Gruppe. Interaktion. Organisation. Zeitschrift für angewandte Organisationspsychologie
https://doi.org/10.1007/s11612-024-00741-9

HAUPTBEITRÄGE – THEMENTEIL

Twin transition in practice

How digital technologies promote employee green behavior

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Accepted: 10 April 2024

Abstract
This article in the journal "Gruppe. Interaktion. Organisation (GIO)" addresses the twin transition—the simultaneous transition to a more sustainable and digitalized society—in organizations and asks how using digital technologies can promote employee green behavior (EGB). Since EGB in an intra-organizational context is often based on psychological ownership (PO) and perceived organizational support for the environment (POSE), we argue that using digital technologies can promote EGB indirectly via fostering PO and POSE. In this respect, we identify the essential features that digital technologies must possess to advance the two mediating constructs introduced and argue that the relation between digital technologies, PO, and POSE is moderated by technology acceptance. As a result, we provide a theory-based framework on the link between EGB and digital technologies, identify key characteristics digital technologies should possess to (indirectly) promote EGB, and derive practical recommendations for organizations and decision-makers to improve organizational sustainability and promote the twin transition in practice.

Keywords Sustainability · Digitalization · Twin transition · Employee green behavior · Organizational support

Die Twin Transition in der Praxis

Wie digitale Technologien umweltbewusstes Handeln von Mitarbeiter:innen fördern

Zusammenfassung
Dieser Beitrag in der Zeitschrift „Gruppe. Interaktion. Organisation (GIO)" untersucht die Twin Transition – die gleichzeitige Transformation in eine nachhaltige und digitalisierte Gesellschaft – im intra-organisationalen Kontext und fragt danach, wie die Nutzung digitaler Technologien umweltbewusstes Handeln von Mitarbeiter:innen (EGB) fördern kann. EGB setzt dabei häufig die individuelle Wahrnehmung von psychological ownership (PO) und eine wahrgenommene organisationale Unterstützung für die Umwelt (POSE) voraus. Vor diesem Hintergrund argumentieren wir, dass die Nutzung digitaler Technologien EGB indirekt stärken kann, indem sie zunächst die Entwicklung von PO und POSE fördern. Vertiefend arbeiten wir die relevanten Charakteristika heraus, die digitale Technologien abbilden müssen, um PO und POSE zu fördern und argumentieren überdies, dass die Beziehung zwischen digitalen Technologien, PO und POSE durch die Technologieakzeptanz moderiert wird. Im Ergebnis entwickeln wir ein Konzept zum Zusammenhang zwischen EGB und digitalen Technologien, identifizieren relevante Merkmale, die digitale Technologien aufweisen müssen, um EGB (indirekt) zu fördern und leiten praktische Empfehlungen für Organisationen und Entscheidungsträger:innen ab, um die organisationale Nachhaltigkeit zu verbessern und die Twin Transition in der Praxis zu fördern.

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Published online: 15 May 2024

Schlüsselwörter Nachhaltigkeit · Digitalisierung · Twin Transition · Umweltbewusstes Handeln · Organisationale Unterstützung

1 Introduction

The term "twin transition" refers to a simultaneous transition to a more sustainable and digital society and argues for synergies between both developments (EU-Commission 2022). While most literature in this area focuses on the usage of digital technologies for ecological sustainability on a societal level (e.g., Aksin-Sivrikaya and Bhattacharya 2017; Lenz 2022; Ruiner and Ehlen 2023), we refer to an intra-organizational level focusing on how digital technologies promote employee green behavior (EGB; Katz et al. 2022). In this respect, we aim to answer the following question: How can using digital technologies promote EGB?

EGB refers to actions associated with pro-environmental sustainability (Ones and Dilchert 2012) and is—in organizational contexts—often based on the presence of psychological ownership (PO), defined as an employee's feeling of ownership towards the organization (Abbas et al. 2021; Jiang et al. 2019; Kurki and Lähdesmäki 2023; Mi et al. 2019), and employees' perceived organizational support towards the environment (POSE) (Lamm et al. 2015; Temminck et al. 2015). However, digital technologies have yet to be conceptually related to EGB and its antecedents.

In this respect, we argue that if using digital technologies can promote PO and POSE, they consequently also promote EGB. The relation between digital technologies, PO, and POSE is furthermore moderated by the acceptance of digital technologies (Davis 1989; Venkatesh and Bala 2008; Venkatesh and Davis 2000). Thus, to clarify how the usage of digital technologies can promote EGB and which characteristics digital technologies should possess to do so, we develop our conceptual framework in reverse: starting with EGB, we discuss PO and POSE as prerequisites and relate this to the usage of digital technologies. From there, we explain the moderating role of technology acceptance.

Our conceptual work makes three contributions: (1) we link EGB to digital technologies via PO, POSE, and technology acceptance as a moderator and thus, deliver a conceptual framework; (2) we identify relevant criteria digital technologies must meet to (indirectly) promote EGB; and (3) derive recommendations for practitioners by pointing to specific digital technologies and applications that allow to foster PO and POSE and thereby to improve organizational sustainability, respectively to promote the twin transition in practice.

2 From EGB to PO and POSE

The organizational success of achieving environmental goals depends on the green behavior of its employees (Ones et al. 2018). EGB has been defined and operationalized in many ways—in fact, Katz et al. (2022) point to the number of more than 30 unique scales measuring EGB—ranging from specific workplace- or organizational-related practices (e.g., Bissing-Olson et al. 2013; Manika et al. 2015; Robertson and Barling 2013) to a form of organizational citizenship behavior for the environment (OCBE) involving discretionary and voluntary behaviors by employees that are neither recognized nor compensated by the organization (Boiral and Paillé 2012; Kim et al. 2017). Moreover, EGB refers to behaviors that have a direct pro-environmental effect, such as water-saving, as well as to those having an indirect effect, such as supporting others (Francoeur et al. 2021). Given the wide range of EGB dimensions, Francoeur et al. (2021), Katz et al. (2022), and Wiernik et al. (2016) suggest categorizing specific practices related to EGB into at least five categories: avoiding harm, conserving, transforming, influencing others, and taking initiative (see Table 1).

In organizational contexts, however, EGB is usually conceptualized to result from PO (Abbas et al. 2021; Jiang et al. 2019; Kurki and Lähdesmäki 2023; Mi et al. 2019) and POSE (Lamm et al. 2015; Temminck et al. 2015). PO describes an individual's feeling to possess and being tied to an organization to a level where it is perceived as "hers" or "his" (Dawkins et al. 2017; Pierce et al. 2001). In the context of EGB, feelings of ownership can lead to a greater responsibility of employees also regarding their organization's ecological outcome and induce pro-active and non-prescribed behavior of environmental caring and avoiding environmental harm (Abbas et al. 2021; Cheng et al. 2021; Jiang et al. 2019). Employees' development of PO is based on specific conditions: a) experienced control, b) intimate knowledge, and c) self-investment as the time, effort, skills, and attention an individual invests (Dawkins et al. 2017; Kurki and Lähdesmäki 2023; Pierce et al. 2001). The more control and efficacy individuals perceive over an object and its outcomes, the more they tend to see the object and its outcomes as direct result of their own behaviors. Knowledge refers to the intensity of the association with an object as well as to the information an individuum has about that object; both together deepen the perceived relationship between an individual and the respective object. Self-investment refers to the time, effort, skills, and attention an individual invests in the respective object. The greater

Table 1 Categories, definition, behaviors and practices of EGB

Categories	Definition	Behaviors and practices
Conserving	Behaviors aimed at preserving resources and avoiding wastefulness	Recycling
		Reusing
		Reducing
		Repurposing
Avoiding harm	Behaviors aimed at avoiding negative environmental impact and mitigating or restoring environmental damage	Reducing/Preventing pollution
		Monitoring environmental impact
		Strengthening ecosystems
Transforming	Behaviors aimed at changing work products and processes to make them more environmentally sustainable	Choosing responsible alternatives
		Changing how work is done
		Creating sustainable products and processes
		Embracing innovation for sustainability
Influencing others	Behaviors aimed at spreading environmental sustainability behaviors to other people	Educating and training for sustainability
		Encouraging and supporting others
Taking initiative	Environmental sustainability behaviors that are proactive, entrepreneurial, and involve personal risk and sacrifice	Initiating programs and policies
		Lobbying and activism
		Putting environmental interests first

Categories, behaviors and practices are inspired by Francoeur et al. (2021). The definitions refer to Katz et al. (2022) based on Ones et al. (2018)

the investment, the more likely is the emergence of PO (Dawkins et al. 2017; Kurki and Lähdesmäki 2023; Pierce et al. 2001).

In addition to PO, EGB is promoted by POSE (Lamm et al. 2015; Temminck et al. 2015). POSE is an environmental-related extension of the classic construct of perceived organizational support (POS) and is also based on the assumption that the relation between employees and their organization is reciprocal, i.e. "employees will act on behalf of an organization to the degree that the organization is perceived as willing and able to reciprocate" (Cantor et al. 2012, p. 35). The POS represents employees' beliefs about the extent that the organization appreciates their efforts and contributions and takes care for their well-being (Eisenberger et al. 1986). Because these beliefs are derived from the employees' perception of the organization's actions and signals (Connelly et al. 2011), Cantor et al. (2012) concludes that organizations can send specific signals indicating that the organization values pro-environmental behaviors and thereby stimulate the development of POSE. In this respect, POSE is defined as "the specific beliefs held by employees concerning how much the organization values their contribution towards sustainability" (Lamm et al. 2015, p. 209). Organizations can thus promote POSE by signaling its environmental aims and values through establishing and reporting pro-environmental goals, policies and procedures, providing supervisory support for environmental initiatives and offering environmental training (Cantor et al. 2012; Ramus and Steger 2000).

In sum, EGB refers to the individual level of employees, but it can be promoted or established by organizational practices, especially by implementing the basic conditions for PO and POSE in the regular work setting and daily practices of employees. However, the ways in which digital technologies commonly used in organizational practice can contribute to this relation have not been explored yet and are the focus of subsequent sections.

3 How digital technologies can promote EGB via PO and POSE

The review of the existing research on PO and POSE as factors of EGB allows us to assume that EGB can be indirectly promoted by digital technologies as far as they address the basic elements of PO and POSE. In general, digital technologies can promote PO and POSE in two ways. Firstly, they can support established methods by allowing them to be independent of place and time and thus, increasing their reach and accessibility. Secondly, digital technologies can contribute to these methods by adding new forms and facets, thus enlarging their variability (Cascio and Montealegre 2016). In this section, we discuss how digital technologies can contribute to established methods that promote PO and POSE simultaneously, leading to EGB. Our considerations are exemplified with common and inexpensive digital technologies and tools, which can be easily implemented by practitioners.

Experienced control and self-investment are crucial for PO (Pierce et al. 2001) while pro-environmental goal-setting, policies and procedures are basis of POSE (Cantor et al. 2012). As Han et al. (2010) have shown, the *involvement and participation* of employees in decision-making-processes contributes to PO in terms of experienced con-

trol and self-investment. Digital technologies provide specific opportunities in this respect. Through digital surveys and idea management systems, employees could become involved and participate in decisions on the organizations' environmental goals and policies, which in turn contribute to POSE (Cantor et al. 2012). Experienced control can be further improved by giving feedback about the progress and effects of decisions made during the process. For example, regular e-mail reports (Degirmenci and Recker 2018) or real-time feedback (Xia and Liu 2021) can be provided to track the success of water-saving efforts, paper reduction and other measures. In general, *feedback* is a tool that allows organizations to communicate behaviors they value. However, feedback is often based on a tracking system, which can raise ethical concerns. To address these concerns, data collection should be minimized to only what is necessary, and employees should be properly informed and consulted.

Feedback can make information on pro-environmental efforts easily accessible to employees, encouraging intimate knowledge of the organization's measurements (Pierce et al. 2001). Offering and exercising environmental *training* has been described to be another efficient way that also contributes to POSE (Cantor et al. 2012). Environmental trainings can be easily conducted online, e.g. in form of webinars, online workshops, and online learning tools (Carrera and Ramírez-Hernández 2018; Mitchell et al. 2020; Talón-Ballesteros et al. 2023). However, according to the POSE-concept, the trainings offered by the organization—and their quality—signals employees the organization's value of the respective topic (Cantor et al. 2012). Therefore, it is important to choose or develop training programs that align with an organization's sustainability goals. Involving employees in the process of selecting and developing these programs can give them a sense of control and encourage self-investment. For instance, employees can participate in intra-organizational webinars on pro-environmental behavior or even develop such webinars to some extent on their own.

Beyond feedback and training, digital technologies allow to build intimate knowledge by making *information and communication* in general quick, easy and inexpensive (Pierce et al. 2001). Organizations can effectively communicate information and knowledge through visually appealing newsletters, webpages, blogs, intranet and social media channels. This enables them to provide a wide range of information, from accessible contact persons and details about their environmental progress to tips for promoting pro-environmental behaviors in the workplace. An organization can also use digital technologies to showcase the (desired) *organizational culture* to all employees. For instance, highlighting employees who actively contribute towards environmental sustainability can inspire others to follow their lead and thus serve as a role model (Ahmad et al. 2021). Additionally, digital leaders can support employees in accepting new technologies (Fasbender et al. 2023), which in turn can strengthen EGB.

Next to being involved in decision-making processes, digital technologies allow employees to support each other as online-forums or discussion threads provide possibilities for *peer exchange*. In this sense, it is a digital place where employees support their colleagues in pro-environmental behavior ("eco-helping") or their engagement in the organization's pro-environmental activities ("eco-civic-engagement"), e.g. in task or project groups (Tsai et al. 2016). However, employees may need to be encouraged to actively invest time and energy (Sun and Shang 2014) through leadership support, which in turn contributes to the POSE (Cantor et al. 2012).

Table 2 summarizes the methods discussed, the corresponding digital technologies and provides examples for practical implementation. However, it is important for practitioners to consider that employees require some degree of autonomy to develop experienced control while intimate knowledge requires time (Pierce et al. 2009). Self-investment requires both. In this respect, the emergence of EGB depends not only on appropriate methods and digital technologies but also on providing appropriate working conditions for the employees. As another factor, we subsequently discuss the importance of the *technology acceptance*.

4 The relevance of technology acceptance in promoting EGB

Research has highlighted that in the context of digital technologies their acceptance crucially determines its effect. Referring to the technology acceptance model (TAM), the attitude of employees towards a technology is determined by its perceived usefulness on the one side and its perceived ease of use on the other side (Davis 1989; Fasbender et al. 2023). With regard to work contexts, the ease of use addresses an employees' belief that the usage of the technology is free of effort, while the perceived usefulness refers to the belief that the usage of the respective technology enhances job performance (Davis 1989; Marangunić and Granić 2015; Venkatesh and Bala 2008). This can also mean to positively contribute to the environment (Broman Toft et al. 2014). The perceived usefulness is furthermore determined by social influence, referring on the one side to the belief that others expect the employee to use the digital technology, and on the other side to the belief that the use enhance the individual's social status by fulfilling social norms and images. Additionally, the belief in the relevance of a specific technology for one's job (*job relevance*), the belief in a technologies' job-related *output quality* as well

Table 2 Measures and digital technologies to promote EGB in organizational practice

Measures promoting PO and POSE	Through the usage of digital technologies	Determinants of technology acceptance	Examples
Involvement and participation	Survey Idea management systems	Subjective norm Image Job relevance	Joint definition of environmental goals, policies, and procedures
Feedback	Tracking systems	Subjective norm Output quality Job relevance Result demonstrability	Regular feedback on environmental behavior, e.g. paper use
Training	Webinars Online workshops Online learning tools	Subjective norm Images Result demonstrability Perceived enjoyment	Webinar on energy saving behavior at the workplace
Information and communication	Newsletter Webpages/Blogs Intranet Social media	Subjective norm Job relevance Perceived enjoyment	Approachable contact persons Weekly newsletter on the organizations' environmental efforts and progresses Blog with tips about pro-environmental behavior at the workplace
Organizational culture	Newsletter Webpages/Blogs Intranet Social media	Subjective norm Image Result demonstrability	Introduction and presentation of role models through regular portrayals of employees acting in a particularly pro-ecological sense and of digital leaders supporting employees' technology acceptance
Peer exchange	Forum Discussion threads	Subjective norm Image Perceived enjoyment	Employees support colleagues in ecologic behavior (eco-helping) Task or project groups (eco-civic-engagement)

as in whether it demonstrates the results of the technology use appropriately (*result demonstrability*) promotes or hinders the perceived usefulness and in consequence also the technology acceptance. The perceived ease of use is in the first place determined by the employees' belief in its ability using the technology (*computer self-efficacy*), the degree of belief in organizational and technical resources in supporting the technology use (*perception of external control*), and the intrinsic motivation in using a technology (*computer playfulness*). Additionally, the employees' experiences of using a specific technology can have an effect on the ease of use in terms of the *perceived enjoyment* and *perceived object usability* (Venkatesh and Bala 2008; Venkatesh and Davis 2000).

All discussed determinants regarding the perceived usefulness as well as the perceived enjoyment as determinant regarding the ease of use are of specific interest to promote PO and POSE by the use of digital technologies. Subjective norms are likely to play a crucial role in the acceptance of technologies as their provision by the organization alone may create an expectation of use. Beliefs in status improvements (image) can be expected regarding involvement and participation processes, training opportunities, and formats of peer exchange. Moreover, if an employee is presented as a role model, the image can impact the organizational culture (see the respective example in Table 2). A belief in the output quality is particularly crucial for the perceived usefulness of feedback providing tracking-systems. Also the job relevance of the feedback is expected to be decisive, as well as the job relevance of involvement and participation processes, and the information and communication of the organization. Having the belief to demonstrate the results of a pro-environmental technology usage can also be expected to be an element in the perceived usefulness of feedback systems as well as of training opportunities, and—by pointing to the example of becoming presented as a role model again—of the technologies that signal the pro-environmental organizational culture. Lastly, the perceived enjoyment can contribute to the perceived ease of use in particular with regard to training opportunities, EGB-related information and communication as well as a digital supported forms of peer exchange as those are perceived as fun or being of personal interest. Table 2 summarizes the considerations discussed on the methods and digital technologies to promote EGB via PO and POSE in organizational practice.

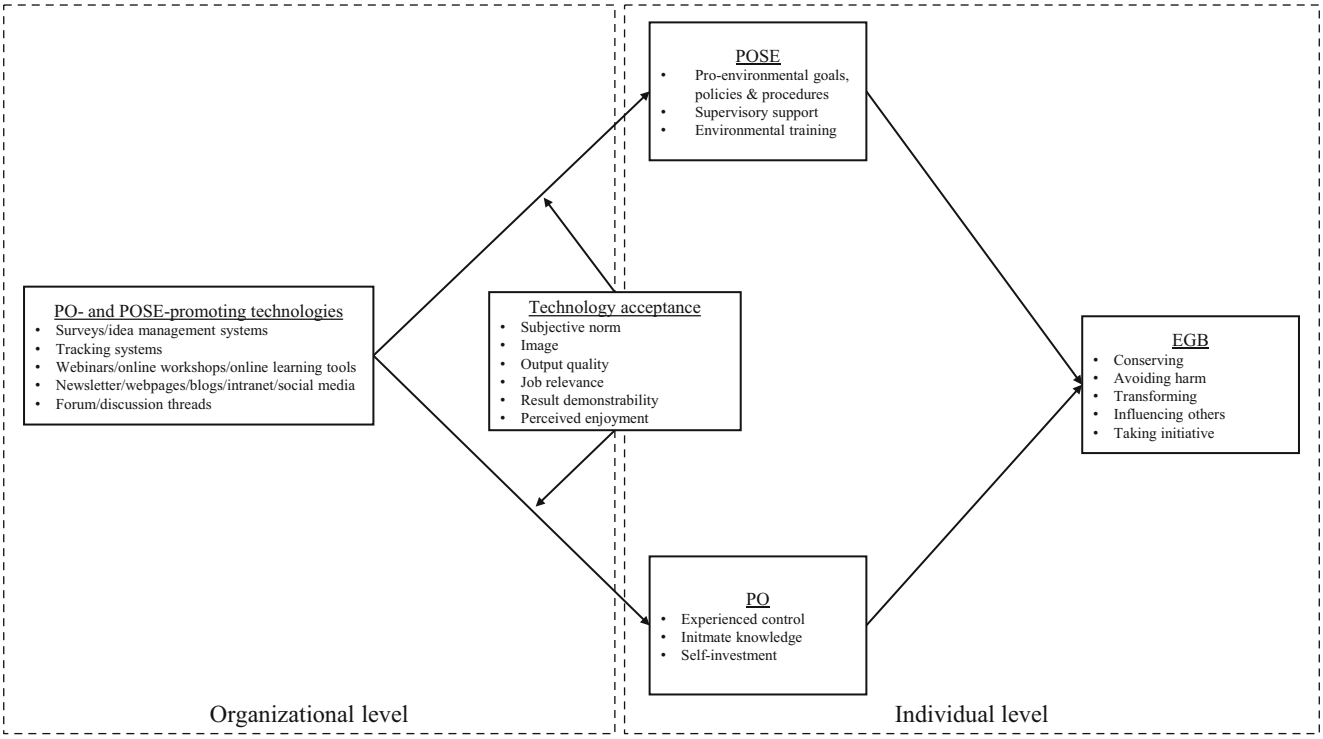

Fig. 1 Conceptual model of digital technologies promoting EGB

5 Discussion and conclusion

While the twin transition is usually investigated at a societal level (e.g., Aksin-Sivrikaya and Bhattacharya 2017; Lenz 2022), we focus on an intra-organizational context, which combines the organizational and individual level, and discuss how the usage of digital technologies can promote EGB. From existing literature, we derive that EGB is based on PO (Abbas et al. 2021; Jiang et al. 2019; Kurki and Lähdesmäki 2023; Mi et al. 2019) and POSE (Lamm et al. 2015; Temminck et al. 2015). Consequently, using digital technologies as a medium can promote EGB by fostering PO and POSE. Digital technologies need to address the basic elements of both mediating constructs. For PO these are experienced control, intimate knowledge, and self-investment (Dawkins et al. 2017; Kurki and Lähdesmäki 2023; Pierce et al. 2001); for POSE these are pro-environmental goals, policies and procedures, leadership support, and environmental training (Cantor et al. 2012; Ramus and Steger 2000). Furthermore, the relation between digital technologies, PO and POSE is strengthened by the acceptance of the respective technologies and thus, by the perceived ease of use of the digital technology on the one side and its perceived usefulness on the other (Davis 1989; Venkatesh and Bala 2008; Venkatesh and Davis 2000). The Fig. 1 illustrates the links between the concepts discussed.

In sum, this paper makes three contributions: First, it conceptually links EGB to digital technologies and explains the mediating role of PO and POSE as well as the moderating role of technology acceptance. Second, this paper derives the key factors fostering PO and POSE and discusses ways digital technologies can be used to map them. Third, this paper allows practical derivations for organizations and decision-makers to improve organizational sustainability and promote the twin transition in practice. We deliver practical examples on how to use accepted digital technologies to promote EGB indirectly via fostering PO and POSE. In this respect, critical levers are the involvement and participation of employees in decision-making-processes, providing feedback and training, establishing information and communication channels and a pro-ecological organizational culture as well as providing possibilities for peer exchange.

Funding Open Access funding enabled and organized by Projekt DEAL.

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