Technological Affordance, Motivational Affordances, Emotional Affordances, and Personal Performance: A Conceptual Model for the E-education Affordance Change

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Abstract

Although much research has been done on the affordances and the performance of online users in education. The process of how affordances change online has received little attention. This paper focuses on developing the dynamic process of relationships between affordances and performance. The author argue that the online students perceived the technology affordances at the beginning and then experience motivational affordances and emotional affordances due to the virtual environment changes. Such relationships are strengthened by the time. Meanwhile, the relationships between the affordances and the performances may differ depending on retention time.

Keywords: Affordance Theory, E-education, Technological Affordance, Motivational Affordances, Emotional Affordances, Affordance Change

1. Introduction

The proliferation of computers and the internet has propelled the rapid expansion of e-learning tools and instructional methods. In the 1980s, the advent of personal computers, exemplified by the first Macintosh, spurred the leashing development of e-learning environments over the following decade (Acs et al., 2021). This provided abundant online information and e-learning opportunities, contributing to the growing popularity of online learning (Nicholson, 2007). Technological advancements further reduced the cost of distance learning, facilitating easier access to education.

Simultaneously, businesses actively adopted e-learning for employee training to enhance industry knowledge and skills (Guha, 2017). As of 2021, the total value of the e-learning market reached $315 billion, with an anticipated 20% compound annual growth rate from 2022 to 2028 (Prnewswire, 2022). The online education market is projected to reach $350 billion by 2025, attributed not only to the introduction of flexible learning technologies in corporate and educational sectors but also benefiting from the significant impetus of advanced artificial intelligence-driven platforms on a global scale (Globenewswire, 2019).

Personal performance is a key competency for personal success (Cheng, 2011; Little,

2001; Masud et al., 2019). However, enabling such individual representation in the context of e-learning combines the properties of interactivity and affordance (Wu et al., 2022). The structure of affordances does not stand alone, it depends on elements of the relationship between human actors and technology (Willermark & Islind, 2022). Existing literature has empirically examined the relationship between different affordances and individual performance. However, the results of these studies may look completely changed by other time-series online learning processes. Notably, time-related factors are essential but neglected in terms of individual performance in long-term learning (Cepeda et al., 2008; Yang et al., 2022).

The timescale exhibits dynamic traits in individual performance, encompassing perceptions of both technical and emotional aspects, demonstrating patterns of change over time (Keough et al., 1999). These dynamic traits play a crucial role in online learning environments, directly influencing learners' experiences and academic achievements. Individuals, during the learning process, possess the ability to flexibly switch between different time perspectives based on task features, contextual considerations, and this is regarded as the operation of balancing time perspectives (Jochemczyk et al., 2017).

Time Perspective is conceptualized as a continuous cognitive framework for current experiences and is viewed as a trait when understood as stable, habitual attention to specific time frames (Stolarski & Witowska, 2017). This trait-based temporal viewpoint is subdivided into six factors, including positive past, negative past, present hedonism, present-fatalism, positive future, and negative future (Shipp & Aeon, 2019). The concept is associated with the organizational relevance of these factors with individual performance.

It is noteworthy that individuals can flexibly switch between different time perspectives in learning and work contexts. The flexibility of balancing time perspectives (BTP) has been demonstrated to have a robust positive predictive relationship with subjective well-being (Perman, 2014), which could positively affect performance. Thus, it highlights the profound impact of temporal perspectives on the formation of individual behavior and values.

Previous research has extensively examined the relationship between different affordances (emotional affordances, technological affordances, and motivational affordances) and personal performance. These studies typically conceptualize affordances as relatively one-dimensional concepts. The purpose of affordances is often

used in human-computer interaction and is seen as a design guide for reviewing which elements are required in a product (Gibson, 1977). Scholars' partial integration of these real and emotive elements (Norman, 1999) into one concept may eliminate their potential differential effects. Affordances are, in most cases, dynamic interactions with the outside world (Cook & Brown, 1999). Regarding the online environment, research confirms that changes in availability affect online behavior (Zhou, 2021). This suggests that affordance differences arise from combining the material properties of a technology with the intent and awareness of its users, such that the same technology may provide different affordances to different users (Ellison et al., 2015). However, the understanding of the contribution of changes in affordability to individual performance in the specific context of e-education remains limited. Through this study, the author hopes to close this research gap by asking the following research questions:

RQ1: *What is the effect of a technological affordances on motivational affordances and emotional affordances, and how does time moderate these relationships?*

RQ2: *What is the effect of motivational affordances and emotional affordances on personal performance, and how does time moderate these relationships?*

RQ3: *What is the effect of technological affordances on personal performance, and how does time moderate this relationship?*

To answer the research question, the author implemented a new model. Previous research on motivational needs has argued that the way in which basic individual needs are met in technological design increases user interaction and usage (Tang & Zhang, 2019), a state of ease of use that inspires beneficial adaptive experiences for success (Sheldon et al., 2001). Therefore, the author argue that technological affordances can promote motivational affordances. The author then use a public health lens to examine the impact of technological affordances on emotional affordances (Chen et al., 2021). The author hypothesize that perceptions of technology being entirely useful and practical can lead to positive and robust responses to emotional affordances. The manifestation of emotion over time has been documented as a key condition of salient motivation (Cheng, 2014). The author then argued that the more emotional affordances that are present, the more motivational affordances are present, and that time strengthens this relationship. Furthermore, convincingly, the author combine several different pieces from the previous literature to test the proposed complex relationship between affordances and individual performance. The author reasonably assume that these affordances are somehow related to individual performance. The author also find evidence for changes in affordance over time in the ecological psychology literature. (Heft, 2018) states that features of the environment can have alternative affordances at different times in different encounter contexts. Affordance is a temporary intuitive

phenomenon. The effects of time are not homogeneous, but depend on the extent to which individuals identify with various features of the technology. While many studies have focused on distinct elements and unique samples of a single affordance study, the novelty of the study lies in its integration of multiple elements and their subtle interactions (**Table 1**).

In Table 1, the author summarizes that some scholars confirm that technological affordances are the inherent capabilities and advantages offered by digital tools or technologies that influence an individual's learning experience and personal performance (Li & Pow, 2011; Mao, 2014). Additionally, motivational affordances are the features within a learning environment or task that stimulate an individual's motivation, including elements that spark interest, present challenges, or offer rewards (Jong, 2014; Pellas & Kazanidis, 2014). Furthermore, emotional affordances are the opportunities and capabilities of a learning context or technology to evoke and impact emotional experiences, such as satisfaction, frustration, enjoyment, or a sense of accomplishment during the learning process (Cheng, 2014; Morie et al., 2005; Roblyer & Wiencke, 2003).

Table 1. Literature on Affordances in E-education

Author	Affordances		
	Technological	Emotional	Motivational
Krouska et al. (2022) (Krouska et al., 2022)	X		X
D'Ambra et al. (2022) (D'Ambra et al., 2022)	X		
Wu et al. (2022) (Wu et al., 2022)	X		
Hwang et al. (2021) (Hwang et al., 2021)	X		X
Carless et al (2022) (Carless, 2022)	X		X
Pechenkina et al. (2017) (Pechenkina et al., 2017)	X		X
Comer et al. (2015) (Comer et al., 2015)		X	X
Mao (2014) (Mao, 2014)	X		
Pellas & Kazanidis (2014) (Pellas & Kazanidis, 2014)			X
Cheng (2014) (Cheng, 2014)		X	
Jong (2014) (Jong, 2014)			X
Lim et al. (2012) (Lim et al., 2012)		X	X
Xu & Moloney (2011) (Xu & Moloney, 2011)			X
Li & Pow (2011) (Li & Pow, 2011)	X		
Morie et al. (2005) (Morie et al., 2005)		X	
Roblyer & Wiencke (2003) (Roblyer & Wiencke, 2003)		X	
Conole & Dyke (2004) (Conole & Dyke, 2004)	X		
This Study	**X**	**X**	**X**

Specifically, Krouska et al. (2022) investigated the technological affordance of Mobile Game-Based Learning (MGbL) during COVID-19. Results showed that MGbL

positively leveraged mobile devices to influence technological affordance. Wu et al. (2022) emphasized the pivotal role of technology affordances and constructivist learning in the success of e-learning. Xu & Moloney (2011) explored interactive whiteboard (IWB) pedagogy in tertiary education, revealing the positive impact of IWB on character retention, students' learning experience, and motivation. Li & Pow (2011) examined the impact of one-to-one tablet-PC implementation on student learning, finding positive effects on both formal and informal learning. Morie et al. (2005) explored emotional affordance in virtual environments (VE), focusing on manipulating sensory and emotional aspects to understand the emotional affordances in VE. Roblyer & Wiencke (2003) discussed the challenge of defining measurable interaction quality in distance learning environment, aiming to enhance understanding of interaction's role through the development of standards.

Furthermore, Krouska et al. (2022) found that MGbL positively influenced motivational affordance, enhancing student engagement and performance in programming. Carless (2022) emphasized the importance of digital affordances, peer review, and examples in effective feedback, highlighting the role of students as the center of the feedback process. Pechenkina et al. (2017) investigated the impact of a gamified mobile learning app on student engagement and academic performance, implying technological and

motivational affordance. Cheng (2014) explored emotional affordance in a MOOC, revealing altruistic emotion fostering collaboration and intergenerational emotional resonance. Jong (2014) found positive impacts of LearningVillages (LV) on collaborative knowledge building (CKB) among elementary students. Lim et al. (2012) proposed an Emoticon Support Tool for emotional affordances in computer-mediated communication to enhance online collaborative learning.

Some research implies affordances based on the use of specific tools. Mao (2014) investigated high school students' capacity and attitudes towards social media for learning, emphasizing the need to optimize social media's affordances in education. D'Ambra et al. (2022) applied affordance theory to explore e-textbook engagement in the digital transformation of higher education, highlighting the importance of considering affordance dimensions to enhance participation and usage. Comer et al. (2015) explored both positive and negative aspects of Massive Open Online Courses (MOOCs) for teachers and students, pointing out challenges in managing negative emotions in MOOCs. Hwang et al. (2021) delved into the evolution of mobile learning in higher education, identifying key research clusters and underlining the significance of mobile technology affordance. Conole & Dyke (2004) discussed the challenge of defining measurable interaction quality in distance learning courses, aiming to enhance

understanding of interaction's role through the development of standards.

In the remainder of this study, the author review the literature on affordance theory, develop proposed propositions and conceptualize the ideas. In addition, the author conducts a quantitative analysis of the literature to clarify the variables used in the model. Finally, the author summarizes the students' e-learning process.

2. The Affordances Theoretical Perspective of Variability

Although historically, affordance was viewed as an immutable property of the object that gave it its functionality, it is perceived by users based on their individual needs (Gibson, 1977). Since then, Norman formally proposed the concept of perceptual affordance (Norman, 2004). Perceptual affordances in human-computer interaction (HCI) have been extensively discussed in many educational studies (Blewett & Hugo, 2016; Hafner & Candlin, 2007; Hammond, 2010). In education and IS research streams, affordance is often associated with the use of technology (John & Sutherland, 2005).

The apparent variation in affordances is due to situations where the interaction between the technology and the environment has to be handled through the behavior of the user (Ugur et al., 2009). It is worth noting that the emergence of technology itself does not produce changes in affordability (Wang & Cranton, 2014). This is a dynamic process related to perception and action processes (Raymond et al., 2017). Leonardi (2013) found that users use different affordances depending on their goals, and that affordances may change when groups of users pursue their goals in the same technological space (Leonardi, 2013). Variations in this affordance can explain how users express their intuition about technical systems and reflect how they use properties in the system in different contexts and moods.

The author can affirm that the several of studies on the temporal scale of blended learning are conducted within the context of specific learning platforms. These platforms serve not only as places for information exchange but also as community spaces where learners gather to share knowledge and experiences. Through these platforms, learners can interact, exchange opinions, and, at the same time, the educational esthetes provided by the platform influence their learning experiences. In the field of e-education, changes in availability are associated with shifts in activity characteristics (Wan, 2010). As can be seen in Table 2, the existing literature explores the affordances-change view of affordance theory over time scales. In the case of knowledge transfer, the dynamics of affordances are easily observed (Cook & Brown, 1999). Inconsistent messages generated by users can lead to changes in the control of transmitted information and knowledge (Wan et al., 2008), which can lead to changes in affordances. Affordance dynamics are experiential changes that affect interaction frequency over time (Augustsson, 2010).

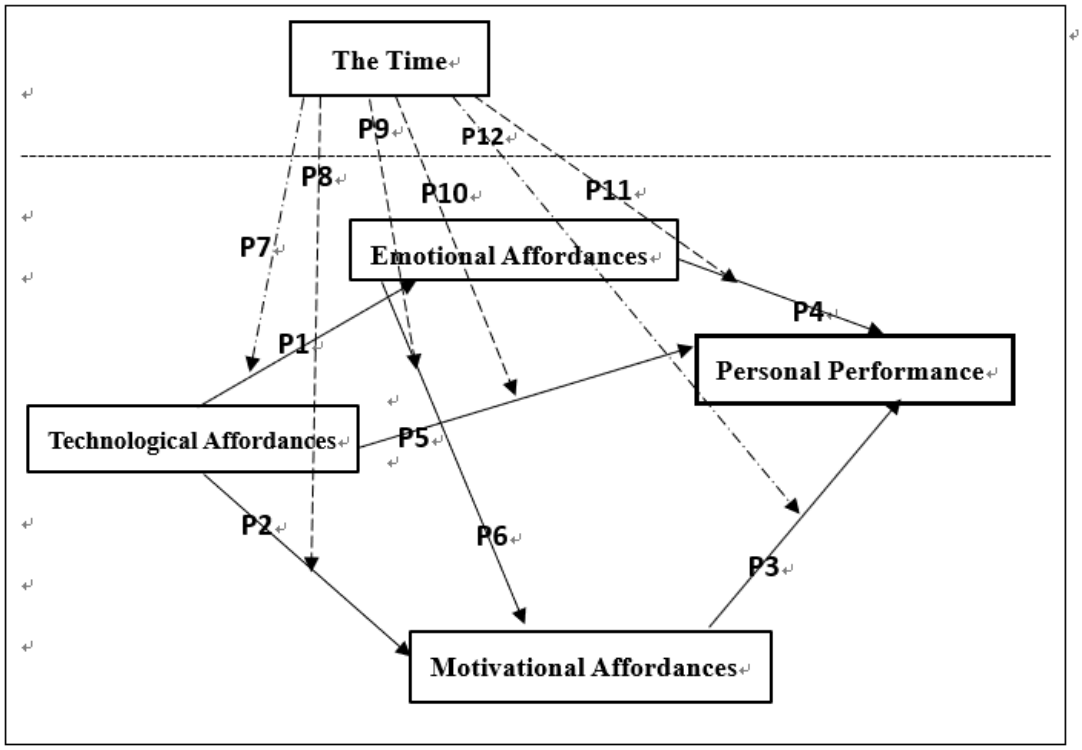
Table 2. Review the Evidence on Changes in Availability over Timescales

Restheces	Findings
Chen & Li (2022) (Chen & Li, 2022)	The time scale affects the user's perception of system uncertainty, which in turn affects performance goals.
Kligler-Vilenchik et al. (2020) (Kligler-Vilenchik et al., 2020)	Over time, online users dropped out of the debate as the content of the forums became frustrated.
Chen et al. (2018) (Chen et al., 2018)	Due to the large number of clues generated by time, the user's uncertainty in using the system will be reduced, resulting in a pleasant experience.
Pibernik et al. (2019) (Pibernik et al., 2019)	The interaction between the user and the system changes over time resulting in differences in the download experience.
Acosta (2016) (Acosta, 2016)	E-education users take advantage of the flexibility of distance learning to increase their knowledge, efficiency, and resthecefulness over time.
Bang et al. (2014) (Bang et al., 2014)	The degree of dispersion of consumption and purchase time affects the difference in purchasing behavior of online consumers
Liikkanen & Gómez (2013) (Liikkanen & Gómez, 2013)	The user's subjective feelings about the passage of time caused by the system will produce different experiences of behavioral use.

3. Proposition Development

In the study, the author performed secondary data analysis. In this section, the author reviews the literature on e-learning based on affordance theory and propose the following propositions. Finally, the author develops the research framework based on the proposal (Figure 1).

Figure 1. Framework



Proposition I : The technological affordances are positively related to emotional affordances (P1).

Technological affordances expresses the possibility of action, that is, what can be accomplished by individuals or groups working towards a certain goal using technology or information systems (Majchrzak & Markus, 2012).

Technological affordances are often linked to levels of availability (Norman, 1988). Conversely, without basic ICT skills, it is difficult to actually use the technology (Bobsin et al., 2019). In most cases, availability is associated with cognitive processes that can be triggered by emotional affordances (Norman, 2002). Creating a sense of connectedness in the technical support area can lead to emotional support (Zhou et al., 2022). Badia et al. (2011) state that "technological affordances should not be viewed as...inherent in technological characteristics...they are inherently dynamic" (Badia et al., 2011), p. 32). A study mentions that the emergence of usability in technology affordability is seen as an important mechanism influencing emotional interaction in e-learning (Kirschner et al., 2004). The usability of technology is primarily related to what happens at the human-machine interface ((De Souza & Preece, 2004). The human-computer response can be seen as the behavior of the optical illusion cyborg (Haraway, 2006). A well-designed ability to use technology increases students sense of control and belief in value (Artino Jr & Jones II, 2012). When students learn online, "emotional arousal" is always present (Wosnitza & Volet, 2005).

In short, proposition I illuminate the dynamic interplay between technological affordances and emotional responses, emphasizing their integral role in shaping the online learning experience, where a sense of connectedness and emotional arousal are

constant companions.

Proposition II: The technological affordances are positively related to motivational affordances. (P2)

According to Abd-Mutalib et al. (2019), motivational affordances occur concurrently with activities that provide gamification (Abd-Mutalib et al., 2019). Chen et al. (2018) further classify motivational affordances into votes and badges, serving as criteria for internalization into intrinsic motivation, thereby keeping online users engaged and helping them achieve their goals (Chen et al., 2018). Previous studies have delved into antecedents of motivational affordances such as scoreboards and game rewards (Liu et al., 2017; Ofosu-Ampong & Boateng, 2020). It is noteworthy that while motivational affordances vary across different gamification scenarios, users' actual actions commence after the perception of motivational affordances (Deterding, 2011). The utilization of gamification in e-education is highlighted, as it puts students into a state of flow (Urh et al., 2015). Gamification is considered a mechanism for providing feedback and interaction (Huotari & Hamari, 2011). Furthermore, gamification serves as an evaluation of the "compatibility" of new technologies (Bíró, 2014). In most cases, the lower the usability, the less likely it is to be gamified. Issues related to usability accelerate users' perception of gamified systems as less interesting, consequently having negative effects on users, such as motivation (Rajanen & Rajanen, 2017).

This proposition emphasizes the interplay between technological and motivational aspects in a gamified environment, suggesting that the application of gamification in e-education may positively impact student engagement and goal achievement.

Proposition II underscores the intricate interplay between technological and motivational elements in gamified environments, highlighting the potential positive impact of gamification in e-education on student engagement and goal achievement.

Proposition III: The motivational affordances are positively related to the personal performance of the students (P3).

Users' goals and inclinations affect individuals' incentive performance (Rockmann & Maier, 2019), which in turn affects the individual's final performance. People need instantaneous reactive feedback control in the process of goal achievement, resulting in a relative state of psychological disequilibrium, which is related to motivating personal skills (Bandura, 1993). Feedback is an effective and useful tool in e-education to improve understanding of performance and goals through comparison (Kluger & DeNisi, 1996; Serge et al., 2013). In the educational context literature, gamification is recognized as a potent tool that can serve as a motivational factor, creating a link to the motivational affordances experienced by learners, consequently influencing their overall performance. The integration of gamification elements, such as rewards, badges,

and interactive challenges, has been shown to effectively engage students and contribute to a positive learning environment. This motivational aspect, deeply rooted in gamification principles, plays a pivotal role in shaping students' attitudes, behaviors, and ultimately, their academic outcomes. Gamification is a mainstream of research on motivational affordances (Kay J et al., 2006; Rambusch & Susi, 2008; Weiser et al., 2015), which drives value creation for users (Huotari & Hamari, 2012). Gamification provides motivation to empower participants (Zhao & Tang, 2016). On the other hand, the better outcome of motivational affordance is that the individual maximizes the function in the system (Schick et al., 2016), which is closer to improving individual performance. The motivation process through the gamification approach of goal realization is a dynamic chain of events rather than a single event (Chou, 2019; Zhao & Tang, 2016).

In short, proposition III (P3) is to understand motivational dynamics. The proposition delves into the intricate dynamics between motivational affordances and students' personal performance. This understanding is fundamental for educators as it provides insights into what motivates students and how these motivations translate into academic success.

Proposition IV: The emotional affordances are positively related to the personal performance of the students (P4).

In general, previous work has considered the relationship between affectively relevant affordances and representations (Cid & Núnez, 2014; Holmberg, 1994; Zembylas & Vrasidas, 2004). Cheng (2014) studied the role of emotional affordance in e-education and found that positive emotions can lead students to a fearless educational experience (Cheng, 2014). Erdoğdu & Çakıroğlu (2021) found that students who perceived humorous emotions had improved task comprehension and possibly improved performance (Erdoğdu & Çakıroğlu, 2021). Jiao et al. (2021) found that visibility into IT systems had a positive impact on emotional perception and motivation (Jiao et al., 2021).

In conclusion, Proposition IV holds significance by contributing to the advancement of the comprehension regarding the intricate interplay between emotional affordances, encompassing positive and humorous emotions, and its impact on student performance.

Proposition V: The technological affordances are positively related to the personal performance of the students (P5).

The purpose of technological affordances in e-education is to assist in information sharing during the decision-making process (Cordes, 2016). Decisions have a direct impact on performance (DuBrin, 2013). When technology availability is elastic, high performance outcomes are easily observed (Cabiddu et al., 2014). In a sense, the

availability of technological affordances can express perceived utility in a system. Wang et al. (2016) identify updatable, differentiable displays as important factors of technology affordability and making it easier to present results for achievement (Wang et al., 2016). Therefore, the author think students will be more aware of the ease of use of the system, which is a core element of technology affordability. The more technological affordances are present, the higher the individual performance is reflected.

Proposition VI: The emotional affordances are positively related to the motivational affordances (P6).

Individuals' perceived emotions provide intrinsic and extrinsic motivation (Jiao et al., 2021). Emotional affordances unfold experiences and exhibit phenomena entangled with technology and environment to motivate motivation (Bareither & Bareither, 2019). Emotions are motivators that drive and guide behavior (Zhang, 2008). The nature of emotion in e-education is forced to arouse in a self-directed manner to motivate action (Wosnitza & Volet, 2005). In addition, positive emotions generated by previous successful e-educational task experiences lead to positive motivation (Lai & Chen, 2016). Thus, the author argue that students' interactions with technology use and the environment become more intense, triggering the emergence of emotional affordances that influence changes in behavior (i.e., motivational affordances).

Proposition VII: The length of time moderates the relationship between technological affordances and emotional affordances such that the greater length of time provided, the stronger the impact of technological affordances on emotional affordances (P7).

Over time, it becomes easier for people to use, and then technological affordances take root (Gaver, 1991). Haines (2015) found that online students tend to master and perceive functions after a longer period of time, showing latent active emotions (Haines, 2015). In the case of usability issues, comments posted by online users appear wildly out of sync, making it difficult to truly express emotion (Sutcliffe et al., 2011). Thus, the author argue that online systems act as intermediaries between individuals and other users, with negative effects on individuals' perceptions of system availability blurred over time. If students perceive affordances to be low, this negative effect can cause emotional affordances to be hidden over time, but it is also possible that users get used to this affordances and thus emotional affordances keep emerging.

Proposition VIII: The length of time moderates the relationship between technological affordances and motivational affordances such that the greater length of time provided, the stronger the impact of technological affordances on motivational affordances (P8).

Kappen et al. (2017) demonstrated that after cultivating ease of use of technology and then developing the habit of providing feedback over time, users drive the power of intrinsic and extrinsic motivation (Kappen et al., 2017). Furthermore, the relationship between technology and motivational affordance is similar to joint demand in economic

theory (Jarrahi et al., 2018). Online users' understanding and use of technology evolves over time, reflecting a new perception of motivation to learn (Haynes, 2014). On the other hand, users show only an initial impression of what the technology has to offer, but respond differently to motivational affordances over time (Jia et al., 2016).

In summary, Proposition VIII not only highlights the temporal evolution of user habits but also establishes parallels with economic theory. Additionally, it recognizes the dynamic nature of user perceptions and their long-term responses to motivational affordances.

Proposition IX: The length of time moderates the relationship between emotional affordances and motivational affordances such that the greater length of time provided, the stronger the impact of emotional affordances on motivational affordances (P9).

Individuals stabilize over time and reappraise the task (Suri et al., 2018), which affect shifts in motivational affordances. In most cases, individuals add appraisal mechanisms to adjust their emotional affordances over time according to existing circumstances and possibly set their ongoing motivational affordances (Beltman & Volet, 2007). Simultaneously, behaviors interact with emotions as humans perceive positive or negative emotions in virtual environments over time (Lin et al., 2017). Meroli et al. (2014) noted that online users experience emotional release and exhibit narrative effects

of affordance after individuals engage in online environments over time, which may lead to different motivational changes (Merolli et al., 2014).

In summary, Proposition IX is important because it sheds light on the temporal evolution of individuals' perceptions, emotions, and behaviors in virtual environments. This understanding is instrumental for tailoring educational interventions to support adaptive motivation and positive experiences over time.

Proposition X: The length of time moderates the relationship between technological affordances and personal performance such that the greater length of time provided, the stronger the impact of technological affordances on the personal performance of the students (P10).

The relationship between technological affordances and performance is malleable over time (Gibson et al., 2022). Features of visibility, persistence, and editability in systems positively impact individual creative performance (Sun et al., 2020). Several studies have shown that the relationship between technology provision and performance is related to knowledge acquisition (Lehrer et al., 2018; Sun et al., 2020; Vuori et al., 2019; Xiangming & Song, 2018). Ali-Hassan et al. (2015) found that the pathway from technological affordances to performance varies with social factors (Ali-Hassan et al., 2015). Chen & Li (2022) found that the more obvious the temporal cues, the clearer the understanding of task completion (Chen & Li, 2022). Given enough time, users can

become familiar with the use of the technology and perceive its ease of use.

Proposition XI: The length of time moderates the relationship between emotional affordances and personal performance such that the greater length of time provided, the stronger the impact of emotional affordances on the personal performance of the students (P11).

Gamification builds learners' sense of achievement through reward systems and level advancements. This aligns with the individuals' needs, as per the Theory of Affordance, for achievement and reaching goals. The establishment of a sense of achievement can inspire learners' enthusiasm and commitment. This association may change over time. Information from real-time data leaderboards improves student performance over time (Chapman & Rich, 2018). Gamification approaches can help increase long-term motivation (Saputra & Risqi, 2015), thereby improving individual performance. Over time, game mechanics create fatigue and reduce student engagement, which reduces their performance (Faiella & Ricciardi, 2015). Thus, the author argue that over time students can develop a sense of solidity about the system that can be viewed as the emotional affordances that lead to individual differences in performance.

Proposition XII: The length of time moderates the relationship between motivational affordances and personal performance such that the greater length of time provided, the stronger the impact of motivational affordances on the personal performance of the students (P12).

Emergence of emotions occurs in the moment, but emerges socially and iteratively (Boiger & Mesquita, 2015). This discovery will provide a stimulus for individual

performance. Over time, students' emotions build up in the classroom to become self-examination, which affects their individual performance (Varelas et al., 2022). Emotional stability is associated with personal achievement (Correia et al., 2012; Jia et al., 2016). Therefore, the author believes that over time, students may receive more homework and work in teams, resulting in higher motivating abilities, which will be reflected in individual performance levels

Considering these observations, this proposition posits that an extended temporal horizon, coupled with strategic interventions like increased homework assignments and collaborative teamwork, cultivates heightened motivational abilities. This cultivation, in turn, translates into elevated levels of individual performance.

4. Affordance Literature Analysis

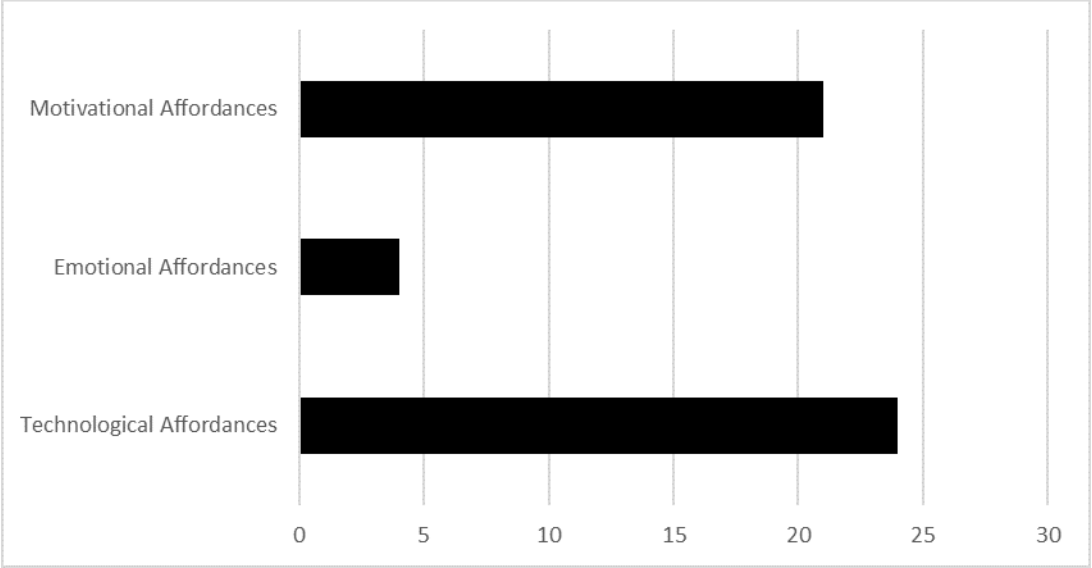
To identify the research variables in the research framework, the author analyzed articles on affordance theory. The author screened articles containing affordance theory from information management journals. The journals the author analyzes include:

1. Decision Support Systems
2. Communications of the Association for Information Systems
3. Electronic Commerce Research and Applications
4. European Journals of Information Systems
5. Information & Management
6. International Jthenal of Human-Computer Studies
7. Information Systems Frontiers
8. International Journals of Electronic Commerce
9. Information and Organization
10. Journals of Strategic Information Systems
11. Journals of Management Information Systems
12. Journals of Information Technology
13. Journals of Organizational Computing and Electronic Commerce
14. Journals of the Association for Information Systems
15. Organization Science
16. The Information Systems Journals

From 2016 to 2023, the authors selected 49 articles for analysis. In this section, the research will disassemble the affordance factors highlighted in each article, drawing from individual affordance theory. These studies are associated with e-learning to provide a specific angle for comparison. Previous affordance research has covered education, organizational behavior, and online communities. Most affordance research focuses on technological and motivational attributes (Figure 2). Specifically, 24 studies

(49%) were technology-related. 21 studies (43%) were about motivation. 4 studies (8%) were about emotions.

Figure 2. Affordances Research Topic Distribution (Number)



The author examined the distribution of related emotional affordance studies (Figure 3). The results concluded that 3 studies (75%) highlighted both positive and negative aspects related to emotional affordance. Van Vugt et al. (2006) investigated user interactions with game interface characters, viewed affordances as having positive and negative dimensions (helping and hindering), and found that users tend to use helpful characters rather than hindering characters (van Vugt et al., 2006). Lee et al. (2021) argue that interactions between gamers and gaming platforms are often associated with experiencing positive emotions or reducing negative emotions (Lee et al., 2021). Wang (2020) defines affordance as emotion regulation, studying how communication media

tools affect emotions (facilitate or suppress) (Wang et al., 2020). Additionally, 1 study (25%) focused on health aspects. James et al. (2019) Consider affordances as extroverted and introverted exercise goals using the example of bodybuilders (James et al., 2019). Individuals may have a negative relationship with data sharing in health devices (introverted exercise goals), users may worry about anxiety (privacy), and use health tools less.

Figure 3. Focuses Distribution for Emotional Affordance Theory's Research (Number)

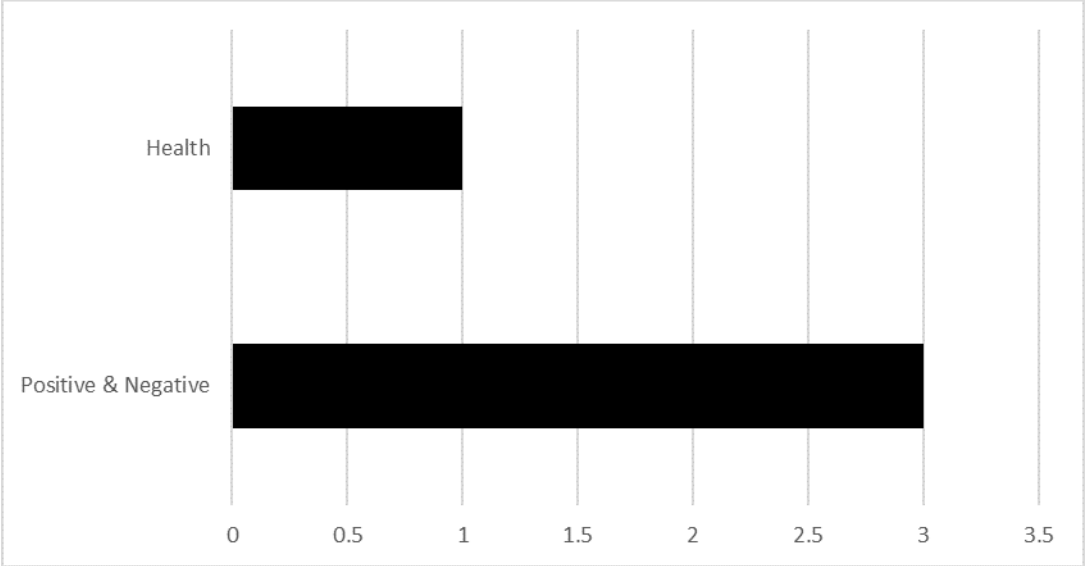
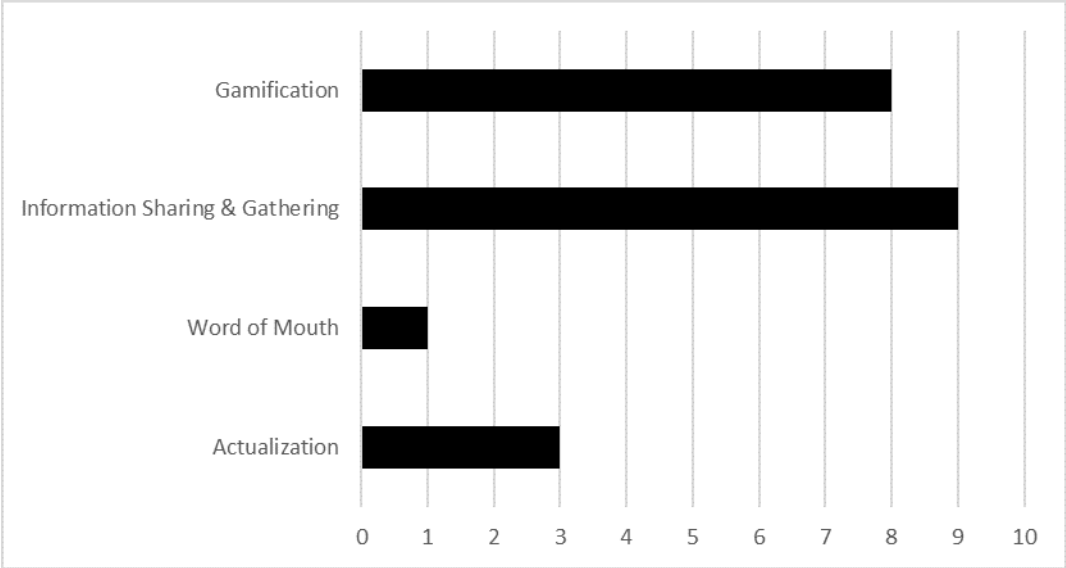


Figure 4 lists the various motivational affordance types. Previous research revealed 4 motivational affordances: information sharing and gathering (n = 9, 43%), gamification (n = 8, 38%), actualization (n = 3, 14%), and word of mouth (Lin et al., 2019) (n = 1, 5%). This suggests that motivational affordances are often revealed through information exchange and collection (Chatterjee et al., 2021; Eismann et al., 2021; Goel et al., 2013; Herterich et al., 2022; Leidner et al., 2020; Leonardi, 2017; Malhotra

et al., 2021; Waizenegger et al., 2020; Zheng & Yu, 2016). The purpose of information exchange is often for collaboration, allowing users to express their opinions through the platform (Eismann et al., 2021). Sometimes, users get more resources and perform more social activities during information exchange (Leidner et al., 2020). On the other hand, users interact with interfaces and achieve goal motivation through gamification (Benitez et al., 2022; Chen et al., 2019; Koroleva & Kane, 2017; Lavoué et al., 2021; McKenna, 2020; Suh et al., 2017; Tan et al., 2017; Wang et al., 2022). Gamification maturity requires effective use of rewards (Suh et al., 2017; Tan et al., 2017). Scholars often use voting and badges as gamification indicators of motivation affordance (Chen et al., 2019; Koroleva & Kane, 2017; Lavoué et al., 2021). The motivational affordances of these 3 studies focus on the possibility of realization (Dremel et al., 2020; Henningsson et al., 2021; Thapa & Sein, 2018). Dremel et al. (2020) investigate the reliability of data-driven services (Dremel et al., 2020). Thapa & Sein (2018) explored the implementation of perception in virtual environments (Thapa & Sein, 2018). Based on the above, the author argue that online platforms' feedback mechanisms (as basic functions of information exchange), badges, and voting can measure online students' motivational affordances.

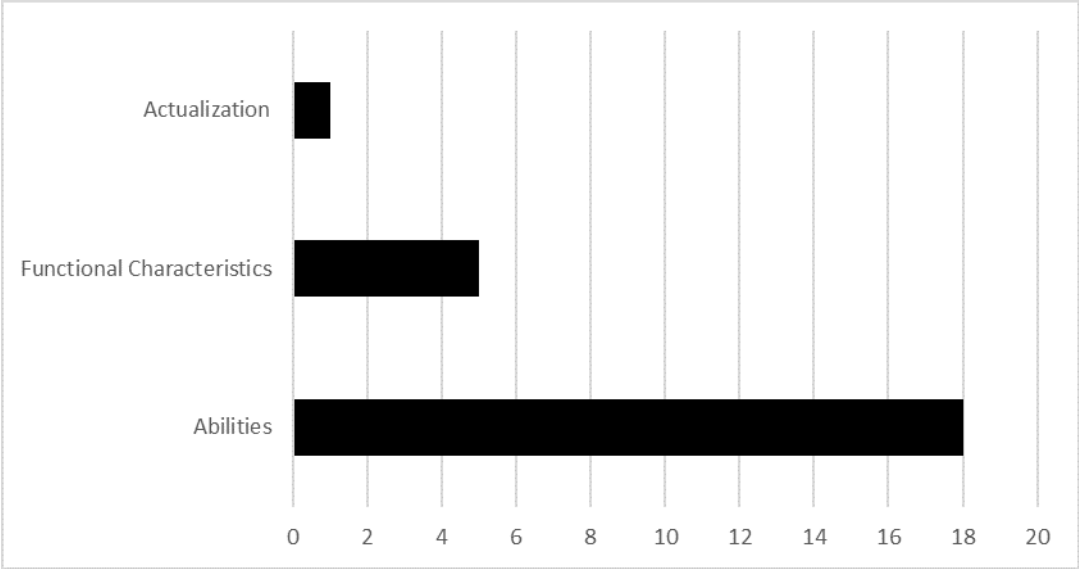
Figure 4. Focuses Distribution for Motivational Affordances Theory's Research (Number)



In terms of technological affordances research (Figure 5), previous studies have revealed three different categories of technological affordances: (1) actualization (Tim et al., 2020). (2) functional characteristics (Knote et al., 2020; Lei et al., 2021; Prakasam & Huxtable-Thomas, 2021; Still & Dark, 2010; Sun et al., 2023). (3) abilities (Argyris & Monu, 2015; Chan et al., 2019; Chatterjee et al., 2020; Chatterjee et al., 2017; Chen et al., 2021; Dincelli & Yayla, 2022; Du et al., 2019; Fang, 2019; Findikoglu & Watson-Manheim, 2016; Hatakka et al., 2020; Lehrer et al., 2018; Miao et al., 2022; Osmundsen et al., 2022; Sheer & Rice, 2017; Sun et al., 2019; Thapa & Sein, 2018; Van Osch & Cthesaris, 2017; Zahedi et al., 2022). Scholars most commonly refer to technological affordances as the ability of individuals to use technological devices. 18 studies (75%) were about technology availability in relation to capabilities. Technology

availability represents the potential of IT to function in a collaborative organizational environment (Chatterjee et al., 2020). Fang (2019) extended technological affordances to the context of brand applications, proposing five affordances: visibility, persistence, interactivity, relevance, and selectivity (Fang, 2019). When IT elements are applied to the design of a virtual environment, an individual's exposure to personally relevant capabilities within that environment results in affordance (Zahedi et al., 2022). Second, 5 studies (20.8%) were about technological availability of functional features. Sun et al. (2023) defined affordance as symbolic language and found that the influence of symbolic language and content ideology on opinion polarization has a positive moderating relationship (Sun et al., 2023). It is critical to consider content ideology and symbolic expression when evaluating polarized opinions online. Lei et al. (2021) investigated the impact of different types of information technology and different functions on the diversification of different businesses, taking the logistics industry of 23 cities in China as an example (Lei et al., 2021). To sum up, when the user's ability to master technology improves, it also represents the ease of use between the user and the technical equipment to a certain extent.

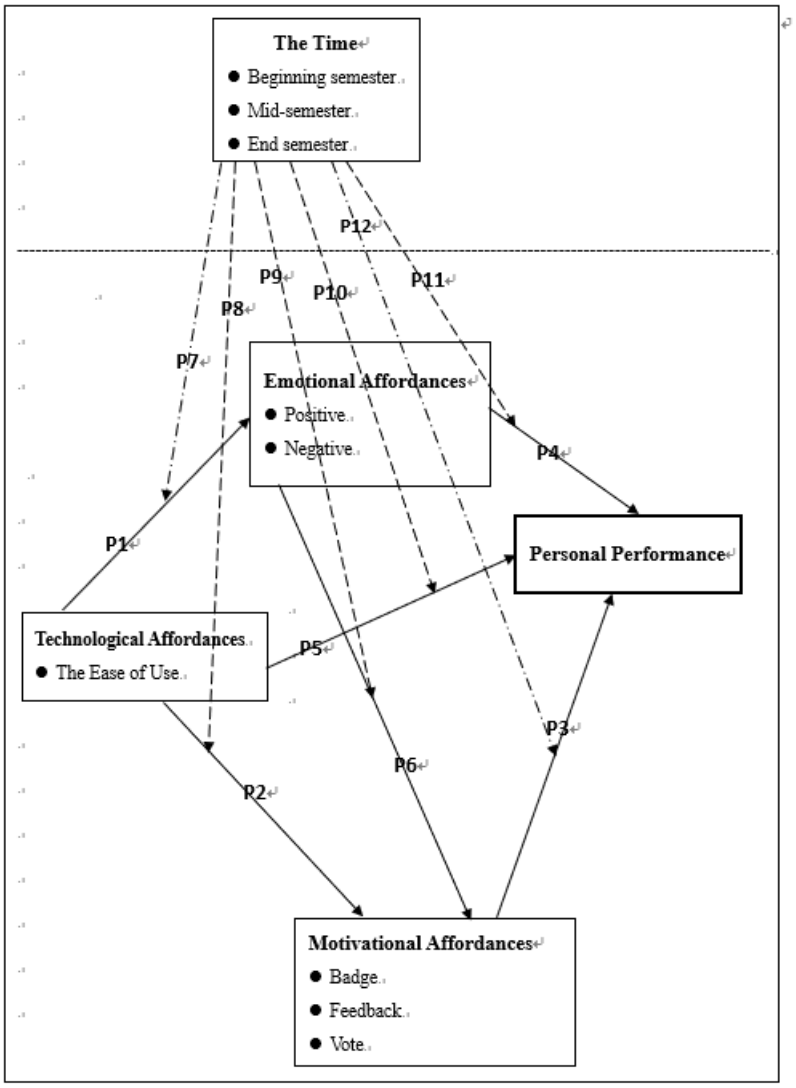
Figure 5. Focuses Distribution for Technological Affordances Theory's Research (Number)



While these articles were not specifically focused on personal performance in online learning, their aim is to enhance performance, considering factors such as continued use or intention. According to the analysis of the research questions in the past literature, the author believe that technological affordances essentially represents an easy-to-use relationship between users and systems. The higher the ease of use, the higher the functionality and performance of the system functions to the user. The emotional affordance expresses the immediate impression of the user's perception of the system. In the field of e-education, students either reflect a happy positive attitude or develop a boring negative learning attitude. Positive and negative is therefore the most straightforward dichotomy for emotions. Motivational affordances reflect the index to measure whether the user stays in the system further, and in the context of online learning, the relevant game functionality will become the main variable of motivational

affordances. In terms of time, school students participate in courses and then use online platforms, usually in one semester (about half a year). Therefore, it is assumed that novice students will use the platform at the beginning, mid-courses (assign task bombing) and end of semester (project acceptance). the process can make a difference in the response to the different affordances. Based on the above, the following is the operational model of this study (Figure 6).

Figure 6. Research Model



Conclusion

This paper helps to address previous concerns that the nature of affordance is dynamic and should be categorized and assessed in the development of each educational scenario (Badia et al., 2011). In the study, the idea behind the conceptual model is that affordance's changes as online users' retention on the platform increases and teachers' expectations of students become visible over time. Existing IT impact research literature shows that the capabilities of technology can provide users with impressions that can be perceived as value (Markus & Silver, 2008). The key evidence emerging from the existing literature is that users can perceive affordances in the context of information delivery and can increase and decrease the strength of affordances (Burlamaqui & Dong, 2015). These arguments lead to the perspective on affordance in the context of e-education. The role of affordance in e-education is sequential and nested (Hammond, 2010). The author expects online students to initially perceive more technological availability due to lack of skills and knowledge. Such technological affordances change with the evolution of time, and users learn to use them subtly, and their reliance on the ease of use of technological affordances may be reduced, gradually forming an emotional impression on the platform. Users are assigned online tasks and have to learn the online system, otherwise they will not be able to complete the target tasks, which will affect personal performance (i.e., grades). The author argue that users

switch synchronously from technological affordances, users perceive emotional affordances (e.g., positive, negative, neutral) because users develop some emotional thoughts about technology when it is useful or not. It's as if they were plugged into an outlet to generate electricity.

Meanwhile, when teachers encourage some teamwork at the start of the semester, users move on to more motivating features. Over time, users learn about this virtual environment, their classmates, and teachers, so they develop more motivational or emotional affordances. This finding is consistent with studies by Camilleri (2012) and Taipale (2014) [Ref (Camilleri, 2012; Taipale, 2014)], in which users generate associated affordances as a result of perceiving properties that are integral to technology and form habits over time, thereby lead to solidification of practice. The author conclude that individual performance levels arise from temporal differences in the interaction between technological function perception and the virtual environment. To the knowledge, this is the first attempt at such a framework. In conclusion, this paper will help us better understand the mechanisms that lead students to incorporate technology into their learning behaviors over time.

In addition, the affordances will eventually reflect a relationship between individuals and the object, and often the quality of this relationship will be reflected in performance as a measure of Human-machine interaction's design. When the affordance is explicit

to be observed, it will strongly induce the emergence of personal performance, producing superior or inferior outcomes. This also means that each affordance in the model will be linked to individual performance.

The author firmly believe that this framework can elucidate the distinctive affordances elements encountered by each learner at various stages, offering valuable insights into the nuanced dynamics of user behavior. By doing so, the contribution extends beyond the realm of e-education, providing essential foundations for human-machine design. This understanding of the diverse challenges and preferences experienced by learners throughout their educational journey is instrumental in tailoring interfaces and experiences that align with individual needs and enhance overall engagement and increase performance.

5. Research Limitation

Despite the valuable insights gained from this study, it is essential to acknowledge certain limitations that may impact the generalizability and applicability of the findings. Firstly, the focus on e-education contexts, while providing a rich understanding of the dynamics within this domain, may limit the generalizability of the proposed framework to other educational settings. Educational environments with different modalities, structures, or technological infrastructures may exhibit unique affordance patterns.

Secondly, the reliance on retrospective analysis and qualitative methods for data collection poses limitations on the establishment of causal relationships. Future research endeavors could benefit from employing longitudinal studies or experimental designs to better ascertain the cause-and-effect relationships between affordances, time dynamics, and personal performance.

Additionally, the proposed framework assumes that affordances evolve over time, impacting individual performance. While this assumption aligns with existing literature, variations in individual learning styles, preferences, and external factors might introduce complexities not fully accounted for in the current model.

Furthermore, the generalization of findings to diverse learner populations, considering factors such as age, cultural background, and prior experience with technology, should be approached with caution. The nuanced interplay between these variables and affordance dynamics warrants further exploration.

Lastly, the study focuses on the affordances within the e-education landscape but does not extensively delve into social affordances. The exclusion of social affordances represents a limitation, and future research could explore their role and impact in greater detail.

In conclusion, while this study contributes significantly to understanding affordance dynamics in e-education, researchers and practitioners should interpret the findings within the outlined limitations and consider these aspects in the design and interpretation of future studies.

Interest Statements

The author of this article declares there is no competing interest.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. Funding for this research was covered by the author(s) of the article.

6. References

Abd-Mutalib, H., Mustapa, I. R., & Salleh, D. (2019). Enhancing Students' Class Participation through Gamification: Creating Motivational Affordance, Psychological and Behavioral Outcomes. *Universal Jthenal of Educational Research*, *7*(9A), 25-35.

Acosta, M. (2016). Paradigm shift in open education and e-learning restheces as teaching and learning in Philippines. *Jurnal Ilmiah Peuradeun*, *4*(2), 161-172. https://doi.org/10.26811/peuradeun.v4i2.94

Acs, Z. J., Song, A. K., Szerb, L., Audretsch, D. B., & Komlosi, E. (2021). The evolution of the global digital platform economy: 1971–2021. *Small Business Economics*, *57*, 1629-1659.

Ali-Hassan, H., Nevo, D., & Wade, M. (2015). Linking dimensions of social media use to job performance: The role of social capital. *The Jthenal of Strategic Information Systems*, *24*(2), 65-89.

Argyris, Y. A., & Monu, K. (2015). Corporate use of social media: Technology affordance and external stakeholder relations. *Jthenal of Organizational Computing and Electronic Commerce*, *25*(2), 140-168. https://doi.org/10.1080/10919392.2015.1033940

Artino Jr, A. R., & Jones II, K. D. (2012). Exploring the complex relations between

achievement emotions and self-regulated learning behaviors in online learning. *The Internet and Higher Education*, *15*(3), 170-175.

Augustsson, G. (2010). Web 2.0, pedagogical support for reflexive and emotional social interaction among Swedish students. *The Internet and Higher Education*, *13*(4), 197-205.

Badia, A., Barbera, E., Guasch, T., & Espasa, A. (2011). Technology educational affordance: Bringing the gap between patterns of interaction and technology usage. *Digital Education Review*, *19*(1), 20-35.

Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. *Educational psychologist*, *28*(2), 117-148.

Bang, Y., Lee, D., & Han, K. (2014). Access affordance of mobile technology in e-commerce: Change of purchase time dispersion.

Bareither, C., & Bareither, C. (2019). Doing emotion through digital media: An ethnographic perspective on media practices and emotional affordances. *Ethnologia Europaea*, *49*(1).

Beltman, S., & Volet, S. (2007). Exploring the complex and dynamic nature of sustained motivation. *European psychologist*, *12*(4), 314-323. https://doi.org/10.1027/1016-9040.12.4.314

Benitez, J., Ruiz, L., & Popovic, A. (2022). Impact of mobile technology-enabled HR

gamification on employee performance: An empirical investigation. *Information & Management*, *59*(4), 103647. https://doi.org/10.1016/j.im.2022.103647

Blewett, C., & Hugo, W. (2016). Actant affordances: a brief history of affordance theory and a Lattheian extension for education technology research. *Critical Studies in Teaching and Learning*, *4*(1), 55-76. https://doi.org/10.14426/CRISTAL.V4I1.50

Bobsin, D., Petrini, M., & Pozzebon, M. (2019). The value of technology affordances to improve the management of nonprofit organizations. *RAUSP Management Jthenal*, *54*, 14-37. https://doi.org/10.1108/RAUSP-07-2018-0045

Boiger, M., & Mesquita, B. (2015). A socio-dynamic perspective on the construction of emotion. *The psychological construction of emotion*, 377-398.

Burlamaqui, L., & Dong, A. (2015). The use and misuse of the concept of affordance. *Design computing and cognition'14*, 295-311.

Bíró, G. I. (2014). Didactics 2.0: A pedagogical analysis of gamification theory from a comparative perspective with a special view to the components of learning. *Procedia-Social and Behavioral Sciences*, *141*, 148-151.

Cabiddu, F., De Carlo, M., & Piccoli, G. (2014). Social media affordances: Enabling customer engagement. *Annals of Ttheism Research*, *48*, 175-192.

Camilleri, P. (2012). Teachers' interpretations of the internet. An applied case study for the evaluation of technological frames of reference. *Informatics in Education-An International Jthenal*, *11*(2), 151-167. https://doi.org/10.15388/infedu.2012.08

Carless, D. (2022). From teacher transmission of information to student feedback literacy: Activating the learner role in feedback processes. *Active Learning in Higher Education*, *23*(2), 143-153. https://doi.org/10.1177/1469787420945845

Cepeda, N. J., Vul, E., Rohrer, D., Wixted, J. T., & Pashler, H. (2008). Spacing effects in learning: A temporal ridgeline of optimal retention. *Psychological science*, *19*(11), 1095-1102. https://doi.org/10.1111/j.1467-9280.2008.02209.x

Chan, T. K., Cheung, C. M., & Wong, R. Y. (2019). Cyberbullying on social networking sites: the crime opportunity and affordance perspectives. *Jthenal of Management Information Systems*, *36*(2), 574-609. https://doi.org/10.1080/07421222.2019.1599500

Chapman, J. R., & Rich, P. J. (2018). Does educational gamification improve students' motivation? If so, which game elements work best? *Jthenal of Education for Business*, *93*(7), 315-322.

Chatterjee, S., D Moody, G., Lowry, P. B., Chakraborty, S., & Hardin, A. (2021). The nonlinear influence of harmonious information technology affordance on

organisational innovation. *Information Systems Jthenal*, *31*(2), 294-322. https://doi.org/10.2139/ssrn.3704978

Chatterjee, S., Moody, G., Lowry, P. B., Chakraborty, S., & Hardin, A. (2020). Information Technology and organizational innovation: Harmonious information technology affordance and ctheage-based actualization. *The Jthenal of Strategic Information Systems*, *29*(1), 101596. https://doi.org/10.1016/j.jsis.2020.101596

Chatterjee, S., Sarker, S., & Siponen, M. (2017). How Do Mobile ICTs Enable Organizational Fluidity: Toward a Theoretical Framework. *Information & Management*, *54*(1), 1-13. https://doi.org/10.1016/J.IM.2016.03.007

Chen, A. N., Lee, Y., & Hwang, Y. (2018). Managing online wait: Designing effective waiting screens across cultures. *Information & Management*, *55*(5), 558-575.

Chen, C.-H., & Li, H. (2022). Effects of time affordance and operation mode on a smart microwave oven touch-sensitive user Interface design. *Multimedia Tools and Applications*, 1-18.

Chen, L., Baird, A., & Straub, D. (2019). Why do participants continue to contribute? Evaluation of usefulness voting and commenting motivational affordances within an online knowledge community. *Decision Support Systems*, *118*, 21-32. https://doi.org/10.1016/j.dss.2018.12.008

Chen, X., Liu, Z., Wei, S., & Liu, Y. (2021). Understanding the Role of Affordances in Promoting Social Commerce Engagement. *International Jthenal of Electronic Commerce*, *25*(3), 287-312. https://doi.org/10.1080/10864415.2021.1943170

Cheng, J. C. (2014). An Exploratory Study of Emotional Affordance of a Massive Open Online Cthese. *European Jthenal of Open, Distance and e-learning*, *17*(1), 43-55.

Cheng, Y. M. (2011). Antecedents and consequences of e-learning acceptance. *Information Systems Jthenal*, *21*(3), 269-299.

Chou, Y.-k. (2019). *Actionable gamification: Beyond points, badges, and leaderboards*. Packt Publishing Ltd.

Cid, F., & Núnez, P. (2014). Learning Emotional Affordances based on Affective Elements in Human-Robot Interaction Scenarios. *Workshop of Physical Agents (Waf)*, *15*, 47-52.

Comer, D., Baker, R., & Wang, Y. (2015). Negativity in Massive Online Open Ctheses: Impacts on Learning and Teaching and How Instructional Teams May Be Able to Address It. *InSight: A Jthenal of Scholarly Teaching*, *10*, 92-113. https://doi.org/10.46504/10201508co

Conole, G., & Dyke, M. (2004). Understanding and using technological affordances: a response to Boyle and Cook. *Research in Learning Technology (ALT-J)*, *12*(3),

301-308. https://doi.org/10.1080/0968776042000259609

Cook, S. D., & Brown, J. S. (1999). Bridging epistemologies: The generative dance between organizational knowledge and organizational knowing. *Organization Science*, *10*(4), 381-400. https://doi.org/10.1287/ORSC.10.4.381

Cordes, S. (2016). Virtual team learning: The role of collaboration process and technology affordance in team decision making. *Knowledge Management & E-Learning: An International Jthenal*, *8*(4), 602-627.

Correia, V., Araújo, D., Cummins, A., & Craig, C. M. (2012). Perceiving and acting upon spaces in a VR rugby task: Expertise effects in affordance detection and task achievement. *Jthenal of Sport and Exercise Psychology*, *34*(3), 305-321. https://doi.org/10.1123/jsep.34.3.305

D'Ambra, J., Akter, S., & Mariani, M. (2022). Digital transformation of higher education in Australia: Understanding affordance dynamics in e-textbook engagement and use. *Jthenal of Business Research*, *149*, 283-295. https://doi.org/10.1016/j.jbusres.2022.05.048

De Souza, C. S., & Preece, J. (2004). A framework for analyzing and understanding online communities. *Interacting with computers*, *16*(3), 579-610.

Deterding, S. (2011). Situated motivational affordances of game elements: A conceptual model. Gamification: Using game design elements in non-gaming contexts, a

workshop at CHI,

Dincelli, E., & Yayla, A. (2022). Immersive virtual reality in the age of the Metaverse: A hybrid-narrative review based on the technology affordance perspective. *The Jthenal of Strategic Information Systems*, *31*(2), 101717. https://doi.org/10.1016/j.jsis.2022.101717

Dremel, C., Herterich, M. M., Wulf, J., & vom Brocke, J. (2020). Actualizing big data analytics affordances: A revelatory case study. *Information & Management*, *57*(1), 103121. https://doi.org/10.1016/J.IM.2018.10.007

Du, W., Pan, S. L., Leidner, D. E., & Ying, W. (2019). Affordances, experimentation and actualization of FinTech: A blockchain implementation study. *The Jthenal of Strategic Information Systems*, *28*(1), 50-65. https://doi.org/10.1016/J.JSIS.2018.10.002

DuBrin, A. J. (2013). *Fundamentals of organizational behavior: An applied perspective*. Elsevier.

Eismann, K., Posegga, O., & Fischbach, K. (2021). Opening organizational learning in crisis management: On the affordances of social media. *The Jthenal of Strategic Information Systems*, *30*(4), 101692. https://doi.org/10.1016/j.jsis.2021.101692

Ellison, N. B., Gibbs, J. L., & Weber, M. S. (2015). The use of enterprise social network sites for knowledge sharing in distributed organizations: The role of

organizational affordances. *American Behavioral Scientist*, *59*(1), 103-123.

Erdoğdu, F., & Çakıroğlu, Ü. (2021). The educational power of humor on student engagement in online learning environments. *Research and Practice in Technology Enhanced Learning*, *16*(1), 1-25.

Faiella, F., & Ricciardi, M. (2015). Gamification and learning: a review of issues and research. *Jthenal of e-learning and knowledge society*, *11*(3), 13-21. https://doi.org/10.20368/1971-8829/1072

Fang, Y.-H. (2019). An app a day keeps a customer connected: Explicating loyalty to brands and branded applications through the lens of affordance and service-dominant logic. *Information & Management*, *56*(3), 377-391. https://doi.org/10.1016/j.im.2018.07.011

Findikoglu, M., & Watson-Manheim, M. B. (2016). Linking macro-level goals to micro-level routines: EHR-enabled transformation of primary care services. *Jthenal of Information Technology*, *31*(4), 382-400. https://doi.org/10.1057/s41265-016-0023-5

Gaver, W. W. (1991). Technology affordances. Proceedings of the SIGCHI conference on Human factors in computing systems,

Gibson, C. B., Dunlop, P. D., Majchrzak, A., & Chia, T. (2022). Sustaining effectiveness in global teams: The coevolution of knowledge management activities and

technology affordances. *Organization Science*, *33*(3), 1018-1048.

Gibson, J. J. (1977). The theory of affordances. *Hilldale, USA*, *1*(2), 67-82.

Globenewswire. (2019). *Online Education Market Study 2019 | World Market Projected to Reach $350 Billion by 2025, Dominated by the United States and China*. Retrieved December 16 from https://www.globenewswire.com/news-release/2019/12/17/1961785/0/en/Online-Education-Market-Study-2019-World-Market-Projected-to-Reach-350-Billion-by-2025-Dominated-by-the-United-States-and-China.html

Goel, L., Johnson, N. A., Junglas, I., & Ives, B. (2013). How cues of what can be done in a virtual world influence learning: An affordance perspective. *Information & Management*, *50*(5), 197-206. https://doi.org/10.1016/j.im.2013.01.003

Guha, S. (2017). *The Importance Of Data Analytics In eLearning*. Retrieved December 14 from https://elearningindustry.com/data-analytics-in-elearning-importance

Hafner, C. A., & Candlin, C. N. (2007). Corpus tools as an affordance to learning in professional legal education. *Jthenal of English for academic purposes*, *6*(4), 303-318.

Haines, K. (2015). Learning to identify and actualize affordances in a new tool. *Language Learning & Technology*, *19*(1), 165-180. https://doi.org/10125/44407

Hammond, M. (2010). What is an affordance and can it help us understand the use of

ICT in education? *Education and Information Technologies*, *15*(3), 205-217. https://doi.org/10.1007/s10639-009-9106-z

Haraway, D. (2006). A cyborg manifesto: Science, technology, and socialist-feminism in the late 20th century. In *The international handbook of virtual learning environments* (pp. 117-158). Springer.

Hatakka, M., Thapa, D., & Sæbø, Ø. (2020). Understanding the role of ICT and study circles in enabling economic opportunities: Lessons learned from an educational project in Kenya. *Information Systems Jthenal*, *30*(4), 664-698. https://doi.org/10.1111/isj.12277

Haynes, N. (2014). Affordances and audiences: finding the difference Christianity makes. *Current Anthropology*, *55*(S10), S357-S365. https://doi.org/10.1086/678285

Heft, H. (2018). Affordances, dynamic experience, and the challenge of reification. In *How Shall Affordances be Refined? Fthe Perspectives* (pp. 149-180). Routledge.

Henningsson, S., Kettinger, W. J., Zhang, C., & Vaidyanathan, N. (2021). Transformative rare events: Leveraging digital affordance actualisation. *European Jthenal of Information Systems*, *30*(2), 137-156. https://doi.org/10.1080/0960085X.2020.1860656

Herterich, M. M., Dremel, C., Wulf, J., & vom Brocke, J. (2022). The emergence of

smart service ecosystems—The role of socio-technical antecedents and affordances. *Information Systems Jthenal*. https://doi.org/10.1111/isj.12412

Holmberg, B. (1994). *Theory and practice of distance education*. Routledge. https://doi.org/10.4324/9780203973820

Huotari, K., & Hamari, J. (2011). Gamification" from the perspective of service marketing. Proc. CHI 2011 Workshop Gamification,

Huotari, K., & Hamari, J. (2012). Defining gamification: a service marketing perspective. Proceeding of the 16th international academic MindTrek conference,

Hwang, B.-L., Chou, T.-C., & Huang, C.-H. (2021). Actualizing the Affordance of Mobile Technology for Mobile Learning. *Educational Technology & Society*, *24*(4), 67-80.

James, T. L., Deane, J. K., & Wallace, L. (2019). An application of goal content theory to examine how desired exercise outcomes impact fitness technology feature set selection. *Information Systems Jthenal*, *29*(5), 1010-1039. https://doi.org/10.1111/isj.12233

Jarrahi, M. H., Gafinowitz, N., & Shin, G. (2018). Activity trackers, prior motivation, and perceived informational and motivational affordances. *Personal and Ubiquitous Computing*, *22*(2), 433-448.

Jia, Y., Xu, B., Karanam, Y., & Voida, S. (2016). Personality-targeted gamification: a survey study on personality traits and motivational affordances. Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems,

Jiao, H., Tang, W., Liu, T., Wang, X., & Ma, L. (2021). How do IT affordances support behavioral intention in charitable crowdfunding? The mediating effects of donor perceptions and motivations. *Kybernetes*.

Jochemczyk, Ł., Pietrzak, J., Buczkowski, R., Stolarski, M., & Markiewicz, Ł. (2017). You only live once: Present-hedonistic time perspective predicts risk propensity. *Personality and Individual Differences*, *115*, 148-153.

John, P., & Sutherland, R. (2005). Affordance, opportunity and the pedagogical implications of ICT. *Educational Review*, *57*(4), 405-413. https://doi.org/10.1080/00131910500278256

Jong, M. S.-y. (2014). Elementary students' view of collaborative knowledge building in LearningVillages. *learning*, *13*, 14.

Kappen, D. L., Mirza-Babaei, P., & Nacke, L. E. (2017). Gamification through the application of motivational affordances for physical activity technology. Proceedings of the Annual Symposium on Computer-Human Interaction in Play,

Kay J, W., Meyer, B. J., Wagoner, D., & Ferguson, L. (2006). Technology affordances: the 'real story'in research with K-12 and undergraduate learners. *British Jthenal*

of Educational Technology, *37*(2), 191-209.

Keough, K. A., Zimbardo, P. G., & Boyd, J. N. (1999). Who's smoking, drinking, and using drugs? Time perspective as a predictor of substance use. *Basic and applied social psychology*, *21*(2), 149-164.

Kirschner, P., Strijbos, J.-W., Kreijns, K., & Beers, P. J. (2004). Designing electronic collaborative learning environments. *Educational technology research and development*, *52*(3), 47-66.

Kligler-Vilenchik, N., Baden, C., & Yarchi, M. (2020). Interpretative polarization across platforms: How political disagreement develops over time on Facebook, Twitter, and WhatsApp. *Social Media+ Society*, *6*(3). https://doi.org/10.1177/2056305120944393

Kluger, A. N., & DeNisi, A. (1996). The effects of feedback interventions on performance: a historical review, a meta-analysis, and a preliminary feedback intervention theory. *Psychological bulletin*, *119*(2), 254-284. https://doi.org/10.1037/0033-2909.119.2.254

Knote, R., Janson, A., Söllner, M., & Leimeister, J. M. (2020). Value co-creation in smart services: a functional affordances perspective on smart personal assistants. *Jthenal of the Association for Information Systems*, 418-458. https://doi.org/10.2139/ssrn.3923706

Koroleva, K., & Kane, G. C. (2017). Relational affordances of information processing on Facebook. *Information & Management*, *54*(5), 560-572. https://doi.org/10.1016/j.im.2016.11.007

Krouska, A., Troussas, C., & Sgtheopoulou, C. (2022). Mobile game-based learning as a solution in COVID-19 era: Modeling the pedagogical affordance and student interactions. *Education and Information Technologies*, *27*(1), 229-241. https://doi.org/10.1007/s10639-021-10672-3

Lai, Y.-L., & Chen, J.-C. (2016). Supporting to Learn Calculus Through E-test with Feedback and Self-regulation. *International Jthenal of Learning, Teaching and Educational Research*, *15*(5).

Lavoué, É., Ju, Q., Hallifax, S., & Serna, A. (2021). Analyzing the relationships between learners' motivation and observable engaged behaviors in a gamified learning environment. *International Jthenal of Human-Computer Studies*, *154*, 102670. https://doi.org/10.1016/j.ijhcs.2021.102670

Lee, Z. W., Cheung, C. M., & Chan, T. K. (2021). Understanding massively multiplayer online role-playing game addiction: A hedonic management perspective. *Information Systems Jthenal*, *31*(1), 33-61. https://doi.org/10.1111/isj.12292

Lehrer, C., Wieneke, A., Vom Brocke, J., Jung, R., & Seidel, S. (2018). How big data analytics enables service innovation: materiality, affordance, and the

individualization of service. *Jthenal of Management Information Systems*, *35*(2), 424-460. https://doi.org/10.1080/07421222.2018.1451953

Lei, Y., Guo, Y., Zhang, Y., & Cheung, W. (2021). Information technology and service diversification: A cross-level study in different innovation environments. *Information & Management*, *58*(6), 103432. https://doi.org/10.1016/j.im.2021.103432

Leidner, D. E., Gonzalez, E., & Koch, H. (2020). An affordance perspective of enterprise social media and organizational socialization. In *Strategic Information Management* (pp. 364-402). Routledge. https://doi.org/10.1016/j.jsis.2018.03.003

Leonardi, P. M. (2013). When does technology use enable network change in organizations? A comparative study of feature use and shared affordances. *MIS quarterly*, 749-775.

Leonardi, P. M. (2017). The social media revolution: Sharing and learning in the age of leaky knowledge. *Information and Organization*, *27*(1), 47-59. https://doi.org/10.1016/j.infoandorg.2017.01.004

Li, S. C., & Pow, J. C. (2011). Affordance of deep infusion of one-to-one tablet-PCs into and beyond classroom. *International Jthenal of Instructional Media*, *38*(4), 319-326.

Liikkanen, L. A., & Gómez, P. G. (2013). Designing interactive systems for the experience of time. Proceedings of the 6th International Conference on Designing Pleasurable Products and Interfaces,

Lim, C., Park, T., & Hong, W. (2012). Developing emoticon support tool based on emotional affordance to facilitate peer feedback in online collaborative Learning. E-Learn: World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education.,

Lin, J.-S., Lee, Y.-I., Jin, Y., & Gilbreath, B. (2017). Personality traits, motivations, and emotional consequences of social media usage. *Cyberpsychology, Behavior, and Social Networking*, *20*(10), 615-623.

Lin, J., Luo, Z., Cheng, X., & Li, L. (2019). Understanding the interplay of social commerce affordances and swift guanxi: An empirical study. *Information & Management*, *56*(2), 213-224. https://doi.org/10.1016/j.im.2018.05.009

Little, B. (2001). Achieving high performance through e-learning. *Industrial and Commercial Training*, *33*, 203-207. https://doi.org/10.1108/EUM0000000005963

Liu, D., Santhanam, R., & Webster, J. (2017). Toward Meaningful Engagement: a framework for design and research of Gamified information systems. *MIS quarterly*, *41*(4).

Majchrzak, A., & Markus, M. L. (2012). Technology affordances and constraints in management information systems (MIS). *Encyclopedia of Management Theory,(Ed: E. Kessler), Sage Publications, Forthcoming*.

Malhotra, A., Majchrzak, A., & Lyytinen, K. (2021). Socio-Technical Affordances for Large-Scale Collaborations: Introduction to a Virtual Special Issue. *Organization Science*, *32*(5), 1371-1390. https://doi.org/10.1287/orsc.2021.1457

Mao, J. (2014). Social media for learning: A mixed methods study on high school students' technology affordances and perspectives. *Computers in Human Behavior*, *33*, 213-223. https://doi.org/10.1016/j.chb.2014.01.002

Markus, M. L., & Silver, M. S. (2008). A foundation for the study of IT effects: A new look at DeSanctis and Poole's concepts of structural features and spirit. *Jthenal of the Association for Information systems*, *9*(10), 5.

Masud, S., Mufarrih, S. H., Qureshi, N. Q., Khan, F., Khan, S., & Khan, M. N. (2019). Academic performance in adolescent students: the role of parenting styles and socio-demographic factors–a cross sectional study from peshawar, Pakistan. *Frontiers in psychology*, *10*, 2497. https://doi.org/10.3389/fpsyg.2019.02497

McKenna, B. (2020). Creating convivial affordances: A study of virtual world social movements. *Information Systems Jthenal*, *30*(1), 185-214.

https://doi.org/10.1111/isj.12256

Merolli, M., Gray, K., & Martin-Sanchez, F. (2014). Therapeutic affordances of social media: emergent themes from a global online survey of people with chronic pain. *Jthenal of Medical Internet Research*, *16*(12), e3494.

Miao, Y., Du, R., & Ou, C. X. (2022). Guanxi circles and light entrepreneurship in social commerce: The roles of mass entrepreneurship climate and technology affordances. *Information & Management*, *59*(1), 103558. https://doi.org/10.1016/j.im.2021.103558

Morie, J. F., Williams, J., Dozois, A., & Luigi, D.-P. (2005). *The Fidelity of'Feel': Emotional Affordance in Virtual Environments*.

Nicholson, P. (2007). A history of e-learning: Echoes of the pioneers. *Computers and education: E-learning, from theory to practice*, 1-11.

Norman, D. (2002). Emotion & design: attractive things work better. *interactions*, *9*(4), 36-42.

Norman, D. (2004). Affordances and design. *Unpublished article, available online at: http://www. jnd. org/dn. mss/affordances-and-design. html*.

Norman, D. A. (1988). *The psychology of everyday things*. Basic books.

Norman, D. A. (1999). Affordance, conventions, and design. *interactions*, *6*(3), 38-43.

Ofosu-Ampong, K., & Boateng, R. (2020). Motivation and information affordances

towards user engagement in a gamified system. Proceedings of the Southern Association for Information Systems Conference,

Osmundsen, K. S., Meske, C., & Thapa, D. (2022). Familiarity with digital twin totality: Exploring the relation and perception of affordances through a Heideggerian perspective. *Information Systems Jthenal*. https://doi.org/10.1111/isj.12383

Pechenkina, E., Laurence, D., Oates, G., Eldridge, D., & Hunter, D. (2017). Using a gamified mobile app to increase student engagement, retention and academic achievement. *International Jthenal of Educational Technology in Higher Education*, *14*(1), 1-12. https://doi.org/10.1186/s41239-017-0069-7

Pellas, N., & Kazanidis, I. (2014). Engaging students in blended and online collaborative ctheses at university level through Second Life: Comparative perspectives and instructional affordances. *New Review of Hypermedia and Multimedia*, *20*(2), 123-144. https://doi.org/10.1080/13614568.2013.856958

Perman, G. (2014). *Balanced time perspective as a mediator of the relationship between mindfulness and subjective well-being: A cross sectional study*. University of Surrey (United Kingdom).

Pibernik, J., Dolić, J., Vistid, A., & Mandić, L. (2019). Time Affordance Components impact on User's Experience. 2019 International Symposium ELMAR,

Prakasam, N., & Huxtable-Thomas, L. (2021). Reddit: Affordances as an enabler for

shifting loyalties. *Information Systems Frontiers*, *23*(3), 723-751. https://doi.org/10.1007/s10796-020-10002-x

Prnewswire. (2022). *E-Learning Market Size Surpassed $315 Billion In 2021 And Projected To Hit 20% CAGR From 2022 To 2028*. Retrieved December 16 from

Rajanen, M., & Rajanen, D. (2017). Usability benefits in gamification. *GamiFIN*, *87*, 95.

Rambusch, J., & Susi, T. (2008). The challenge of managing affordances in computer game play. *Human IT: Jthenal for Information Technology Studies as a Human Science*, *9*(3).

Raymond, C. M., Kyttä, M., & Stedman, R. (2017). Sense of place, fast and slow: The potential contributions of affordance theory to sense of place. *Frontiers in psychology*, *8*, 1674. https://doi.org/10.3389/fpsyg.2017.01674

Roblyer, M. D., & Wiencke, W. R. (2003). Design and use of a rubric to assess and enctheage interactive qualities in distance ctheses. *The American jthenal of distance education*, *17*(2), 77-98. https://doi.org/10.1207/S15389286AJDE1702_2

Rockmann, R., & Maier, C. (2019). On the fit in fitness Apps: studying the interaction of motivational affordances and users' goal orientations in affecting the benefits gained.

Saputra, M. R. U., & Risqi, M. (2015). LexiPal: Design, implementation and evaluation of gamification on learning application for dyslexia. *International Jthenal of Computer Applications*, *131*(7), 37-43.

Schick, A.-R., Henkel, C., Kranz, J., & Fiedler, M. (2016). The role of motivational affordances and institutional logics in IS-enabled organizational sustainability transformations-A research agenda.

Serge, S. R., Priest, H. A., Durlach, P. J., & Johnson, C. I. (2013). The effects of static and adaptive performance feedback in game-based training. *Computers in Human Behavior*, *29*(3), 1150-1158.

Sheer, V. C., & Rice, R. E. (2017). Mobile instant messaging use and social capital: Direct and indirect associations with employee outcomes. *Information & Management*, *54*(1), 90-102. https://doi.org/10.1016/j.im.2016.04.001

Sheldon, K. M., Elliot, A. J., Kim, Y., & Kasser, T. (2001). What is satisfying about satisfying events? Testing 10 candidate psychological needs. *Jthenal of personality and social psychology*, *80*(2), 325-339. https://doi.org/10.1037/0022-3514.80.2.325

Shipp, A. J., & Aeon, B. (2019). Temporal focus: Thinking about the past, present, and future. *Current Opinion in Psychology*, *26*, 37-43.

Still, J. D., & Dark, V. J. (2010). Examining working memory load and congruency

effects on affordances and conventions. *International Jthenal of Human-Computer Studies*, *68*(9), 561-571. https://doi.org/10.1016/j.ijhcs.2010.03.003

Stolarski, M., & Witowska, J. (2017). Balancing one's own time perspective from aerial view: metacognitive processes in temporal framing. *Time perspective: Theory and practice*, 117-141.

Suh, A., Cheung, C. M., Ahuja, M., & Wagner, C. (2017). Gamification in the workplace: The central role of the aesthetic experience. *Jthenal of Management Information Systems*, *34*(1), 268-305. https://doi.org/10.1080/07421222.2017.1297642

Sun, R., Zhu, H., & Guo, F. (2023). Impact of content ideology on social media opinion polarization: The moderating role of functional affordances and symbolic expressions. *Decision Support Systems*, *164*, 113845. https://doi.org/10.1016/j.dss.2022.113845

Sun, Y., Shao, X., Li, X., Guo, Y., & Nie, K. (2019). How live streaming influences purchase intentions in social commerce: An IT affordance perspective. *Electronic Commerce Research and Applications*, *37*, 100886. https://doi.org/10.1016/J.ELERAP.2019.100886

Sun, Y., Shao, X., Li, X., Guo, Y., & Nie, K. (2020). A 2020 perspective on "How live streaming influences purchase intentions in social commerce: An IT affordance

perspective". *Electronic Commerce Research and Applications*, *40*, 100958. https://doi.org/10.1016/j.elerap.2020.100958

Suri, G., Sheppes, G., Young, G., Abraham, D., McRae, K., & Gross, J. J. (2018). Emotion regulation choice: The role of environmental affordances. *Cognition and Emotion*, *32*(5), 963-971.

Sutcliffe, A. G., Gonzalez, V., Binder, J., & Nevarez, G. (2011). Social mediating technologies: Social affordances and functionalities. *International Jthenal of Human-Computer Interaction*, *27*(11), 1037-1065. https://doi.org/10.1080/10447318.2011.555318

Taipale, S. (2014). The affordances of reading/writing on paper and digitally in Finland. *Telematics and Informatics*, *31*(4), 532-542.

Tan, F. T. C., Tan, B., Lu, A., & Land, L. (2017). Delivering disruption in an emergent access economy: A case study of an e-hailing platform. *Communications of the Association for Information Systems*, *41*(1), 22. https://doi.org/10.17705/1CAIS.04122

Tang, J., & Zhang, P. (2019). Exploring the relationships between gamification and motivational needs in technology design. *International Jthenal of Crowd Science*, *3*(1), 87-103.

Thapa, D., & Sein, M. K. (2018). Trajectory of A ffordances: Insights from a case of

telemedicine in Nepal. *Information Systems Jthenal*, *28*(5), 796-817. https://doi.org/10.1111/isj.12160

Tim, Y., Ouyang, T., & Zeng, D. (2020). Back to the future: Actualizing technology affordances to transform Emperor Qin's terracotta warriors Museum. *Information & Management*, *57*(8), 103271. https://doi.org/10.1016/j.im.2020.103271

Ugur, E., Sahin, E., & Öztop, E. (2009). Affordance learning from range data for multi-step planning. EpiRob.,

Urh, M., Vukovic, G., & Jereb, E. (2015). The model for introduction of gamification into e-learning in higher education. *Procedia-Social and Behavioral Sciences*, *197*, 388-397.

Van Osch, W., & Cthesaris, C. K. (2017). A Strategic Social Action Framework: Theorizing and analyzing the alignment of social media affordances and organizational social action. *Jthenal of Organizational Computing and Electronic Commerce*, *27*(2), 99-117. https://doi.org/10.1080/10919392.2017.1297643

van Vugt, H. C., Hoorn, J. F., Konijn, E. A., & de Bie Dimitriadou, A. (2006). Affective affordances: Improving interface character engagement through interaction. *International Jthenal of Human-Computer Studies*, *64*(9), 874-888.

https://doi.org/10.1016/j.ijhcs.2006.04.008

Varelas, M., Kotler, R. T., Natividad, H. D., Phillips, N. C., Tsachor, R. P., Woodard, R., Gutierrez, M., Melchor, M. A., & Rosario, M. (2022). “Science theatre makes you good at science”: Affordances of embodied performances in urban elementary science classrooms. *Jthenal of Research in Science Teaching*, *59*(4), 493-528.

Vuori, V., Helander, N., & Okkonen, J. (2019). Digitalization in knowledge work: the dream of enhanced performance. *Cognition, Technology & Work*, *21*(2), 237-252.

Waizenegger, L., McKenna, B., Cai, W., & Bendz, T. (2020). An affordance perspective of team collaboration and enforced working from home during COVID-19. *European Jthenal of Information Systems*, *29*(4), 429-442. https://doi.org/10.1080/0960085X.2020.1800417

Wan, L. (2010). Application of web 2.0 technologies in e-learning context. 2010 International Conference on Networking and Digital Society,

Wan, Z., Wang, Y., & Haggerty, N. (2008). Why people benefit from e-learning differently: The effects of psychological processes on e-learning outcomes. *Information & Management*, *45*(8), 513-521. https://doi.org/10.1016/j.im.2008.08.003

Wang, L., Sun, Y., & Luo, X. (2022). Game affordance, gamer orientation, and in-game purchases: A hedonic–instrumental framework. *Information Systems Jthenal*. https://doi.org/10.1111/isj.12384

Wang, N. T., Carte, T. A., & Bisel, R. S. (2020). Negativity decontaminating: Communication media affordances for emotion regulation strategies. *Information and Organization*, *30*(2), 100299. https://doi.org/10.1016/j.infoandorg.2020.100299

Wang, P., Li, H., & Suomi, R. (2016). Value co-creation in business via social media: a technology affordance approach.

Wang, V., & Cranton, P. (2014). Transformative learning and technology in adult and vocational education. In *Adult and Continuing Education: Concepts, Methodologies, Tools, and Applications* (pp. 1102-1113). IGI Global. https://doi.org/10.4018/jicte.2013010103

Weiser, P., Bucher, D., Cellina, F., & De Luca, V. (2015). A taxonomy of motivational affordances for meaningful gamified and persuasive technologies. EnviroInfo and ICT for Sustainability 2015,

Willermark, S., & Islind, A. S. (2022). Seven educational affordances of virtual classrooms. *Computers and Education Open*, *3*, 100078.

Wosnitza, M., & Volet, S. (2005). Origin, direction and impact of emotions in social

online learning. *Learning and instruction*, *15*(5), 449-464.

Wu, L., Hsieh, P.-J., & Wu, S.-M. (2022). Developing effective e-learning environments through e-learning use mediating technology affordance and constructivist learning aspects for performance impacts: Moderator of learner involvement. *The Internet and Higher Education*, *55*, 100871.

Xiangming, L., & Song, S. (2018). Mobile technology affordance and its social implications: A case of "Rain Classroom". *British Jthenal of Educational Technology*, *49*(2), 276-291.

Xu, H. L., & Moloney, R. (2011). " It Makes the Whole Learning Experience Better": Student Feedback on the Use of the Interactive Whiteboard in Learning Chinese at Tertiary Level. *Asian Social Science*, *7*(11), 20. https://doi.org/10.5539/ass.v7n11p20

Yang, A. C., Chen, I. Y., Flanagan, B., & Ogata, H. (2022). How students' self-assessment behavior affects their online learning performance. *Computers and Education: Artificial Intelligence*, *3*, 100058.

Zahedi, F. M., Zhao, H., Sanvanson, P., Walia, N., Jain, H., & Shaker, R. (2022). My Real Avatar has a Doctor Appointment in the Wepital: A System for Persistent, Efficient, and Ubiquitous Medical Care. *Information & Management*, *59*(8), 103706. https://doi.org/10.1016/j.im.2022.103706

Zembylas, M., & Vrasidas, C. (2004). Emotion, Reason, and Information and Communication Technologies in Education: Some issues in a post-emotional society. *E-Learning and Digital Media*, *1*(1), 105-127.

Zhang, P. (2008). Motivational affordances: Reasons for ICT design and use. *Communications of the ACM*, *51*(11), 145-147.

Zhao, Y., & Tang, J. (2016). Exploring the motivational affordances of Danmaku video sharing websites: Evidence from gamification design. International Conference on Human-Computer Interaction,

Zheng, Y., & Yu, A. (2016). Affordances of social media in collective action: the case of Free Lunch for Children in China. *Information Systems Jthenal*, *26*(3), 289-313. https://doi.org/10.1111/isj.12096

Zhou, A. (2021). Causal effects of affordance change on communication behavior: Empirical evidence from organizational and leadership social media use. *Telematics and Informatics*, *59*, 101549.

Zhou, X., Krishnan, A., & Dincelli, E. (2022). Examining user engagement and use of fitness tracking technology through the lens of technology affordances. *Behavithe & Information Technology*, *41*(9), 2018-2033.