Unveiling the Strength of Digital Objects: The Impact of the Digital Object Concept on Technology Acceptance

Christopher B. Califf
Western Washington University
califfc@wwu.edu

Mark C. Springer
Western Washington University
springer@wwu.edu

Abstract

Research in developmental psychology suggests that humans possess innate cognitive principles that shape how we make sense of objects: cohesion, continuity, and contact. This paper applies these ideas to IS research to introduce the digital object concept framework and scale. Grounded in Spelke's core knowledge theory, the framework identifies three principles (digital object cohesion, digital object continuity, and digital object contact) that shape individuals' understanding of digital objects. To measure the strength of individuals' digital object concepts, a scale was developed. The scale was tested in relation to perceived usefulness, ease of use, and intention to use, revealing positive and significant relationships. This study enhances the understanding of cognitive processes in technology usage and provides a valuable lens and measurement tool for IS researchers to use in multiple research streams. IS professionals can use this paper to help identify strong and weak digital object concepts in employees.

Keywords: digital object, technology usage, technology acceptance, perception, psychology

1. Introduction

The information systems (IS) discipline has long relied on ideas based on the *perception* of technology and the *perception* of the characteristics of technology. These ideas rooted in perception often serve as the foundations of frameworks and survey constructs that help IS researchers understand and analyze the impact of technology in various organizational contexts (e.g., Davis, 1989; Venkatesh et al., 2000). For example, Markus and Silver (2008) note in their 2008 paper on affordances that it is "common practice today in the information technology (IT) diffusion and technology acceptance literature to characterize innovations by measuring adopters' *perceptions* of the technology" (p. 617, emphasis added). IS researchers often use perception-based constructs like perceived usefulness, perceived ease of use, perceived relative advantage, and perceived enjoyment to gauge users' attitudes and intentions toward using technology (Davis 1989; Venkatesh et al. 2000). These constructs are still widely used today in a variety of contexts and streams of research such as technostress (e.g., Califf et al., 2020).

Ideas rooted in perception not only guide those researching IT diffusion or acceptance or, more broadly, those engaged in survey research; perception-based ideas also govern a wide range of interpretive research. For example, a more recent tendency in IS research is to utilize the concept of affordances to understand the relationship between the user and the IT artifact (e.g., Bernhard et al., 2013; Strong et al., 2014). These ideas stem from James Gibson, an ecological psychologist, who studied animals' *perceptions* of their surroundings. Originally, Gibson's ideas of affordances were based on perception. In his influential 1979 article, for example, Gibson states: "The observer may or may not *perceive* or attend to the affordance, according to his needs, but the affordance, being invariant, is always there to be *perceived*" (1979, p. 139, emphasis added).

Overall, it can be argued that IS researchers have generally relied on the idea that technology and the features of the technology are perceived by the user, and that perception plays a crucial role in how a user interacts with and relates to technology. The tendency to conceptualize technology in terms of user perception is commonly attributed to a paper by Downs and Mohr (1976) on technological innovations, which they refer to as objects (Markus & Silver, 2008). For example, Downs and Mohr (1976) argue that objects can be understood by researchers in two ways: (1) primary characteristics or (2) secondary characteristics. Primary characteristics, they say, are "essential to the object and so are inherent in whether they are perceived or not," while secondary characteristics are "perceived by the senses, and so may be differently estimated by different participants" (Downs & Mohr, 1976, p. 703). The authors conclude that researchers studying technology should include both primary and secondary characteristics in their work. While much of IS research now includes both primary and secondary characteristics, much of it is still based on the idea of perception.

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Research in developmental psychology suggests that, though perception is indeed important, humans *do not perceive* objects; at their core, humans *conceive* objects (Spelke, 1988; Spelke & Kinzler, 2007). That is, humans conceive of objects in the same way we reason about the world. Before perceiving the features of an object, individuals must form an *object concept* through *innate principles*. Without a strong object concept, individuals cannot perceive the features of an object. This research is attributed to Elizabeth Spelke, a cognitive psychologist at Harvard University. After decades of research, Spelke argues that humans have innate cognitive principles that shape how we make sense of objects. These innate principles are called cohesion, continuity, and contact. Spelke contends that humans use the principles of cohesion, continuity, and contact to form cognitive representations of an object called an object concept (Spelke, 1988, 2000; Spelke & Kinzler, 2007). Moreover, Spelke argues that it is difficult to anticipate or achieve actions through objects without forming an object concept (Spelke & Kinzler, 2007; Kinzler & Spelke, 2007).

In this paper, we adopt and apply Spelke's innate principles to IS research with the goal of offering a framework and a tool for IS researchers to study innate principles involved in forming the *digital object concept*. To do so, we apply Spelke's ideas to argue that technology users use innate principles to form a digital object concept. Using that lens, we design a survey tool that enables researchers to investigate individuals' digital object concepts. The scale includes three constructs inspired by the three innate principles in Spelke's work: digital object cohesion, digital object continuity, and digital object contact. The scale measures the strength of the individual's digital object concept, and specifically answers the question: does an individual have a strong or a weak concept of the digital object they are using? We then test the validity and reliability of the constructs and items in the digital object concept scale and test its effects on perceptual variables widely used by IS researchers: perceived usefulness and perceived ease of use. We do so by analyzing survey data of 1049 users of technology across a variety of professions.

Overall, the paper makes the following contributions to IS research. First, we argue that, while individuals indeed make sense of technology by perceiving its features, they must form a concept of the digital object first, and that the digital object concept represents the core of the sense-making process. Second, we offer insight into how to evaluate the extent to which the digital object concept is formed in the individual through a survey tool that involves three constructs. Third, we demonstrate how IS researchers can investigate the effects of the digital object concept on technology acceptance variables. Fourth, we show that the digital object concept is critical for users to accept and to use technology. This paper is also valuable to IS professionals; they can utilize the digital object concept lens and scale to assess users' understanding and perception of digital objects, enabling them to identify individuals with weak digital object concepts and provide targeted support to improve their technology acceptance and usage. The digital object concept scale can also be used to aid in the design and development of more user-friendly interfaces based on innate cognitive principles.

2. Literature Review

2.1. Perception, core knowledge, and the object concept

Humans organize the world into objects. Philosophers and researchers have studied and debated how this occurs for centuries. Several viewpoints have developed, with most involving the concept of sensemaking through perception. For example, empiricists argue that humans gain an understanding of objects by perceiving their sensible properties (Baillargeon, 2008; Spelke, 1988). Perception, in this way, involves individuals processing sensory information about an object through sight, sound, touch, and so on. In this view, empiricists argue that knowledge about objects is derived from sensory experiences and that such sensory perception is the primary source of our understanding of the world. Empiricist ideas about perception and knowledge have dominated investigations of how humans make sense of objects since many of the leading psychologists in the 20th century, such as Watson (1924), Skinner (1938), and Piaget (1954), have based their work on these ideas.

Other views of perception, however, are also acknowledged. For example, in the early-mid 20th century, gestalt psychologists argued that perception is not just a collection of isolated sensations but a process that involves the organization and interpretation of sensory information as meaningful patterns (Koffka, 1935; Wertheimer, 1958). Additionally, in the 1960s and 1970s (and later), James Gibson, whose views many IS researchers have adopted, offered an ecological viewpoint of perception. Perception, in Gibson's view, involves humans perceiving properties of the world (and objects) that are relevant to action; such properties are invariant, and the perceiver acts on the properties according to their needs (Gibson, 1979).

In 1988, Elizabeth Spelke claimed that the ideas about object perception from empiricists, gestalt psychologists, and ecological psychologists were "wrong" (Spelke, 1988, p. 198). Specifically, Spelke (1988) stated:

> "We have conducted research that suggests that all these approaches to object perception are wrong. In our studies of human infants, the organization of the perceptual world does not appear to mirror the sensory properties of scenes, it does not appear to follow from gestalt principles of organization, and it does not appear to depend on invariant-detectors…" (Spelke, 1988, p. 198).

Spelke's (1998) claim is that humans do not make sense of objects based on perception at all. Rather, humans conceive of objects through reason, not through sensible properties of objects. Her research has shown that infants, as well as adults, possess innate principles that "guide the organization of the perceived world into units" (Spelke 1988, p. 198).

Over the last few decades, Spelke has developed these ideas into a theory called core knowledge theory (Spelke, 2000; Spelke and Kinzler, 2007). Core knowledge theory suggests that humans are born with innate, specialized cognitive abilities that enable us to acquire and organize knowledge about the physical, biological, and social worlds (Spelke, 2000). Core knowledge theory is comprised of four core knowledge systems: (1) core knowledge of objects, (2) core knowledge of agents, (3) core knowledge of spatial relationships, and (4) core knowledge of numerosity (Kinzler and Spelke, 2007; Spelke and Kinzler, 2007). For this article's purposes, we focus on the innate principles in the core knowledge of objects, which is the most widely studied core knowledge system.

The core knowledge system of objects, also referred to as object cognition or object representation, is the idea that humans have innate cognitive principles that enable us to comprehend and interact with physical objects. These principles form the foundation for our understanding of objects. Spelke's research suggests that infants as young as three months old, as well as adults, possess three core object principles that are independent of sensory perception (Spelke, 2000). The three principles that comprise the core knowledge system of objects are the principle of cohesion, the principle of continuity, and the principle of contact.

The *principle of object cohesion* is the principle that the object has specific boundaries and stays consistent and clear over time (Spelke & Kinzler, 2007). This principle enables humans to perceive object boundaries. The *principle of object continuity* states that objects move on connected, unobstructed paths and cannot spontaneously appear or disappear (Baillargeon 2008). This principle enables humans to perceive objects as complete shapes as they move in and out of view. The *principle of object contact* states that objects do not interact at a distance; that is, objects only move through contact (Bloom 2005). This principle enables humans to predict when objects move and will stop (Spelke & Kinzler, 2007).

The principles of cohesion, continuity, and contact form an initial object concept in infants and represent the core of the object concept in adults (Spelke, 1988). The object concept refers to the cognitive understanding and mental representation of objects as discrete entities with specific properties, boundaries, and persisting identities. Without cohesion, continuity, and contact, humans could not divide the world into objects, and, therefore, could not identify, interact with, or act through distinct objects or features of objects.

The object concept is presented by Spelke and colleagues as involving thought, not perception. This relates to answering the following questions: what is perception, what is thought, and how are they related? For example, Spelke argues that humans have separate cognitive systems involving perception and thought. Perception involves sensory features, such as color or weight (Spelke and Kinzler, 2007). Indeed, perception helps individuals distinguish between several object types. Perception, however, does not "package the world into units" (Spelke 1988). That is, the information perceived by the observer needs a core object concept attached to it. Thought, therefore, helps the individual organize the perceived world into units, one of which is the object concept (Spelke 1988). In this sense, the object concept involves thought, not perception (Spelke and Kinzler 2007). Overall, perception provides the raw sensory input for thought to process and analyze, and thought can shape how we interpret and make sense of sensory information; they interact and influence each other.

2.2. The digital object concept

The IS discipline often theorizes technology as digital objects, which possess both physical and nonphysical modes of being (Faulkner & Runde, 2019). Digital objects have physical properties, often called material, and nonphysical properties, often called immaterial (Leonardi 2010). Individuals use those physical and nonphysical properties to make sense of digital objects, often through system features and symbolic expressions (Leonardi 2010; Markus and Silver 2008). Through a process of sense-making, the user of the digital object interprets and reinterprets the object's general intent and purpose through its structural features and symbolic expressions (DeSansctis & Poole, 1994; Cheikh-Ammar, 2018; Markus & Silver, 2008).

How a user makes sense of and anticipates acting through the digital object is often guided by the underlying assumption of perception. That is, the user is assumed to make sense of the object and how to use and act through the object's physical and nonphysical properties by perceiving them. While this assumption may be true, we argue that IS research has focused on perception in isolation and overlooked the possibility of perception leading to forming a thought about the digital object in the form of a digital object concept. For this latter model of perception, we assume that the principles that form the object concept also apply to forming a digital object concept, and therefore help the user make sense of the object and how to anticipate acting on the object through its features.

We introduce the digital object concept as based on the innate principles embedded in the core knowledge of objects (Spelke, 1988, 2000). We define *the digital object concept* as the user's cognitive understanding and mental representation of the digital object as a discrete entity with specific properties, boundaries, and a persisting identity. Like the object concept, the digital object concept is comprised of three innate principles: digital object cohesion, digital object continuity, and digital object contact. The *principle of digital object cohesion* is the principle that the technology and its associated features have specific boundaries and stay consistent and clear over time; moreover, the design of the software and the function of features technology (and general intent of technology) is clear. This principle enables technology users to perceive the boundaries of the digital object and its features. The *principle of digital object continuity* is the principle that technology and features cannot spontaneously appear or disappear. This principle gives technology users the ability to perceive digital objects and their features as complete shapes as they move in and out of view; they will not just suddenly disappear. The *principle of digital object contact* is the principle that technology functions through contact; the features are not going to function unless something contacts them. This principle involves predicting how the features will function and when they will (and will not) function.

Table 1: The Digital Object Concept: Principles and Definitions

Term	Definition
Digital Object Concept	The user's cognitive understanding and mental representation of the digital object as a discrete entity with specific properties, boundaries, and a persisting identity.
Principle of digital object cohesion	The principle that the technology and its associated features have specific boundaries and stay consistent and clear over time.
Principle of digital object continuity	The principle that technology and features cannot spontaneously appear or disappear.
Principle of digital object contact	The principle that technology functions through contact; the features are not going to function unless something contacts them.

2.3. The digital object concept and technology acceptance/usage

One of the main (and well-known) areas of IS research that emphasizes the perception of the features of the digital object is the area of technology acceptance. For example, the technology acceptance model is grounded in a four-stage theoretical process: system design features influence a cognitive response (perceived usefulness and perceived ease of use), an affective response (intention to use), and a behavioral response (actual use) (Davis, 1993). The technology acceptance model and its associated constructs have influenced countless other research articles that rely on a similar structure with similar constructs. To show the importance of the digital object concept in guiding user perceptions, as well as the role of the digital object concept in technology acceptance and usage, in this section we theorize and hypothesize how the digital object concept and its associated principles play a role in technology usage through the lens of the technology acceptance model.

The technology acceptance model is based on the theory of reasoned action, which explains human behavior based on individuals' attitudes, beliefs, and subjective norms (Fishbein & Ajzen, 1975). The constructs that make up the technology acceptance model are based on the theory of reasoned action and the idea of *beliefs* about technology and the consequences of using technology and its features; that is, how useful the features will be and how easy to it will be to use the features. For example, perceived usefulness is defined by Davis (1989) as "the degree to which a person believes that using a particular system would enhance his or her job performance" while perceived ease of use is defined as "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989, p. 320). Moreover, the intention to use the system is positioned as the cognitive belief that the user anticipates acting through the technology in use (Venkatesh et al., 2000).

As we discussed above, the object concept guides how individuals form perceptions of the properties or features of their environment (Spelke, 1988, 2000; Spelke & Kinzler, 2007). The object concept also shapes how individuals anticipate acting through the object through object-directed action (Spelke, 2000; Robson & Kuhlmeier, 2016). The object concept is formed through three innate principles: cohesion, continuity, and contact

(Spelke & Kinzler, 2007). In the context of technology acceptance, we argue that the principles that comprise the digital object concept (digital object cohesion, digital object continuity, and digital object contact) relate to the perceptions of the technology's features in terms of perceived usefulness, perceived ease of use, and intention to use. Therefore, we hypothesize that:

Hypothesis 1: The digital object concept (comprised of digital object cohesion, continuity, and contact) is positively related to perceived usefulness.

Hypothesis 2: The digital object concept (comprised of digital object cohesion, continuity, and contact) is positively related to perceived ease of use.

Hypothesis 3: The digital object concept (comprised of digital object cohesion, continuity, and contact) is positively related to intention to use.

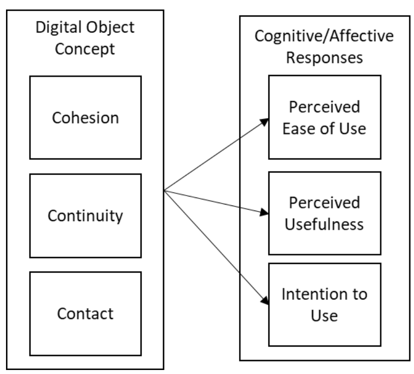

Figure 1. Research Model

3. The digital object concept scale

Below, first, we introduce the digital concept scale and discuss the formation of the scale through the scale development process (MacKenzie et al., 2011). Then, we show how the digital object concept relates to perceived usefulness, perceived ease of use, and intention to use (hypotheses 1, 2, and 3).

3.1. Scale formation and survey development

We first examined relevant IS and psychology literature to identify the initial set of items for each of the three principles that comprise the digital object concept, and to develop a conceptual definition of the constructs. The constructs we established are digital object cohesion, digital object continuity, and digital object contact (see Table 1 for their definitions). Once the definitions for each of the three constructs were formed, we generated items to represent each construct. Then we assessed the content validity of the items by sending the definitions and items to colleagues in the academic field and in business organizations. Colleagues commented on the readability, validity, and meaning behind each construct and associated items. Overall, eleven individuals commented on the items. After analyzing their comments, we revised the measurement items so that they could be included in a pretest.

Next, we conducted a pretest. To do so, we formally specified the measurement model and prepared the questions in questionnaire form. The pretest involved sending the items to undergraduate students at universities in the United States. Students were given extra credit for taking the survey. Overall, we analyzed 243 responses from university students. We analyzed the responses to further refine the items so that we could conduct a larger study.

We then sent the refined items and other constructs in a questionnaire to individuals employed in various industries across the world. The questionnaire contained the three digital object concept constructs as well as existing constructs such as perceived usefulness, perceived ease of use, and intention to use. The latter three constructs were adopted from Venkatesh et al. (2000). We administered the questionnaire in two ways: First, we sent the questionnaire to teachers employed in the Pacific Northwest region of the United States; then, we posted the questionnaire on Amazon's Mechanical Turk platform to gather data from industry professionals. Each participant was asked if they were interested in completing a questionnaire about how they use technology at work. The participants were told that the survey was voluntary and that their responses would remain confidential. Both groups—teachers and Mechanical Turk respondents—were asked the same questions. After analyzing the data for missing values and unengaged responses, 1,049 individuals were included in the study. Table 2 shows some demographics of the sample.

3.2. Analysis: identifying factors

The first step of the analysis involved a factor analysis of the items included in the digital object concept scale as well as the variables included in our research model. Ideally, each construct should load separately since it should represent its own concept. Overall, there were 22 items originally identified for the digital object concept scale and the three technology acceptance constructs. Twelve of these items were identified as representing the three principles that comprise the digital object concept, while the rest reflected the variables of perceived usefulness, perceived ease of use, and intention to use.

Given the exploratory nature of our project—building three new constructs and testing them on existing ones—we conducted an exploratory factor analysis to identify the structure of the measurement items. The exploratory factor analysis indicated that the measure of sampling adequacy was 0.914, well above the 0.80 recommendation (Hair et al., 2014).

Table 2. Sample Characteristics

Gender	*Frequency*
Male	596
Female	440
Non-binary/third gender	5
Prefer not to say	2
Other	2
Missing	4
Total	1049
Age	Frequency
Below 25	98
26 to 35	444
36 to 45	268
46 to 55	150
56 to 65	70
Above 65	17
Missing	2
Total	1049
Education	*Frequency*
High School	85
Two-year College	60
Bachelor's degree	530
Master's degree	345
Other	26
Missing	3
Total	1049

The total variance explained was 69.82%. Items that had communalities less than 0.3 were removed. The results of the factor analysis are shown in Table 3. A six-factor structure was identified. All items had factor loadings greater than 0.05, and there were no cross-loadings greater than 0.4.

After each factor was identified in the factor analysis, we calculated the reliability, means, and standard deviations of each factor. The reliability was calculated using Cronboch's alpha. All the factors have reliability above the recommended value of 0.70 (Hair et al. 2014). The factors, items, means, and standard deviations are shown in Table 4. Table 4 also includes the individual items for each factor.

3.3. Analysis: structural model

Once the factor structure was identified and each of the constructs was deemed reliable and valid, we examined the structural relationships between the digital object concept and perceived usefulness, perceived ease of use, and intention to use. To do so, we used the structural equation modeling software AMOS. To identify the role of the digital object concept, we modeled the three innate principles—the digital object, digital object cohesion, and digital object continuity—into a second-order construct called the digital object concept. The digital object concept measures the strength of one's digital object concept, with higher numbers indicating a more fully formed concept. We then tested the relationship between the second-order factor and perceived usefulness, perceived ease of use, and intention to use. Figure 2 shows the results of the structural analysis and the digital object concept as a second-order factor. Table 5 shows the goodness of fit measures for the structural model. Table 6 shows the results of the structural analysis.

The structural model showed a good fit with the data (Hair et al., 2014). Our model has a sample size greater than 250 with less than twelve statistical variables. For this criterion, our model meets or exceeds the standard goodness of fit measures: greater than 0.92 for CFI, 0.08 or less for SRMR, and 0.07 or less for RMSEA (Hair et al., 2014). Our chi-square was significant; while our chi-square/df measure was greater than 2, this is to be expected with a large sample size (Hair et al., 2014).

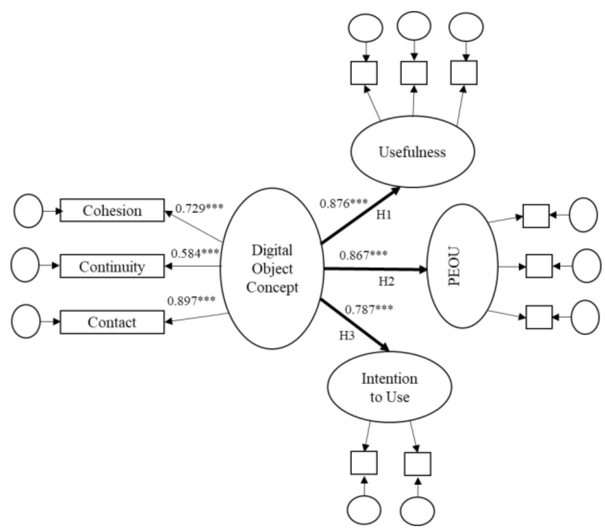

Figure 2. Relationship among the digital object concept, perceived usefulness, perceived ease of use, and intention to use

Table 3: Rotated Component Matrix

	Factor					
	1	2	3	4	5	6
Cohesion_1	.863					
Cohesion_2	.629					
Cohesion_3	.755					
Continuity_1		.745				
Continuity _2		.732				
Continuity _3		.728				
Continuity _4		.693				
Contact_2			.759			
Contact_3			.707			
Contact_4			.766			
Usefulness_1				.778		
Usefulness_2				.728		
Usefulness_3				.715		
PEOU_2					.873	
PEOU_3					.616	
PEOU_4					.580	
Intent_1						.743
Intent_2						.815
Notes: Usefulness = perceived usefulness; PEOU = perceived ease of use.						

Table 4. Mean, Standard Deviation, Reliability (Alpha), and Measurement Items of Variables in EFA

		Mean	Std. Deviation
Innate Principles			
Digital Object Cohesion (Reliability = 0.79)		3.88	0.99
Cohesion_1	The interface of the technology I use for work stays consistent over time.		
Cohesion _2	The technology I use for work behaves in a consistent way.		
Cohesion _3	The design of the technology I use for work is consistent over time.		
Cohesion _4	The software I use for work has a clear design.*		
Digital Object Continuity (Reliability = 0.93)		3.29	1.34
Continuity _1	The technology I use for work shuts down unexpectedly. (R)		
Continuity _2	The technology I use for work unexpectedly stops functioning. (R)		
Continuity _3	The technology I use for work freezes unpredictably. (R)		
Continuity _4	Issues with technology often hinder my work tasks. (R)		
Digital Object Contact (Reliability = 0.82)		4.12	0.88
Contact_1	When I click on an icon it responds in a way I expect it to respond.*		
Contact_2	The technology I use for work behaves in a way I expect it to behave.		
Contact_3	The technology I use for work functions in a way I expect it to function.		
Contact_4	The technology I use at work does what I expect it to do.		

Technology Acceptance Constructs			
Perceived Usefulness		4.15	0.89
Useful_1	The technology I use for work improves my performance in my job.		
Useful_2	The technology I use for my job increases my productivity.		
Useful_3	The technology I use for work enhances my effectiveness in my job.*		
Useful_4	I find the technology I use for work to be useful.		
Perceived Ease of Use		3.90	1.01
PEOU_1	My interaction with the technology I use for work is clear and understandable.*		
PEOU_2	Interacting with the technology I use for work does not require a lot of mental effort.		
PEOU_3	I find the technology I use for work to be easy to use.		
PEOU_4	I find it easy to get the technology I use for work to do what I want it to do.		
Intention to Use		4.25	0.84
Intent_1	On a given workday, I intend to use the available technology to complete work tasks.		
Intent_2	When at work, I predict that I will use the technology available to me.		
Notes: *indicates that item was removed during EFA; (R) = reverse coding; The mean, std. deviation, and alpha for each item in the second-order factor called Hindrance Techno-stressors are not included in this table; reliability for the second-order construct called Hindrance Techno-stressors is in Table 5; reliability, means, and std. deviations for individual hindrance techno-stressor constructs are available upon request.			

Table 5. Model Fit Indices for Structural Model

Chi-square (df)	520 (127)***
CFI	0.95
SRMR	0.04
RMSEA	0.05
*** $p < 0.001$	

Table 6. Relationship Among Digital Object Concept, Perceived Usefulness, Perceived Ease of Use, and Intention to Use

1st Order Factor	2nd Order Factor	Std. Estimates	Hypothesis supported?
Cohesion	<--- DOC	0.729***	
Continuity	<--- DOC	0.584***	
Contact	<--- DOC	0.879***	
Usefulness (H1)	<--- DOC	0.876***	Yes
PEOU (H2)	<--- DOC	0.867***	Yes
Intention to Use (H3)	<--- DOC	0.787***	Yes
Notes: *** $p < .001$; DOC = Digital Object Concept; H = hypothesis			

3.4. Analysis: Discussion of the results

The results of our analysis are important for a few reasons. First, the results of the factor analysis indicate that there is a clear difference between the constructs of digital object cohesion, digital object continuity, digital object contact and the three technology acceptance variables. Moreover, each one of the three constructs in the digital object concept scale loaded on its own factor. This suggests that each of the innate principles indeed exists and is different from the common variables found in the IS literature. Second, each of the three innate principles had a reliability score of over 0.75; this indicates that all three have adequate convergence and internal consistency, and that each of the items in all three constructs consistently represents the same latent construct (Hair et al. 2014). Third, all three hypotheses were supported. The digital object concept was significantly and positively related to perceived usefulness (H1) ($\beta = 0.88$; $p < .001$), perceived ease of use (H2) ($\beta = 0.87$; $p < .001$), and intention to use (H3) ($\beta = 0.79$; $p < .001$). In this sense, one's digital object concept indeed influences one's perception and beliefs about technology. For example, as one's digital object concept strengthens (i.e., increases) so does one's perception of usefulness, ease of use, and intention to use the technology.

4. Contributions

4.1. Contributions to Theory

The role of perception in the IS discipline has persisted over the last several decades. The root of this perception-based research stems from philosophers, empiricists, and psychologists who assume that individuals make sense of objects through their features and characteristics. While this may be true, there is a stream of research in psychology that suggests that objects are conceived rather than perceived, and that three core innate principles comprise an individual's object concept. Moreover, without the object concept, the individual cannot make sense of objects through perception. The goal of this paper was to adapt the innate principles of the core knowledge of objects to the IS discipline and introduce the idea of a digital object concept through three principles. This paper makes several contributions.

First, the paper extends IS research by applying Spelke's core knowledge theory, originally developed to understand how humans make sense of physical objects, to IS research in the realm of digital objects. This application broadens the understanding of the cognitive processes involved in technology usage and offers insights into how individuals make sense of and interact with digital objects. We specifically highlight the role of cohesion, continuity, and contact in forming cognitive representations of digital objects, and, in doing so, we emphasize the importance of these principles in individuals' understanding and interaction with technology. By drawing on principles proposed by Spelke's core knowledge theory, the research contributes to the theoretical understanding of how individuals form mental representations of digital objects, bridging the gap between cognitive and developmental psychology and technology acceptance research. Moreover, by arguing that innate principles are involved in digital object sensemaking, we take a step towards moving beyond perception into thought.

Second, we develop and validate the digital object concept scale. In doing so, we provide a reliable and valid instrument for researchers to assess whether an individual has a strong or weak concept of the digital object they are using, enhancing the ability to study the cognitive processes involved in technology usage. The scale offers a standardized approach to assess the cognitive representations of digital objects and can be used in future studies exploring related phenomena or investigating the impact of the digital object concept on technology acceptance and use.

Third, the study provides empirical evidence supporting the influence of the digital object concept on technology acceptance and usage. By demonstrating the relationship between individuals' mental representations of digital objects and their acceptance of technology, the research contributes to a deeper understanding of the underlying cognitive processes that shape technology adoption and use. Moreover, by examining the relationships between the digital object concept and these variables, the paper contributes to our understanding of how individuals' cognitive processes influence their attitudes and intentions toward using technology.

4.1. Contributions to Practice

The paper makes the following contributions to practice. First, IS professionals can use this study to help design user interfaces and features that align with users' innate cognitive processes (cohesion, continuity, and contact), and, in turn, help to make the technology more intuitive and user-friendly. Second, managers can utilize the link between, first, the digital object concept, and, second, technology acceptance and use, to identify potential barriers to technology adoption within their organization. For example, if users have a weak digital object concept, it may indicate a lack of understanding about the benefits and value that the technology can bring. Third, managers can support decision-making processes by ensuring that information systems provide a coherent and seamless representation of digital objects.

5. Limitations

This paper is not without limitations. First, the research involved a specific sample of 1049 technology users across various fields. While efforts were made to include a diverse range of participants, the findings may not be fully representative of the entire population of technology users. Second, the paper introduces the digital object concept scale as a tool to measure the strength of an individual's digital object concept. While the scale underwent development and validation processes, further research is needed to establish its reliability and validity across different contexts and user groups. The scale may also benefit from refinement and additional psychometric testing to enhance its robustness. Third, the data collected for this study relied on self-reported measures, which may be subject to various biases and limitations. Participants' responses may be influenced by social desirability bias or subjective interpretations of the survey questions. Last, the paper assumes a specific conceptualization of digital objects as entities with both physical and nonphysical properties. However, different theoretical perspectives exist regarding the nature of digital objects, and alternative conceptualizations may yield different results. Future research could explore alternative frameworks and theories to further investigate digital object concepts.

6. Conclusion

This paper provides a lens for understanding how individuals form a digital object concept, drawing from research in developmental psychology on innate cognitive principles: cohesion, continuity, and contact, all of which guide the formation of an object concept. We specifically apply these principles to the context of digital objects, and, in so doing, propose the digital object concept scale, which consists of three constructs: digital object cohesion, digital object continuity, and digital object contact. The scale is designed to measure the strength of an individual's digital object concept. By considering the innate principles that shape the digital object concept, this paper helps to broaden the perspective on how individuals interact with technology, moving beyond the sensemaking of technology through sensory properties to the sensemaking of technology through thought. We also offer valuable insights for researchers and practitioners with the overall goal of further understanding how users understand and engage with digital objects. Overall, this paper enhances our understanding of individuals' cognitive processes in technology usage, offers a framework for studying innate principles in forming the digital object concept, and provides a tool for measuring the strength of individuals' digital object concepts. The paper also demonstrates how the digital object concept relates to technology acceptance and argues that the digital object concept has been a missing but critical part of the user sensemaking process.

7. References

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