be assessed as fragmented and lacks coherence: “A pat on the back and a hearty

‘well done’ is ‘positive feedback’. A course grade is ‘feedback’. A meeting in which a supervisor rates the performance of an employee is called ‘feedback’. The sound of a pellet falling into the food tray of a Skinner box and the sight and taste of the pellet are said to provide ‘feedback’ as well as reinforcement to the rat or pigeon” (Doherty & Balzer, 1988, p. 186). Given this multitude of feedback conceptualizations and applications, it remains unclear how the concept of feedback is used in the existing body of IS research. Therefore, I pose the following research question:

What are different research streams that adopt the concept of feedback within the field of information systems and what roles does feedback play?

The IS discipline is characterized by its diverse and interdisciplinary nature (Webster & Watson, 2002). Providing scholars with an overview of the diverse feedback research streams and linking these domains to corresponding authors, reduces complexity and facilitates the identification of similarities and differences between the different domains.

2 Research Method

The purpose of this research is to identify and analyze domains in which the concept *feedback* is adopted within the field of information systems and to present an integrated overview. To do so, a systematic literature review is conducted that builds upon the framework of vom Brocke et al. (2009) and follows the guidelines of Webster and Watson (2002).

2.1 Review Scope and Topic Conceptualization

The scope of this review is visualized in Table 1 and structured along the well-established taxonomy of literature reviews from Cooper (1988).

Dimension	Characteristics			
Focus	<i>Outcomes</i>	<i>Methods</i>	<i>Theories</i>	<i>Practices or Applications</i>
Goal	<i>Integration</i>		<i>Criticism</i>	<i>Central Issues</i>
Organization	<i>Historical</i>		<i>Conceptual</i>	<i>Methodological</i>
Perspective	<i>Neutral Representation</i>		<i>Espousal of Position</i>	
Audience	<i>Specialized Scholars</i>	<i>General Scholars</i>	<i>Practitioners</i>	<i>General Public</i>
Coverage	<i>Exhaustive</i>	<i>Exhaustive & Selective</i>	<i>Representative</i>	<i>Central / Pivotal</i>

Table 1. Scope of the literature review; Source: Cooper (Cooper, 1988)

The focus of this article lies on research practices with the goal to identify central domains in which the concept of feedback is adopted within the body of IS literature. Thereby, a domain is considered as “a field or sphere of activity, influence or expertise” (Wiktionary, 2019). Specifically, this research seeks to identify a set of domains, whereas in each domain the feedback concepts are used in a similar vein. This is achieved by obtaining a natural representation of literature, which is organized concept-centric (Webster & Watson, 2002). The intended audience is twofold. On the one hand, general feedback scholars from any field are targeted to provide them an overview of how the concept is used in IS research. On the other hand, IS scholars specialized in one of the identified domains are targeted to provide them a structure to delineate their feedback

domain from others as well as transfer knowledge in between. Finally, this research strives for a representative coverage of the subject rather than for completeness (vom Brocke et al., 2015). Regarding topic conceptualization, the research at hand focuses on one particular concept, that is, feedback. According to dictionaries, the concept of feedback originates etymologically from the verb “feed“ and the adverb “back” and has often been viewed from the perspective of a system so that feedback refers to "the return of a fraction of an output signal to the input of an earlier stage" (Memidex Dictionary/Thesaurus, 2019). Similarly, feedback may be seen as a process in which a system (e.g., a person) produces an output and receives back some measure that “allows the system to compare its present state with an ideal state, to adjust itself in light of that comparison, and bring itself closer to that ideal state” (Doherty & Balzer, 1988, p. 163). Alternatively, in the context of human performance, feedback is understood as "information about the gap between the actual level and the reference level of a system parameter which is used to alter the gap in some way" (Ramaprasad, 1983, p. 4). Thereby, the information about the gap may relate to any system parameter such as the input (e.g., the effort an employee puts into a task), process (e.g., the way an employee approaches a task), or output (e.g., the outcome from completing a task) (Ramaprasad, 1983). Nevertheless, the “information about the gap must be used to alter the gap; only then is the loop complete” (Ramaprasad, 1983, p. 4). This means, the sole awareness of employee performance is not enough to call it feedback, but actions are required to close the feedback loop (Ramaprasad, 1983). However, to prevent being preconceived, the search and analysis within this structured literature review is not limited to a particular type of feedback and phenomenon (e.g., a particular behavior and action), but relies on the obtained literature to identify different feedback conceptualizations emergent in IS research.

2.2 Approach to Literature Search and Analysis

A structured literature search process was conducted on February 05, 2019 by following two different strategies and applying four exclusion criteria, which are described subsequently.

Stage	Description	Change (Total)
<u>Search Strategy 1 - Diversity</u>	<i>Search in AISEL for articles with titles that include “feedback”</i>	+ 151 articles (151)
Exclusion Criteria 1	Duplicates and unavailable files	- 3 articles (148)
Exclusion Criteria 2	Formal criteria not met	- 9 articles (139)
Exclusion Criteria 3	Focus on investigating feedback	- 9 articles (130)
Exclusion Criteria 4	Lack of definition of type of feedback	- 2 articles (128)
<u>Search Strategy 2 - Quality</u>	<i>Search in Senior Scholar Basket for articles with titles that include “feedback”</i>	+ 23 articles (151)
Exclusion Criteria 1	Duplicates from AISEL (MISQ, JAIS)	- 6 articles (145)
Exclusion Criteria 3	Focus on investigating feedback	- 1 articles (144)
		<u>144 articles</u>

Table 2. Structured approach to literature search and analysis

Search Strategy 1: Diversity of feedback in IS research. In a first step, we searched the AIS Electronic Library (AISEL) library on February 05, 2019. By probing all articles that contain

“feedback” in their titles to ensure covering a broad variety of information systems research in which feedback plays the principal role. This is in line with the scope of our review (see Table 1), since we do not strive for exhaustiveness.

Search Strategy 2: Feedback in high quality IS research. In a second step, we continued our search with the Senior Scholar Basket of Journals (Association for Information Systems, 2019), since the corresponding journals are known as the most recognized IS journals. Specifically, the journals of the basket were chosen based on three criteria: “(1) the rigorousness of the review process, (2) the composition of the editorial board [...], and (3) the existence of an international readership and contribution” (Hirschheim & Klein, 2012, p. 216). Consequently, we searched the following journals for articles with titles that include the keyword “feedback”: European Journal of Information Systems (EJIS), Information Systems Journal (ISJ), Information Systems Research (ISR), Journal of AIS (JAIS), Journal of MIS (JMIS), and MIS Quarterly (MISQ), Journal of Strategic Information Systems (JSIS) and Journal of Information Technology (JIT).

Exclusion Criteria. Throughout both search strategies, we applied four exclusion criteria. First, publications for which no file was available could not be considered and duplicates were removed. Second, we excluded articles that did not meet formal criteria: (1) articles without results such as research-in-progress and short papers without results, (2) summaries of panel discussions and commentaries as well as (3) articles without proper scientific structure (i.e., without abstract). Third, articles without a clear focus on investigating feedback mechanisms were omitted. For example, research in which the term feedback was associated with the evaluation or with the application of methods (e.g., feedback mapping) were separated out. Fourth, research in which the nature of feedback was ambiguous was not considered.

Literature Analysis. To analyze the collected literature, a coding framework was developed based on theory-driven and data-driven codes (DeCuir-Gunby, Marshall, & McCulloch, 2011). It is distinguished between the phenomena that are observed, assessed or evaluated (i.e., the feedback subject) and the different types of feedback that are investigated. In regard to the latter, literature further suggests that feedback is either provided by humans or machines, which is referred to as human-generated and computer-generated feedback (Ang et al. 1991). In addition, literature distinguishes between the two delivery modes face-to-face and computer-mediated feedback (Ang et al. 1991). In the following, the qualitative data analysis software MAXQDA was used to code text passages of the obtained articles by applying the following coding schema:

- Feedback Type (*theory-driven code*)
 - Human-Generated Feedback (*theory-driven code*)
 - Face-to-Face Feedback (*theory-driven code*)
 - Open codes of face-to-face feedback (*data-driven code*)
 - Computer-Mediated Feedback (*theory-driven code*)
 - Open codes of computer-mediated feedback (*data-driven code*)
 - Computer-Generated Feedback (*theory-driven code*)
 - Open codes of computer-generated feedback (*data-driven code*)
- Feedback Subject (*theory-driven code*)
 - Feedback Domains (*data-driven code*)
 - Open codes of feedback subject (*data-driven code*)

Finally, seven feedback domains were identified from analyzing a total of 144 articles (Table 3).

Feedback Domain	Number of Articles per Source		
	AISeL	Senior Scholar Basket	Total (unique)
D1. <i>Product and Service Feedback</i>	21	3	23
D2. <i>Machine Performance Feedback</i>	11	0	11
D3. <i>Human Performance Feedback</i>	20	6	24
D4. <i>Community Contribution Feedback</i>	12	2	14
D5. <i>Educational Feedback</i>	14	0	14
D6. <i>Everyday Life Activity Feedback</i>	26	0	26
D7. <i>System (Use) Feedback</i>	24	11	32
<i>Total included</i>	128	22	144

Table 3. Identified feedback domains and their distribution across literature sources

3 Results - Seven Feedback Domains in IS Literature

This research highlights seven distinct feedback domains within the field of information systems research (see Figure 1) and elaborates on the diversity of feedback concepts. Each domain is introduced in the following by describing the roles of feedback in these domains.

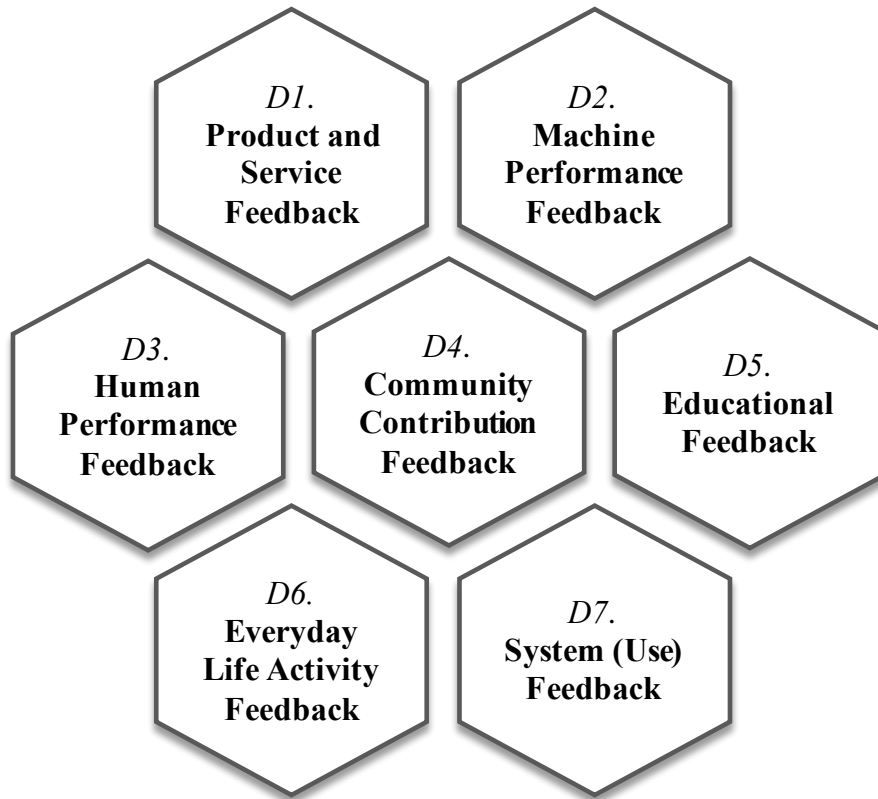


Figure 1. Seven Feedback Domains in IS Literature

D1 – Product and Service Feedback. The first domain is concerned with user, consumer and customer feedback on products and services such as software systems, physical products, services as well as the reputation of individuals and companies. The first identified article dates back to the 1980s, in which scholars have started to investigate how to elicit user feedback during system development (Salaway, 1981). In the meanwhile, much literature moved towards examining feedback and reputation mechanisms in the context of E-commerce marketplaces, platform-based trading and auctions, and alternate forms of online communities that include feedback on products and services. More specifically, the identified literature examines online reviews of books (e.g., Chen, Wu, & Yoon, 2004), hotels (e.g., Li, Lin, & Zhang, 2015), and movies (e.g., Mukhopadhyay, Conlon, & Simmons, 2011). Thereby, reviews comprise both quantitative numerical ratings as well as qualitative text comments (Pavlou & Dimoka, 2006). Further, not only products, but also individuals and companies are increasingly being rated as they engage in transactions such as selling and buying products and services. In particular, research investigates the role of feedback on trust building, price premiums, and seller differentiation in online marketplaces (Pavlou & Dimoka, 2006). Similarly, scholars study implications of the reputation of service providers such as physicians in online health consultation and how they harness their online popularity to achieve price premiums (Chen, Rai, & Guo, 2015). With the advent of digitalization, phenomena such as datafication and big data allow collecting and gaining access to usage data and sensor data of products and services. On the one hand, such data is harnessed in the form of computer-generated feedback to improve the product design (Holler, Neiditsch, Uebernickel, & Brenner, 2017). On the other hand, and aside from explicit feedback on products and services through reviews and ratings, implicit feedback becomes available through analyzing the actual behavior of users, customers, and consumers, e.g., buying behavior and music listening behavior (Qi et al., 2013).

D2 – Machine Performance Feedback. In the second domain, the concept of feedback is used to evaluate machine performance such as calculating recommendations and predications. Much IS research in this domain is concerned with recommender systems and is tightly linked to related fields in the computer science discipline, therefore, relies on corresponding concepts. Most notably, the concept of relevance feedback is adopted, which originates from literature on information retrieval (IR). In contrast to database and decision support systems, IR systems aim at finding information (and reducing information overload) from a vast amount of unstructured data by means of search queries, whereas the corresponding performance is evaluated as users modify the query or use the results (i.e., relevance feedback) (Belkin & Croft, 1992; Salton & McGill, 1983). While some IS research in this feedback domain is concerned with improving relevance feedback (e.g., Xu, 2001), others investigate recommender systems and domain-specific recommendations such as news articles (Prawesh & Padmanabhan, 2012), task-relevant knowledge (Wu & Liu, 2003), and e-commerce products (Gupta, Kumar, & Bhasker, 2017). Interestingly, not only explicit feedback is used, but also various ways to derive implicit feedback data are examined, since (negative) feedback is often missing or unknown in real-world applications (Li et al., 2018). In contrast to the first domain, the role of feedback here is to help improving the machine recommendations and predictions, rather than reducing information asymmetry and increasing trust. For instance, binary and quantitative implicit feedback data such as the listening count of music, the purchasing count of items, or webpage bookmarking is harnessed (Gupta et al., 2017). Also, implicit feedback data is derived from applying collaborative filtering, e.g., by predicting if a user will rate an item (Li et al., 2018). Finally, one work examines effects of self-feedback on the performance of chaotic neural network models (Xu & Liu, 2012).

D3 – Human Performance Feedback. The third feedback domain comprises feedback on human performance reflecting a field of research that is often associated with performance management, performance appraisals, and human resource management, which is traditionally covered by management and psychological literature. With the advent of the digitalization of work, information systems research investigates three roles of corresponding performance feedback. First, research on traditional work settings increasingly investigates computer-mediated and computer-generated feedback aside from face-to-face (Ang, Cummings, Straub, & Earley, 1993; Ang, Straub, Cummings, & Earley, 1991) and how to design such electronic feedback systems (Niehaves & Ortbach, 2016). Further, it is examined how computer-generated feedback mechanisms facilitate the improvement of employee motivation of train drivers through the continuous provisioning of gamified feedback mechanisms that target the basic human needs of competence, relatedness, autonomy and purpose (Bartnik & Ćwil, 2017). Second, information systems literature includes research that investigates performance feedback in platform-mediated work settings such as crowdsourcing and open innovation. For example, prior research examines the relevance of platform facilitated feedback mechanisms in the form of comments within IT-based innovation contests (Adamczyk, Haller, Bullinger, & Moeslein, 2011). Third, research investigates the role of feedback that is available on projects and team performance. For example, in the area of system deployment, developers increasingly rely on post-release feedback (Lee, Licorish, MacDonell, Patel, & Savarimuthu, 2015). Further, it is investigated how project-related accountability and feedback in terms of direction and optimism affect the willingness of managers to continue with these software projects (Wei, Tan, & Heng, 2003).

D4 – Feedback on Community Contributions. Today, various social software platforms provide interaction possibilities to form communities and exchange information (Kaplan & Haenlein, 2010). In this context, the fourth feedback domain relates to feedback on voluntary contributions to platforms such as social networking sites, online communities and open source software. On the one hand, these platforms offer computer-mediated feedback mechanisms that foster community feedback, e.g., commenting and liking (e.g., Cheikh-Ammar & Barki, 2014) as well as up- and down-voting (e.g., Armisen, Majchrzak, & Brunswicker, 2016) of contributions posted by other members. In contrast to formal organizations in which feedback is controlled, feedback in the context of voluntary contributions is itself a voluntary behavior (Moon & Sproull, 2008). Accordingly, feedback mechanism are essential components of community and social software platforms that shape individual perceptions of social presence and enjoyment (Cheikh-Ammar & Barki, 2014). As such, it is examined how receiving feedback influences the quantity and quality of voluntary contributions, and as such, how it facilitates and motivates people to (continue) contributing. In fact, research shows that systematic feedback systems have positive effects on the quality and quantity of contributions over time (Moon & Sproull, 2008). Further, it is examined how receiving feedback upon message posts relates to the number of connections (e.g., friends) and the frequency of postings. For example, research suggests that both having a small number and a plethora of friends goes along with receiving less feedback compared with people that have moderate friend counts (Schoendienst & Dang-Xuan, 2011). Note that community feedback is by no means limited to feedback on social network posts among friends, but include such as recipe contributions (Hong et al., 2016; Huang et al., 2017), knowledge contributions on Wikipedia (Grigore, Rosenkranz, & Sutanto, 2015), answers to academic surveys (Winkler, Sarstedt, Keil, & Rost, 2015), participation in forecasting communities (Teschner, Mazarakis, Riordan, & Weinhardt, 2011), and product configurations (Hildebrand, Häubl, Herrmann, & Landwehr, 2013);

Hildebrand, Landwehr, & Herrmann, 2011). For example, studies of the latter suggest that receiving others' feedback on initial product configurations leads to less unique final self-designs and lower satisfaction with self-designed products (Hildebrand et al., 2013). Aside from computer-mediated feedback mechanisms, descriptive and normative feedback on community contributions can be automatically generated by platforms. Prior research suggests that (social) normative feedback is a powerful means to foster community contributions and facilitate behavioral change (Noyen & Wortmann, 2014). Thereby, investigations show positive effects of feedback on the quantity of content contributions when it is framed either pro-socially (e.g., you helped x other users) or pro-self (e.g., you are in the top x%), while competitively framed feedback was found to be less effective (Huang et al., 2017). Such metrics may not only be embedded in the corresponding platform but are provided over various channels such as weekly newsletters that act as reminders that drive participation (Teschner et al., 2011).

D5 – Educational Feedback. In the fifth feedback domain, feedback is viewed from a pedagogical and learning perspective in educational settings. Identified key concepts in this domain are summative and formative feedback, peer assessments, computerized feedback, and self-regulated learning. On the one hand, research in this domain includes investigations of face-to-face classroom settings, for example, to examine how instant online feedback on presentations increases students' interest in, commitment to and quality of presentations (Figl, Bauer, & Kriglstein, 2009) and how audio feedback instead of textual feedback on assignments enhances the process for tutors and learners (Evans & Palacios, 2010). On the other hand, research includes studies that examine the learning behavior of students in online learning (i.e., E-Learning) settings in which feedback is increasingly generated by information systems (i.e., computerized feedback) to reduce the workload of instructors and increase self-regulation of learners. Accordingly, Wu et al. (2017) compare the effects of computerized and instructor feedback and Rietsche et al. (2018) design and evaluate an IT-based formative feedback tool.

D6 – Everyday Life Activity Feedback. The sixth feedback domain comprises feedback on (1) health and lifestyle behavior as well as (2) safety and sustainability behavior of humans in their everyday life. Examples of the former include feedback on the sleeping behavior (Nguyen, Ruiz, Wilson, Strong, & Djamasbi, 2018), on food choices (Ronen & Te'eni, 2011), on diet and exercise decisions (McCreless, Goul, Louis, & Warner, 2017), on taking medications and keeping diets (Ronen & Teeni, 2013) as well as on managing fitness and health data (Kwon, Lee, & Lee, 2014). Examples of the latter are often referred to as eco-feedback and include feedback on the consumed electricity in households (Loock, Landwehr, Staake, Fleisch, & Pentland, 2012), consumed water in the shower (Tasic, Tiefenbeck, Schöb, & Staake, 2015), sustainability of driving behavior (Tulusan, Steggers, Staake, & Fleisch, 2012), commuting behavior with e-bikes (Flüchter & Wortmann, 2014), and on public safety within cities (Gopeni, Wayi, & Flowerday, 2016). Across these various types of feedback on everyday life activities, this research commonly investigates effects of different types of absolute and normative feedback interventions on the subsequent behavior. In this context, Loock et al. (2012) elaborate on the relevance of setting appropriate reference groups when presenting descriptive normative feedback that compares the behavior of individuals to others. Dalén and Krämer (2017) illustrate the relevance of user-centered feedback design by showing feedback of monetary savings instead of consumed energy. Ronen and Teeni (2013) highlight the impact of feedback visualization, personalization, and interactivity. As a final

example, Tiefenbeck et al. (2016) find persistent long-term effects from providing people with real-time feedback on their energy consumption (in contrast to aggregated information).

D7 – System (Use) Feedback. The seventh feedback domain relates to information systems use and occurs in four varieties. First, feedback is understood as system-generated information that is presented to a systems' users in response to their actions with the goal to help them improving the accomplishment of tasks and processes (Te'eni, 1992). Drawing on cognitive psychology, the underlying logic is that humans have limited cognitive abilities and need help in information processing as well as judgment and decision making (Doherty & Balzer, 1988; Kahneman, Slovic, & Tversky, 1982). Accordingly, the concept of feedback denotes, for instance, information about decision-making processes and scholars investigate how systems "can be designed to provide feedback at the appropriate time so that the decision maker can use it effectively" (Te'eni, 1991, p. 644). Most notably, the concept of *cognitive feedback* refers to systems that present their users with information of one or more of the following three components of cognitive feedback (Balzer et al., 1989). Task information or feed-forward includes relations of the task environment, e.g., how to do a judgment task (Balzer et al., 1989; Balzer, Sulsky, Hammer, & Sumner, 1992). Cognitive information includes relations of the perceptions of the user, e.g., how a judgment task is done or how it was done previously (Balzer et al., 1989, 1992). Functional validity information includes relations between the environment and the user's perceptions of the environment, e.g., how successful a judgment strategy is (Balzer et al., 1989, 1992). As opponent to outcome feedback that provides knowledge of results, cognitive feedback is understood as process feedback (Balzer et al., 1989). Thus, it can influence and change the behavior of people (e.g., the decisions they make). However, the effectiveness depends on the content and form of the feedback and, therefore, requires sophisticated design considerations (Te'eni, 1992). Due to the diversity of IS research, cognitive feedback and so-called *information feedback* is investigated for varies types of information systems (e.g., decision support systems, auctions, and online retail sites). In the context of auctions, it is examined how the provisioning of information to suppliers influences the economic outcome of auctions (Adomavicius, Gupta, & Sanyal, 2012) and how bidder support systems can be designed so that bidders are guided by exact price feedback (Adomavicius, Curley, Gupta, & Sanyal, 2013). In the context of online retail sites, scholars investigate the influence of information feedback such as the total amount and past expenses on consumer behavior in online payment processes and how this can improve the experience (Dutta, Jarvenpaa, & Tomak, 2003). However, cognitive feedback goes beyond purely digital settings and includes research that investigates how public feedback on mobile self-checkout systems in physical stores can make users more comfortable making purchases in public when others can be observe if the payment was successful (Vuckovac, Hubert, Fritzen, Fuchs, & Ilic, 2017). Second, IS research related to human-computer interaction often takes a broader stance by considering feedback as any communication from the system back to the user (Fryszak, 2016). Such feedback may provide users with information regarding the actions that have actually been executed by the system (Norman, 1998), a system's state (Sheng & Lockwood, 2011) and the signalization of system responses and outcomes (Vuckovac et al., 2017). For example, it is examined how the provisioning of system status feedback can reduce uncertainty and, thus, increases the perceived acceptability of delays, satisfaction with the site, as well as the intention to return to the site (Sheng & Lockwood, 2011). Third, literature on computer-mediated communication emphasizes the anticipated personal feedback that is somewhat limited or delayed when information systems are used to communicate as opposed to interpersonal face-to-face communication that comes with plenty and immediate

feedback. In this context, feedback is understood as the perception of a message receiver that a reply to this message would be read and answered (Wilson & Djasasbi, 2013). This is tightly coupled to the richness of media, which differs in the immediacy of feedback, that is, to what extent media enable providing rapid feedback on received communication and to what degree they enable the sender to recognize to which extent a receiver has understood the message (Dennis & Kinney, 1998). Fourth from a task-technology fit perspective (Goodhue & Thompson, 1995), information systems use is coupled to experience and adaptation feedback (Chiasson, Kelley, & Downey, 2015). *Experience feedback* describes how using an information system allows users to check if their initial expectations (of the task-technology fit) have been met so that they can adjust their expectations and the subsequent use (Chiasson et al., 2015; Goodhue & Thompson, 1995). *Adaptation feedback* describes that using an information system leads to positive or negative effects that allow users to adjust as well as learn to improve the ways they use a system and, thus, to increase their individual-technology fit (Chiasson et al., 2015; Goodhue & Thompson, 1995).

In the following, Table 4 provides a detailed overview of the articles for each feedback domain.

Feedback Domain	Human-Generated Feedback	Computer-Generated Feedback
<p>D1. Product and Service Feedback</p> <p><i>Keywords: Trust, online review, (digital or electronic) word-of-mouth, signaling theory, online trustworthiness, online feedback, social exchange theory, motivation crowding theory, benevolence, creditability, institution-based trust, subjective norm, text mining.</i></p>	<ul style="list-style-type: none"> - Direct user/ consumer/ customer feedback via analog or digital channels such as questionnaires, telephone, letters, and email (Bragge & Merisalo-Rantanen, 2002; Culnan, 1989; Eklund, Toivonen, Vanharanta, & Back, 2011; Jayanth, Jacob, & Radhakrishnan, 2011; Lee et al., 2015; Salaway, 1981; Tabor, 1999). - Platform-based online feedback mechanism (i.e., reputation systems such as reviews and ratings) (Chen et al., 2015; Chen et al., 2004; Cui, Wang, Feng, & Teng, 2014; Li et al., 2015; Loebbecke, Bolton, & Ockenfels, 2007; Mou, Ren, Qin, & Kurcz, 2018; Mukhopadhyay et al., 2011; Pardue, Landry, & Shaw, 2007; Pavlou & Dimoka, 2006; Sanger & Pernul, 2018; Seeger, Neben, & Heinzl, 2017; Shahbaznezhad, 2016; Shen & Liu, 2018; Vannoy, Nath, & Iyer, 2008; Wang, Teo, & Wei, 2005; Zhang, Zheng, & Wang, 2004). 	<ul style="list-style-type: none"> - Usage and sensor data of products and services (Holler et al., 2017). - Implicit feedback through usage behavior (Qi et al., 2013).
<p>D2. Machine Performance Feedback</p> <p><i>Keywords: Information retrieval, semantic analysis, concept extraction, document re-ranking, concept fusion, term hierarchy, item ranking, weight learning, non-linear self-feedback, neural network, linguistic approach, collaborative filtering.</i></p>		<ul style="list-style-type: none"> - <i>Implicit and explicit relevance feedback</i> (Bot, 2003; Chou, Dai, Liu, & Lin, 2015; Chou, Zeng, & Dai, 2014; Gupta, Kumar, & Bhasker, 2016; Gupta et al., 2017; D. Li et al., 2018; Pathak, 1998; Prawesh & Padmanabhan, 2012; Wu & Liu, 2003; Xu & Liu, 2012; Xu, 2001).

<p>D3. Human Performance Feedback</p> <p><u>Keywords:</u> <i>Absorptive capacity, open innovation, feedback seeking, motivation, improvement, continuous feedback, goal setting, self-regulation, social facilitation, feedback intervention, team performance, rank order tournament, incentives, accountability, feedback optimism, feedback direction, feedback specificity, feedback acceptance, dissonance reduction theory, feedback process model, behavioral theory, anchoring effect.</i></p>	<ul style="list-style-type: none"> - <i>Face-to-face performance feedback</i> (Ang et al., 1993, 1991) including techniques such as pair programming and peer code reviews (Schmidt, Spohrer, Kude, & Heinzl, 2012). - <i>Computer-mediated electronic performance feedback</i> (Ang et al., 1993, 1991; Bellini & Lacet Serpa, 2018; Niehaves & Ortbach, 2016; Wang, Zhao, Qiu, & Zhu, 2014). - <i>Social feedback from peers</i> (Babar, Chan, & Choi, 2018b, 2018a). - <i>Crowd and peer feedback</i> (Adamczyk et al., 2011; Koh, 2018; Lee et al., 2015; Seeber, Zantedeschi, Bhattacharjee, & Füller, 2017; Thiebes, Scheidt, Schmidt-Kraepelin, & Benlian, 2018; Yang & Hahn, 2016). - <i>Feedback on group performance such organizational performance as well as project feedback and evaluation</i> (Baker, 1995; Baker, Song, & Jones, 2017; Koch, 2015; Saraf, Dasgupta, & Assadi, 2012; Wei et al., 2003). 	<ul style="list-style-type: none"> - <i>Descriptive statistics of performance</i> (Babar et al., 2018a, 2018b; Bartnik & Ćwil, 2017; Niehaves & Ortbach, 2016). - <i>Normative feedback on performance</i> (Jung, Schneider, & Valacich, 2005; Straub, Gimpel, Teschner, & Weinhardt, 2014, 2015). - <i>Computerized feedback</i> (Ang et al., 1993, 1991; Garfield, Satzinger, Taylor, & Dennis, 1997).
<p>D4. Community Contribution Feedback</p> <p><u>Keywords:</u> <i>Social presence, social loafing, social influence, social value orientation theory, self-determination theory, incentive mechanisms, user-generated content, reputation, social judgment theory.</i></p>	<ul style="list-style-type: none"> - <i>Online community feedback mechanisms such as likes, gratitude, up-votes and down-votes</i> (Armisen et al., 2016; Cheikh-Ammar & Barki, 2014; Glogowska, Csáki, Feller, & Gleasure, 2016; Grigore et al., 2015; Hildebrand et al., 2013, 2011; Moon & Sproull, 2008; Schoendienst & Dang-Xuan, 2011). - <i>Sentiment-driven (affective) feedback</i> (Grigore et al., 2015). 	<ul style="list-style-type: none"> - <i>Descriptive statistics</i> (Winkler et al., 2015). - <i>Normative feedback such as relative ranking among peers and social ranking feedback</i> (Hong et al., 2016; Huang et al., 2017; Noyen & Wortmann, 2014; Teschner et al., 2011). - <i>Summative system feedback</i> (Armisen et al., 2016).
<p>D5. Educational Feedback</p> <p><u>Keywords:</u> <i>Self-regulated learning, self-motives, social influence, value perceptions, instructor feedback, online learning, social support, learning outcome, information processing, student engagement, student participation, personalized feedback, formative assessment; active learning, interactive technology enhanced learning, pedagogy, anonymity, eLearning, Gamification, Mobile Learning, Motivation.</i></p>	<ul style="list-style-type: none"> - <i>Feedback from teachers and peers in general</i> (Aoun, Ang, & Vatanasakdakul, 2014). - <i>Computer-mediated feedback from teacher</i> (Evans & Palacios, 2010). - <i>Computer-mediated feedback from peers</i> (Dreher & Maurer, 2006; Figl et al., 2009; Sager, 2006; Williams, Mondschein, Farmer, & Twyman, 2018; Wu, Wang, Zhao, & Liang, 2015). 	<ul style="list-style-type: none"> - <i>Computerized feedback for students</i> (Coakley & Tyran, 1999; Grigoriou, Cheong, & Cheong, 2015; Lederman et al., 2017; Rietsche et al., 2018; Schneider, Janson, & Schöbel, 2018; Wu et al., 2017). - <i>Computerized feedback for teachers</i> (Cristea et al., 2018).

<p>D6. Everyday Life Activity Feedback</p> <p><u>Keywords:</u> Feedback application, task-technology fit, task-performance chain, feed-forward, learning process, social norms, motivation theory, social normative feedback, feedback loop, self-feedback, continued use of IT, social presence, behavior change, decision support systems, conscientiousness, persuasive system design, praise, rewards, reminders, suggestions, eco-feedback, self-efficacy, personalization, interactivity, social cognitive theory, goal setting theory, self-regulation, real-time feedback, effect persistence, data push system, intrinsic motivation, feedback presentation, humanized feedback, computers are social actors (CASA), cognitive load.</p>	<ul style="list-style-type: none"> - <i>Self-feedback</i> (Kwon et al., 2014). - <i>Computer-mediated feedback concerning public safety issues</i> (Gopeni et al., 2016). 	<ul style="list-style-type: none"> - <i>Absolute feedback on behavior regarding health, lifestyle, safety and sustainability</i> (Ableitner, Tiefenbeck, Fleisch, & Staake, 2018; Albizri & Zahedi, 2012; Dalén & Krämer, 2017; Gottlieb & Böhm, 2018; Gottlieb, Böhm, & Krcmar, 2018; Nguyen et al., 2018; Piccolo, Scharl, & Baranauskas, 2012; Promann & Brunswicker, 2017; Ronen & Teeni, 2013; Ronen & Te'eni, 2011; Strong, Tulu, Agu, & He, 2014; Tasic et al., 2015; Tiefenbeck et al., 2016; Tulusan et al., 2012; Yoganathan & Kajanana, 2014). - <i>Normative feedback on behavior regarding health, lifestyle, safety and sustainability</i> (Flüchter & Wortmann, 2014; Flüchter, Wortmann, & Fleisch, 2014; Looock et al., 2012; Looock, Staake, & Landwehr, 2011). - <i>Cognitive feedback for behavior change</i> (McCreless et al., 2017). - <i>Biofeedback</i> (Lux et al., 2018; Lux, Hawlitschek, Adam, & Pfeiffer, 2015; Maier, Reimer, & Ridinger, 2011; Shih, Kowatsch, Tinschert, Barata, & Nissen, 2016).
<p>D7. System (Use) Feedback</p> <p><u>Keywords:</u> Auctions, information feedback, bidder behavior, reputation, classification of sellers, groupware, awareness, media richness theory, information cues, equivocality, group support system, feedback utilization, decision making, decision support systems, decisional guidance, recommender system, transparency, computer-mediated communication, feedback immediacy, nonverbal cues, mental models, business intelligence, data warehouse, consumer expertise, flow, intrinsic motivation, information failure, trust violation, trust repair, electronic word-of-mouth, e-commerce, multi-user systems, software agents, delay, attention, satisfaction, intention, eye tracking, change, post-adoption, (continued) use, adoption, public feedback, persuasion, influence, interpersonal communication, feedback strategy.</p>	<ul style="list-style-type: none"> - <i>Feedback from IS use</i> (Tennant & Chin, 2015). - <i>Experience and adaptation feedback</i> (Chiasson et al., 2015). 	<ul style="list-style-type: none"> - <i>Feedback on system status</i> (Sheng & Lockwood, 2011) or <i>system outcomes</i> (Vuckovac et al., 2017). - <i>Cognitive feedback and information feedback</i> (Adomavicius et al., 2012; Adomavicius et al., 2013; Adomavicius, Gupta, & Sanyal, 2008; Adomavicius, Gupta, & Zhdanov, 2009; Adomavicius, Sanyal, Gupta, & Curley, 2007; Appan & Lin, 2004; Bordetsky & Mark, 2000; Djamassbi & Loiacono, 2006; Dutta et al., 2003; Frysak, 2016; Hashim, Kannan, & Maximiano, 2017; Hebrado, Lee, & Choi, 2011; Hiltz, Johnson, & Turoff, 1991; Huguenard & Frolick, 2001; Kayande et al., 2009; Kolodner & Even, 2009a, 2009b; Koppius, Heck, & Kumar, 2000; Ottaway, Bruneau, & Evans, 2001; Pikoovsky & Bichler, 2005; Schaffer & Feng, 2015; Sen & Bagchi, 2012; Sengupta & Te'eni, 1993; Weber, Presser, & Norrie, 2015; Zhang & Zhang, 2015). - <i>Feedback related to computer-mediated communication and media richness</i> (Dennis & Kinney, 1998; Kahai & Cooper, 2003; Wilson & Djamassbi, 2013).

Table 4. Details of feedback types by feedback domains

4 Discussion

The literature review at hand reveals seven different feedback domains and elucidates the diversity of feedback in IS research. Specifically, it provides an overview of how the concept of feedback is applied in different domains of IS research. We now discuss similarities and differences before offering suggestions on how to bridge these, so far, detached feedback domains.

4.1 Similarities and Differences Among the Feedback Domains

To discuss similarities and differences, we now reflect the seven feedback domains along the following five aspects: (1) goal setting and control, (2) explicit and implicit feedback, (3) feedback exchange in a digital world, (4) feedback timing and purpose, (5) external and internal feedback.

Goal setting and goal control. Prior research shows that feedback and goal setting are closely interrelated, since (1) feedback only leads to performance improvement given that it leads to higher goal setting and (2) performance only increases over time given the presence of feedback that relates to goal attainment (Latham, 2012; Latham & Locke, 1990). However, the seven feedback domains differ in the way goal setting and control is treated. On the one hand, feedback conceptualizations strongly emphasize the control function of feedback to compare a system's current state against the predetermined goal state, thus, contribute towards goal attainment (Clement & Frandsen, 1976). On the other hand, scholars consider any reaction or signal of communication as feedback. Accordingly, it has been argued that by considering independent messages and sole response cues as feedback, scholars "have largely overlooked or ignored the vital aspects of control and goal-setting that are central to the concept of feedback" (Clement & Frandsen, 1976, p. 21). Within the scope of this literature review, this is particularly reflected in the domain of system use feedback (D7). For example, the provisioning of information about a system's state to its users is considered as feedback (Sheng & Lockwood, 2011). One way to look at this example is that goal setting and goal control is implicitly given, because users control their actions and attain the goal of establishing a successful human-computer interaction. On the other hand, goal setting and goal control can be interpreted as rather trivial with little to no goal conflicts. In many other feedback domains (e.g., performance feedback) multiple actors are involved and mutually influence the goals and goal setting so that goal determination and alignment becomes much more complex and crucial (Clement & Frandsen, 1976). In the context of human performance feedback (i.e., the third feedback domain), goal-setting depends on multiple involved actors and the information about a gap is not necessarily an objective unidimensional measure, since humans are perceptual and adaptive actors (Clement & Frandsen, 1976; Smith, 1973). As such, feedback effects are often negative (Kluger & Denisi, 1996), since they depend on factors such the creditability of the feedback source, the perceived accuracy, desire to respond or the intended response (Kinicki, Prussia, Wu, & McKee-Ryan, 2004). Furthermore, in other situations the goals might also be relatively fixed and given by one actor. For instance, in the educational context goals are usually set by a teacher and feedback is conceptualized accordingly as "information provided by an agent (e.g., teacher, peer, book, parent, self, experience) regarding aspects of one's performance or understanding" (Hattie & Timperley, 2007, p. 102). To sum up, the characteristics of the underlying goal setting and control processes widely differ between the seven feedback domains. In turn, the extent to which feedback is treated as control system is tightly coupled to the way feedback enables corrective behavior, provides direction, reinforcement and persuasion (Clement & Frandsen, 1976).

Explicit and implicit feedback. While prior research comprises explicit feedback across the seven feedback domains, only part of the feedback domains include research that adopts a systematic understanding of feedback which incorporates implicit feedback. For example, implicit relevance feedback on machine performance (e.g., no clicks on a particular search result), implicit feedback through usage behavior (e.g., no one listening to a particular song), or implicit feedback on voluntary contributions (e.g., no likes on a particular social media posting). This distinction between explicit and implicit feedback can be seen in the broader context of cybernetics. Cybernetics examines communication from the perspective of a control systems and introduces the concept of feedback as circularity of response, which provides information whether or not the exerted control was effective (Smith, 1973; Wiener, 1948). In this context, mechanical conceptualizations differ from systemic conceptualizations of feedback so that the former reduces feedback to the direct and materially evident exchange of information, whereas the latter views feedback “as a relationship rather than a material response” (Smith, 1973, p. 26). Specifically, in the more general systemic understanding, feedback is not given and received. Once a feedback relationship exists based on circularity of interaction, a receiver cannot not respond, since no response also comes with informational value (Smith, 1973). Hence, in the context of the ongoing digitalization, datafication and ubiquitous computing, one can argue that a feedback relationship is increasingly being given. Therefore, it seems increasingly valuable to embrace a systemic understanding of feedback.

Feedback exchange in a digital world. Against the backdrop of the ongoing digitalization, datafication and automation (Brynjolfsson & McAfee, 2014; Faraj, Pachidi, & Sayegh, 2018; Markus, 2017), behavior and performance can increasingly be monitored, and, on the other hand, feedback can increasingly be mediated and generated by computers. Though the seven feedback domains vary regarding task characteristics such as regulatory and privacy constraints, computer-generated feedback is investigated across all feedback domains. However, scholars have adopted alternate concepts to refer to computer-generated feedback: computerized feedback, automated feedback, computer-based feedback, computer-aided instructions, and machine-based feedback. While the result is the same, the plurality of concepts reflects the contextual differences. For example, the concept of automation acknowledges the full or partial replacement of human operators (Parasuraman, Sheridan, & Wickens, 2000), while the concept of computer-aided instruction emphasizes the role of the computer as support function of teachers addressing the challenge to provide formative feedback in large-scale lectures given a constant rise of student numbers (Rietsche et al., 2018). However, aside from the different concepts, the discussed advantages and disadvantages of computer-generated feedback are similar. From a feedback receiver perspective, computer-generated feedback directs the attention more to the task and to the task details compared to identical feedback from a supervisor (Earley, 1988). Given that the source of the feedback changes from a person to a computer, critical factors that would otherwise elicit negative feedback effects, such as source credibility, expertise, and power, can be eluded (D. Ilgen & Davis, 2000; D. R. Ilgen et al., 1979). At the same time, computer-generated feedback enables setting up less threatening and anonymous feedback-seeking environments (Anseel, Beatty, Shen, Lievens, & Sackett, 2015; Anseel, Lievens, & Levy, 2007). However, monitoring systems come with the risk of being perceived as invisible supervisors leading to greater stress, psychological reactance and resistance (Ang et al., 1993). Accordingly, it seems crucial to consider how the underlying behavior and tasks are motivated, which may vary across and within the seven domains.

Lastly, from a feedback giver perspective, computer-generated feedback reduces the workload to provide timely and personalized feedback (e.g., Wu et al., 2017).

Feedback timing and purpose. Prior research highlights feedback timing as a crucial characteristic with complex effects on the effectiveness of feedback interventions (Kulik & Kulik, 1988; Lechermeier & Fassnacht, 2018; Shute, 2008). This is reflected in the present research by information systems that play an active role in enabling more timely feedback exchange. In fact, it seems to be a common denominator among the seven feedback domains that digitalization increases the opportunities of timely feedback (i.e., instant, immediate or even real-time) rather than delayed feedback. However, only part of the scholars explicitly refer to *real-time feedback*. For example, in the domain of everyday life feedback (i.e., sixth feedback domain) scholars investigate real-time feedback on energy consumption (e.g., Tiefenbeck et al., 2016) or live biofeedback (e.g., Lux et al., 2018). In contrast, many scholars rather put the emphasis on particular types of feedback (i.e., formative feedback, process feedback, progress feedback and cognitive feedback), which are indirectly linked to timely feedback due to their purpose and content. First, timely feedback is often examined from the perspective of *formative feedback*, which aims at fostering improvement, learning and progress opposed to summative feedback that aims at judging ex post on success or failure. According to Armisen et al. (2016) formative feedback “provides ongoing comments on how to improve a solution” (p. 2), while summative feedback “measures the level of success of the solution” (p. 2). It seems not surprising that this perspective is widely taken in educational research where formative feedback is understood as “information communicated to the learner that is intended to modify his or her thinking or behavior for the purpose of improving learning” (Shute, 2008, p. 154). As such, scholars, for example, investigate how information systems can be designed and harnessed to facilitate formative feedback (Rietsche et al., 2018). Second, timely feedback is examined from the view of *process feedback* (i.e., information concerning the manner in which an individual implements a work strategy) opposed to outcome feedback (i.e., information concerning performance outcomes) (Earley, Northcraft, Lee, & Lituchy, 1990). Process feedback is corrective feedback and directs attention on task-learning (Kayande et al., 2009). Though outcome feedback may trigger adjustments and progress, it is associated with less specific information on how to adjust compared to process feedback (Earley et al., 1990). Similarly, specific and directive feedback is distinguished from general and facilitative feedback as well as verification from elaborated feedback, whereas pure verification relates to “knowledge of results” or “knowledge of outcome” (Bangert-Drowns, Kulik, Kulik, & Morgan, 1991; Shute, 2008). However, especially for unstructured and complex tasks it is relevant to receive feedback that guides appropriate adjustments rather than receiving sole outcome information (Earley et al., 1990). Aside from process feedback, IS scholars also refer to *progress feedback* (Schaffer & Feng, 2015). Third, there is a vast body of IS literature that looks at timely feedback in the form of *cognitive feedback*, which is closely related to process feedback since its purpose is to improve the accomplishment of tasks and processes (Te’eni, 1992). Much knowledge has been accumulated on how to present users with task information, cognitive information and functional validity information (Balzer et al., 1989). For example, scholars investigate how to design combinatorial auctions so that real-time bidder support metrics support bidders and increase their performance (Gediminas Adomavicius et al., 2013).

External and internal feedback. In the reviewed articles, different concepts are adopted that all relate to the fact that humans are not just passively exposed to external feedback, but also can take

an active role in generating internal feedback: self-generated feedback, self-feedback, self-evaluation, self-assessment, self-management, self-monitoring and self-regulation. The common denominator is that “self” emphasizes some degree of autonomy of individuals, which are responsible for their own actions (Kwon et al., 2014). A self “does not regulate itself directly, but it may control the behaviors, feelings, and thoughts that comprise it” (Baumeister, Schmeichel, & Vohs, 2007, p. 517) and it can acknowledge the consequences of the corresponding actions (Kwon et al., 2014). Accordingly, feedback is closely related to the self(-concept) and it fulfills a self-evaluative role since it allows its receivers to compare their actual behavior with their targets and goals and, then, to adjust their future actions and targets (Earley et al., 1990). Self-regulation reflects an essential function of the human self that significantly characterizes the self and the *raison d’être* (Baumeister et al., 2007). In turn, feedback is an inherent catalyst of self-regulation, since it not only occurs in the form of external feedback, but also as internal feedback (Bangert-Drowns et al., 1991; Butler & Winne, 1995; Narciss, 2008). As humans engage in tasks, they self-generate feedback so that the feedback is provided by their internal source of information such as direct perceptions based on self-monitoring (Narciss, 2008). Note that, in turn, individuals may also receive feedback about their self-regulation (FR), which should not be confused with feedback about the self as a person. The latter is less effective due to the fact that it is directed to the self (e.g., you are a great student) and does not relate to the task (Hattie & Timperley, 2007). In contrast, feedback about self-regulation may include external feedback (e.g., from a teacher) on internal feedback strategies (e.g., a students’ skills to generate feedback through self-evaluation) (Hattie & Timperley, 2007). This is important, since humans that develop self-regulation strategies are viewed as more effective learners in the educational feedback domain (D5), because they are less reliant on external factors (e.g., the task, teachers or supervisors) for feedback (Hattie & Timperley, 2007). Further, research in the area of human performance management (D4) highlights the self as the most important feedback source, since employees more heavily rely on the self as feedback source than on feedback from the task, supervisor, co-workers, and the organization (Greller & Herold, 1975; Ilgen et al., 1979). From an external feedback perspective, valuable feedback is rare, since humans are often reluctant to provide feedback (Fisher, 1979; Rosen & Tesser, 1970). At the same time, feedback is often provided as outcome feedback, which provides less guidance about how to self-regulate (Butler & Winne, 1995). Even if feedback is provided, literature shows that feedback interventions are often ineffective and have negative consequences, such as reduced performance (Kluger & Denisi, 1996). Feedback interventions only have positive effects if people react positively, which many process models suggest depends on factors such as the feedback environment, source credibility, and the perceived accuracy (Anseel et al., 2015; D. R. Ilgen et al., 1979; Kinicki et al., 2004). From an internal feedback perspective, self-evaluation grounds in different motives: (1) self-assessment (i.e., to increase accuracy of the self-evaluation), (2) self-improvement (i.e., to improve traits, abilities, and skills), (3) self-enhancement (i.e., to protect the self-concept from negative information and maximize the self-concept), and (4) self-verification (i.e., to maintain consistency between the self-concept and other self-related information) (Anseel et al., 2007). Both individual factors and situational factors influence the prevailing motive, e.g., a context with higher accountability increases self-assessment motives, while a higher publicity context increases the self-enhancement motive (Anseel et al., 2007). It is here where situational factors are increasingly being altered, since digitalization provides novel possibilities to enable feedback seeking privately with information technology that presents feedback such as performance statistics so that the cost of public feedback seeking can be prevented (Anseel, 2017).

This applies to multiple of the identified domains, e.g., performance feedback (D3), community feedback (D4), educational feedback (D5), or feedback on everyday life (D6).

4.2 Bridging the Feedback Domains – Avenues for Future Research

Striving to bring the different streams of research together, possible intersections between the seven domains are now discussed and two avenues of future research are proposed.

First, our results show that information systems play a crucial role for computer-mediated and computer-generated feedback across all seven feedback domains. Against the backdrop of the ongoing digitalization, datafication and automation (Brynjolfsson & McAfee, 2014; Dremel, Stoeckli, Wulf, & Herrmann, 2018; Faraj et al., 2018; Markus, 2017), two questions become apparent for each feedback domain: (1) How does the underlying phenomenon change (e.g., behavior, task)? and (2) how does the corresponding feedback mechanism change? On the one hand, research is needed to answer these two questions for each of the seven domains. On the other hand, scholars should, in the long term, try to create more generalizable knowledge across the seven feedback domains. For example, prescriptive knowledge on how to design digital feedback systems considering the different task characteristics. So far, it is very rare that feedback researchers acknowledge the theoretical importance of different task characteristics (Kluger & Denisi, 1996).

Second, an avenue for future research is to transfer knowledge in between the feedback domains. More specifically, the underlying goals of the seven feedback domains are as diverse as reducing information asymmetry and increasing trust in products and services (D1), improving performance of machines (D2) and humans (D3), motivating community contributions (D4), increasing learning (D5), changing everyday life behavior (D6) or improving task performance of system interactions (D7). As such, each article was assigned to one feedback domain based on the research purpose and the role feedback plays in the corresponding article. Though the emergent seven feedback domains are coherent and center on particular uses of the feedback concept, feedback at the very core can be seen as information on a particular phenomenon that is fed back to control a system (Narciss, 2008; Wiener, 1948). To bridge the feedback domains, the same information can be “fed back” to another system for which it is relevant. For example, implicit feedback derived from the tracks played by users of digital music platforms such as last.fm (Qi et al., 2013) can be viewed from different angles. Scholars could take a Domain 1 point of view and consider it as consumer and customer feedback on songs (i.e., product and service feedback). Alternatively, in a Domain 2 view the implicit feedback could serve as relevance feedback to improve the algorithmic performance of music recommendations. Adopting a singer’s perspective, implicit feedback can serve as performance feedback as represented by Domain 3. Also, imagine a digital music platform allows song contributions from the community so that a Domain 4 view becomes useful, i.e., community feedback on voluntary contributed songs. From a Domain 7 perspective, scholars could regard digital music services as decision support systems that help users to decide on the music they listen to. Accordingly, future research can benefit from transferring knowledge between the feedback domains. In addition, this also applies to related fields of information systems research. For example, Domain 6 includes research that investigates how to design digital feedback systems in health, while Domain 7 includes research that examines how to design cognitive feedback to improve decision making. Both feedback intervention scenarios may facilitate behavior change. This, in turn, bears similarities with adjacent fields of research such as nudging and persuasive

systems (Mirsch, Lehrer, & Jung, 2017; Oinas-Kukkonen & Harjumaa, 2009; Weinmann, Schneider, & vom Brocke, 2016). Consequently, future research can benefit from linking knowledge from adjacent fields with knowledge from the individual feedback domains.

Conclusion

Feedback is and remains crucial to both human and machine learning and development. This literature review highlights seven different feedback domains in IS research: (1) product and service feedback, (2) machine performance feedback, (3) human performance feedback, (4) community contribution feedback, (5) educational feedback, (6) everyday life activity feedback, and (7) system (use) feedback.

However, the literature review also has some limitations. Selecting keywords and databases as well as excluding literature when conducting a systematic literature review commonly implies that the review is not completely inclusive. In particular, this research aimed at identifying a broad range of feedback domains in IS research to provide an overview of this fragmented and incoherent field. Given that the underlying concept of feedback is used for hundreds of years, reducing the search to a viable number of articles was indispensable. To do so, the focus was set on articles in which the concept of feedback is so relevant that authors decided to include the keyword “feedback” in their title.

Consequently, the paper offers an overview of seven relevant feedback domains within the field of information systems and elaborates on the roles that feedback plays in these domains. With this contribution, this article reduces complexity and builds a foundation for scholars to assess their feedback domain and inspires scholars to transfer knowledge in between these domains.

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