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The Adoption and Use of IT Artifacts: A New Interaction-Centric Model for the Study of User-Artifact Relationships

Sameh Al-Natour
The University of British Columbia
sameh@interchange.ubc.ca

Izak Benbasat
The University of British Columbia
benbasat@sauder.ubc.ca

Abstract

The question of why a user adopts an information technology (IT) artifact has received ample research attention in the past few decades. Although recent adoption research has focused on investigating some of the relational and experiential aspects associated with adopting and using IT artifacts, the theories utilized have been static in nature. Furthermore, many have been based on traditional models like TAM and TPB, which focus on the utilitarian benefits that users accrue from their interactions with IT artifacts. Independently, recent research has paid much-needed attention to factors surrounding the use *of IT artifacts. In this paper, we offer an overview of a theoretical model that connects these two interrelated processes.*

Starting with a survey of concepts related to social interactions, we present an argument in support of viewing IT artifacts as social actors, whose characteristics are manifested within the context of interactions. The proposed interaction-centric model highlights how the characteristics of an IT artifact, together with the user's internal system and other structuring factors, affect users' choices in terms of how to utilize the artifact. The nature of that utilization, subsequently, affects the beliefs users form about the artifact and the outcomes from using it. Furthermore, the model proposes that users will also form beliefs about their bond or relationship with the IT artifact. These beliefs do not refer to observations made in a single interaction, but rather concern users' mental representations of past interactions and outcomes. To facilitate the study of the relationship that develops from user-artifact interactions over time, the model describes how past interactions affect future ones. Specifically, it proposes that deciding how to utilize an IT artifact in subsequent interaction, consistent with theories of relationship development, is influenced by already held beliefs about the artifact and the relationship with it.

Keywords: *Electronic Commerce, IT Adoption Models, Online Relationships, IT Artifacts*

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1. Introduction

Explaining user acceptance and continued use of information systems (IS) has taken center stage in IS research for the past three decades (Venkatesh, Davis, and Morris 2007). Traditional models of IS adoption (e.g., Technology Acceptance Model, TAM; Davis 1989) have championed a view of information technology (IT) artifacts as productivity tools. They focused on predicting users' adoption intentions and behaviors using a set of utilitarian-based beliefs (e.g., perceived usefulness) that address the performance benefits from using these artifacts (see Orlikowski and Iacono 2001, for a commentary on the different views of IT artifacts). Recently, this narrow view of IT artifacts has been replaced by the more general view of them as "the application of IT to enable or support some task(s) embedded within a structure(s) that itself is embedded within a context(s)" (Benbasat and Zmud 2003, p. 186). This paradigm shift has ushered in a new era in IS research in which IT artifacts are recognized to assume roles beyond solely enhancing productivity, including serving as communication mediators (e.g., Te'eni 2001) or intelligent decision-making partners (e.g., Komiak and Benbasat 2006).

The recognition of these new roles has resulted in significant changes to the criteria used to evaluate IT artifacts. This has been manifested through the emergence of second-generation adoption models supplemented with new constructs that capture non-utilitarian-based characteristics of IT artifacts. For instance, when investigating IT artifacts that facilitate the communication between individuals, researchers have proposed that users' perceptions concerning the richness of the medium (Ngwenyama and Lee 1997) and its ability to convey social presence (Karahanna and Straub 1999) are important variables.

1.1. Nature of IT Utilization as an Antecedent of IT Adoption and Use

The extension of the roles assumed by IT artifacts was accompanied by increased sophistication of their designs. Technology advancements and the escalation of users' requirements and expectations have resulted in artifacts that perform multiple functions and offer alternatives in how these functions are performed. For example, newly developed decision support systems can be configured to act as providers of information about certain problem domains, as recommenders of possible courses of action, and/or as agents that diagnose and fix problems. In performing these functions, these systems can be configured to follow certain procedures and problem-solving strategies.

These same ideas are also applicable to office productivity tools, in the context of which many of the traditional adoption models were initially, and continue to be, tested. These tools increasingly offer a host of new features, and choices of functions to be performed and procedures to be followed. For instance, while Microsoft's Word 1.0 supported only 100 commands in 1989, current versions of Microsoft Office Word 2003 support around 1,500 distinct commands (Microsoft, 2006).

Users' choices in how to employ an IT artifact affect which of the artifact's features they become exposed to. At minimum, they directly affect what the artifact can achieve. Accordingly, researchers have started focusing on how an IT artifact is utilized rather than simply focusing on its features (some of which may be unused, misunderstood, or undiscovered by users). Specifically, they have more closely looked at "usage" itself; offering taxonomies of its types and demonstrating how the nature of the artifact's utilization affects the benefits attained (e.g., Boffo and Barki 2003; Burton-Jones and Straub 2006).

Similarly, we believe that how an IT artifact is used in a particular interaction establishes the basis for how this artifact is perceived and evaluated by its users. The characteristics of a certain artifact, such as the features it offers, generate options concerning how it can be used. Yet, it is users' *choices* in terms of how to utilize the artifact that determine the relevance of the evaluative criteria used to assess that artifact, and the type of perceptions users form about the artifact during their interaction. Therefore, instead of treating an IT artifact as a *static* bundle of features, the design of which directly affects how it is evaluated by users, we view each *interaction* a user has with an IT artifact as the basic unit of analysis that determines adoption and use behaviors. In other words, rather than

assuming that different users will utilize an IT artifact in the same way, or that the same user will utilize an IT artifact in a constant manner over time, we propose that each user-artifact interaction is to be studied separately.

1.2. Toward an Interaction-Centric Model of IT Adoption and Use

In this paper, we propose a model for the study of users' interactions with IT artifacts that describes why and how users interact with them in the context of a single interaction, as well as repeated use over time. The model accounts for the changing nature of IT artifact utilization and recognizes the role of hedonic and social factors in affecting how artifacts are utilized and evaluated. It is guided by the following two principles:

1) *IT Artifacts are Social Actors*: We adopt a perspective of IT artifacts that goes beyond that of productivity-enhancing tools, and posit that users perceive them as social actors as well. Consequently, users view their interactions with IT artifacts as interpersonal in nature, and react to them as though they are interacting in social situations (for a detailed discussion see: Johnson, Marakas, and Palmer 2006; Nass and Moon 2000; Reeves and Nass 1996). In assessing IT artifacts, therefore, users consider both the interpersonal interactions with them and their functioning as productivity tools.

These central ideas of the social actor view of IT artifacts, which are formalized in the *social response theory* (Moon 2003), inspire the *interaction-centric* approach of our model. First, they support the proposition that beliefs users form about IT artifacts extend to addressing their social and relational characteristics, as well as the hedonic and social outcomes from their use. Second, they motivate the view of an IT artifact as more than a static bundle of features, but rather as a social actor whose characteristics are manifested in the context of social interactions (Kelley, Holmes, Kerr, Reis, Rusbult, and Van Lange 2003). The nature of these social interactions is determined by how the user chooses to interact with the artifact.

This view of the "social individual," which assumes that interactions provide a context for the expression of an individual's characteristics, is most appropriate to the study of relationships (Reis, Capobianco and Tsai 2002). Its central tenet is not separating the "individual" and the "situation" into discrete factors, but rather conceptualizing individual effects in terms of the individual's response to, and selection among, the possibilities afforded by situations (Baron and Boudreau, 1987).

2) *Dynamic View of User-Artifact Interactions*: The proposed model explicitly supports a dynamic view of user-artifact interactions. Specifically, we propose that past interactions, and users' beliefs about the artifact and the interaction outcomes formed in these interactions, can influence the pattern of subsequent interactions as well as the *overall* beliefs users hold about the artifact and their association with it.

Adding a dynamic structure to adoption models has been previously attempted. Specifically, researchers have argued for the use of longitudinal (e.g., Venkatesh, Morris, Davis, and Davis 2003), two-stage (e.g., pre-post adoption, Karahanna, Straub, and Chervany 1999), or process models (e.g., DeLone and McLean 1992) to study users' changing beliefs and attitudes. These models have differed greatly in terms of the constructs captured, yet fundamentally are similar in their approach. While having recognized the importance of representing changing perceptions over time, they capture change through a single variable (e.g., disconfirmation, Bhattacherjee and Premkumar 2004), or by running different models at different points in time (Venkatesh 2000; Karahanna et al. 1999).

It is clear that such models have advantages over earlier ones, whether resulting from their differing theoretical bases or the manner in which they capture changes in perceptions over time. Still, we believe them to be unbefitting the study of relationships that develop between users and IT artifacts from their repeated interactions. These models maintain a static view of IT artifacts and focus on the effects of design characteristics on subsequent beliefs and attitudes. In contrast, research in interpersonal relationships asserts that the essence of a relationship is found in the interactions that

occur between the interaction partners (Berscheid and Reis 1998; Kelley, Berscheid, Christensen, Harvey, Huston, Levinger, McClintock, Peplau, and Peterson 1983). Therefore, dynamic models developed to study user-artifact relationships need to focus on studying how users' *interactions* with these artifacts change over time as their relationship develops.

The remainder of this paper proceeds as follows: Section 2 presents a new model for studying user-artifact interactions and relationships. Section 3 offers a detailed discussion of IT artifact appropriation, and the subsequent effects on users' beliefs about the artifact. Section 4 describes users' beliefs evaluating the outcomes of using artifacts and the relationship with them. Section 5 discusses the effects of these beliefs on future interactions and subsequent appropriation of these artifacts. Section 6 offers a general discussion and an overview of the paper's contribution to theory and suggestions on how the model can be tested.

2. A Proposed Model for Evaluating User-IT Artifact Interactions

The question of why an individual adopts an IT artifact has received ample research attention in the past few decades. Independently, recent research has paid well-needed attention to factors surrounding the *use* of IT artifacts (e.g., Burton-Jones and Straub 2006). We view the two processes of adopting an IT artifact and using it to be highly interrelated. Yet, to the best of our knowledge, we cannot identify one single theory that combines both perspectives and integrates constructs that are associated with, or are antecedents of, both adoption determinants and use characteristics. To fill in this gap, we propose a model that describes the effects of how an IT artifact is used and perceived in an interaction, and how past interactions affect subsequent ones. The latter can be achieved through conceptualizing these repeated interactions as a form of a relationship, comprised of a series of causally connected interactions.

Research in social psychology has distinguished between the concepts of an interaction and a relationship. An interaction is a one-time event comprised of a sequence of causally connected "behaviors" that are perceived by a partner (Reis et al. 2002). These behaviors refer to any and all activities that are potentially available for a partner to perceive, including words, gestures, expressions, and actions (Reis et al. 2002, p. 818). A relationship, on the other hand, is comprised of a series of causally connected *interactions*, and includes mental representations of past interactions (e.g., memories, attributions, feelings) as well as expectations about the future. To understand a relationship, one needs to describe 1) the interactions that have taken place, 2) the causal connections between these interactions, and 3) the factors that alter the structure of this relationship, such as its interdependence (Clark and Reis 1998, p. 611).

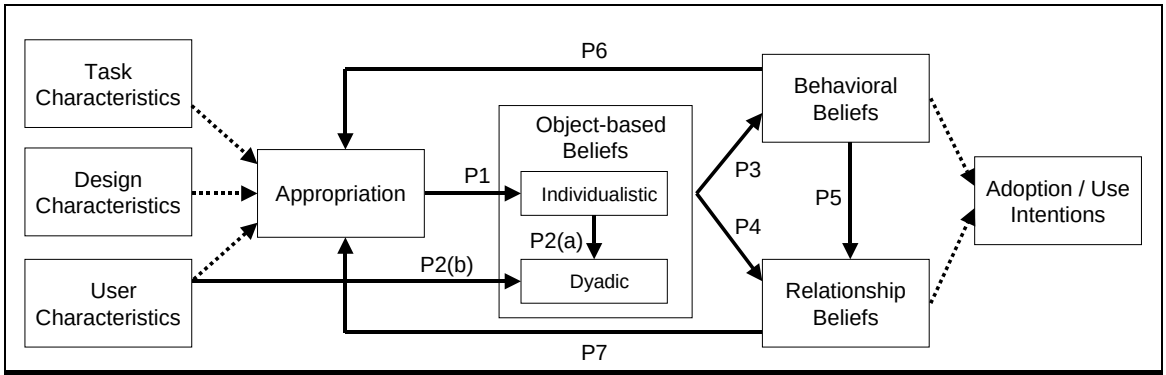

Figure 1: Interaction-Centric Model for the Study of User-Artifact Relationships

These three criteria necessary for describing the user-artifact relationship are exhibited in the model shown in Figure 1. First, the model describes the interactions that take place between a user and an IT artifact. As suggested by Fiske (1992), "people make meaning and think about each other in the service of interaction; their interactions depend on their goals, which in turn depend on their

immediate roles" (p. 878). Consequently, the model differentiates between the determinants of an interaction, what occurs in an interaction, and the outcomes of an interaction. The *determinants* of an interaction are proposed to consist of the characteristics of the task in which the artifact is employed, the characteristics of the user utilizing the artifact, and the characteristics of the artifact itself. The *structure* of an interaction represents what occurs in it, and subsequently, determines its outcomes. Consistent with definitions of an interaction that differentiate between the behaviors of those involved and how these behaviors are perceived and cognitively processed (Kelley et al. 1983; Reis et al. 2002), the structure of a user-artifact interaction (henceforth referred to as "interaction") is comprised of the two distinct components of *appropriation* and *object-based beliefs*. These two components represent the behaviors that occur in an interaction, as well as how these behaviors are perceived and cognitively processed.

Specifically, appropriation refers to users' choices in terms of the artifact's features used within a specific interaction (Orlikowski 1996), and thus, determines the artifact's behaviors in an interaction. Object-based beliefs, on the other hand, represent how the artifact's characteristics manifested through these behaviors are perceived by users. As suggested by Kelley et al. (1983), at each node of the interaction sequence, the individual must process the information obtained from observing the other's behavior; this behavior is perceived and then processed cognitively and affectively, which in turn leads to the behavioral responses that continue the chain of interaction.

Table 1: Overview of Model's Constructs

Construct	**Definition** (Examples of constructs in the context of online decision aids)
Design Characteristics	The artifact's available features and allowable combinations of these features (Example: type of decisional guidance offered).
Task Characteristics	The properties of the task for which the artifact is used *(Example: task complexity).*
User Characteristics	User's dispositional characteristics that affect how she interacts with the artifact. *(Example: information seeking behavior, computer self-efficacy).*
Appropriation	User's choices in terms of how to utilize the artifact.
Role	Appropriations performed with the goal of changing the function the artifact performs *(Example: recommender system vs. delegated agent).*
Process	Appropriations performed with the goal of changing how the artifact performs its role *(Example: decision-making strategy used).*
Communication	Appropriations performed with the goal of specifying how the artifact communicates what it performs *(Example: voice vs. text communication).*
Object-Based Beliefs	User's subjective probability judgments concerning some discriminable characteristics and behaviors of the IT artifact perceived in the context of a particular interaction.
Individualistic	Object-based beliefs about characteristics and behaviors of the IT artifact independent of how they relate to those of the user's *(Example: information quality, interactivity).*
Dyadic	Object-based beliefs about characteristics and behaviors of the IT artifact as they relate to those of the user's *(Example: personality similarity, complementarity).*
Behavioral Beliefs	User's subjective probability judgments concerning relevant outcomes of utilizing the IT artifact in a particular interaction *(Example: perceived usefulness).*
Relationship Beliefs	User's subjective probability judgments concerning the relationship or bond between her and the IT artifact *(Example: perceived interdependence).*

The proposed model also explicates how interactions and the beliefs formed in them affect evaluations of the interaction outcomes and beliefs about the relationship itself. This is represented by 1) the proposed effects of object-based beliefs on *behavioral beliefs* that capture users' evaluations of the interaction outcomes, and 2) the proposed effects of object-based and behavioral beliefs on a new set of beliefs, namely, r*elationship beliefs*. These relationship beliefs explicitly represent users' mental representations of their relationship with the artifact, by directly capturing relevant characteristics of that relationship.

In addition to describing the individual user-artifact interactions, their determinants, and their outcomes, the proposed model further illustrates the causal connections between these interactions, and the factors that alter the structure of the user-artifact relationship. This is accomplished through, first, explicating the effects of behavioral beliefs on future appropriations of the artifact (i.e., how past outcomes affect future uses of the artifact), and second, through describing how perceptions about the structure of the relationship (represented via their relationship beliefs) between the user and the artifact affect how the artifact is utilized in an interaction. Table 1 highlights the main constructs of the model.

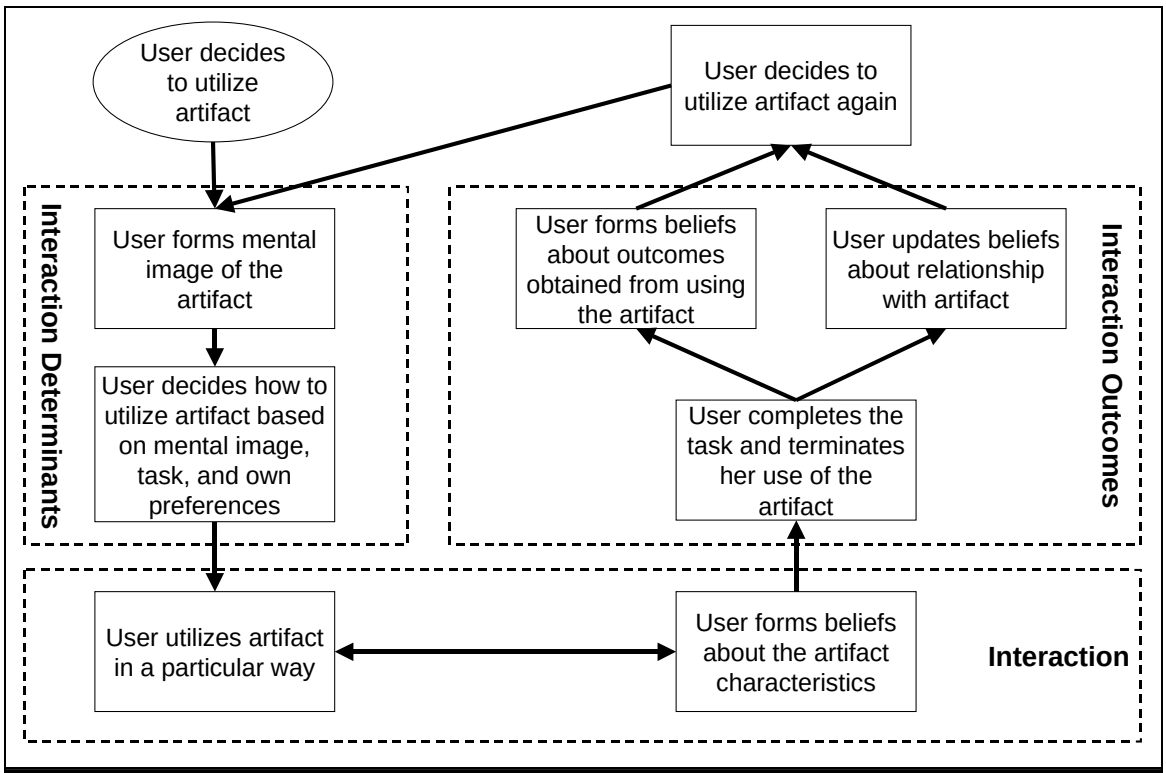

Figure 2: Process Model of User-Artifact Interactions

The *process model* depicted in Figure 2 illustrates the flow of the proposed variance model, and shows all the steps involved when a user decides to use a new IT artifact. This artifact could be a spreadsheet tool or an anthropomorphic online decision support aid that is endowed with the ability to perform autonomous action and communicate using verbal means (e.g., the 3-D realistic character "Greta" developed by Berry and colleagues, 2005). A new user of this artifact will likely form some sort of a mental image of it based on observations of its features and/or information received from outside sources, such as others who have used this artifact or written descriptions of its features.

This mental image of the artifact and its features is only one of the factors affecting a user's choices in how to utilize the artifact. In their Adaptive Structuration Theory (AST), DeSanctis and Poole (1994) propose that the user's internal system and other sources of structure act as two additional

determinants of utilization. When applied to contexts of individual use of IT artifacts, these refer to relevant user and task characteristics that influence the purpose and the nature of the interaction.

After a user decides on how to utilize the artifact and during her interaction with it, she forms beliefs about its characteristics. The type and nature of these object-based beliefs are largely constrained by how the user decides to appropriate the artifact. For instance, a user who takes advantage of the calculation functions offered by a spreadsheet tool will not form beliefs about its support for interoperability with other office productivity tools, but will form beliefs about the accuracy and speed of processing. Similarly, an e-commerce shopper using an online decision aid (DA) as a tutor offering information about products is unable to form beliefs about the aid's decision-making strategy, but rather, will form beliefs about the level of its interactivity and information quality.

Once an interaction concludes, the user will form beliefs about the outcomes of using the IT artifact in that interaction. These behavioral beliefs can address salient utilitarian outcomes (e.g., usefulness or ease of use), or social and hedonic ones (e.g., perceived enjoyment). These behavioral beliefs affect the user's intentions to reuse the artifact, as suggested by traditional adoption models such as TAM (Davis 1989).

In addition to beliefs about the artifact itself or the outcomes from using it, the user will form, or update already held, beliefs about her relationship with the IT artifact. These beliefs do not refer to observations made in a single interaction or the outcomes of that interaction, but rather comprise the user's mental representation of all past interactions and outcomes (Duck and Sants 1983; Hinde 1997; Reis and Downey 1999; Reis et al. 2002). An example is a decision aid user's overall perception of the quality of her relationship with the aid. Since such a belief captures the emergent quality perceptions in the user-aid relationship, it is, in turn, affected by beliefs about the outcomes of using the aid in individual interactions. Perceiving the aid as useful in a particular interaction will enhance this belief about the overall quality of the relationship.

The effects of past interactions on future ones are also described in the model in Figure 1. Similar to interpersonal relationships where already held beliefs about interaction outcomes and the relationship affect choices made in future interactions, the user's beliefs about the outcomes of using the aid in the past and her relationship with it will affect how she chooses to utilize it in the future. This proposed effect of prior interactions on future interaction choices is not completely new to IS research. DeSanctis and Poole (1994) have proposed that the new social structure that emerges from appropriating an artifact's design characteristics will largely determine the nature and type of future interactions. For example, a user who believes the online DA to be easy to use and useful as a tutor will be more inclined to use the aid in other capacities, such as serving as a recommender system, if the opportunity arises in the future. Similarly, the user's belief concerning the interdependence of her relationship with the aid (the extent to which she relies on and can influence the aid's behaviors (Rusbult and Van Lange 1996), which inherently includes an aggregate mental representation of past interactions and forms the basis for her expectations about the aid in the future, will affect how she elects to utilize the aid in future interactions.

At this point, it is important to highlight some of the model's assumptions. First, consistent with Fishbein and Ajzen (1975), we define behavioral beliefs within the context of a particular interaction. Thus, in contrast with summative evaluations of the outcomes of using an IT artifact, behavioral beliefs refer to the outcomes of using it in a particular interaction. This, as suggested by Ajzen (1991), is necessary to ensure that the behavioral beliefs, and the behavioral intentions they predict, are consistent in terms of target, action, context, and time. After all, an IT artifact that is perceived to be useful serving in a certain capacity in one interaction could be perceived as less useful in another interaction.

Second, the model imposes specific temporal boundaries for an interaction. Consistent with established definitions of interactions as one-time goal-driven events composed of causally connected behaviors, the *process model* in Figure 2 proposes that a user's interaction with an IT artifact begins with using the artifact and concludes when this usage is halted. What precedes

determines the form of that interaction, and what follows involves an evaluation of its outcomes. This, in addition to allowing us to distinguish between the interaction, on one hand, and its determinants and consequences, on another, also affords a temporal distinction between past and future interactions. The choice to focus on behavioral beliefs as an "after-the-interaction" occurrence was motivated by two main reasons: 1) even if some behavioral beliefs are formed during the interaction, they will likely be updated after the interaction concludes and 2) capturing these micro-level changes in behavioral beliefs during an interaction will be impossible through input-output type experimental designs.

Third, the model distinguishes conceptually between three types of beliefs. As with any type of beliefs, a belief represents the evaluator's subjective probability that an object is associated with a certain attribute (Fishbein and Ajzen 1975). Object-based beliefs do not address a specific behavior, but rather concern the user's subjective probability that the artifact (the object or target of the belief) has certain attributes (represented by the characteristics addressed in each specific belief). For behavioral beliefs, the behavior of using the artifact represents the target of the belief, and the outcome from using the artifact represents the attribute that is being linked to that behavior. Finally, relationship beliefs address characteristics of the user-artifact relationship. In this, the relationship serves as the target of the belief, and some relevant characteristic of that relationship (e.g., interdependence) constitutes the attribute that is being linked to that relationship.

The following three sections provide a detailed discussion of the model and its constructs in the context of interacting with Business-to-Customer (B2C) electronic commerce (e-commerce) IT artifacts. Such artifacts afford their users many options in how they can be utilized. Furthermore, e-commerce IT artifacts have been recognized for their ability to possess interactive and human-like characteristics (e.g., recommendation agents for B2C electronic commerce; Xiao and Benbasat 2007), and are used on a voluntary basis in contexts where the utilitarian benefits from their use are paralleled by the benefits of engaging in enjoyable social interactions and trustworthy relationships. In such contexts, they are typically employed across heterogeneous tasks and over extended periods of time. These considerations, accompanied by the wealth of studies that have adopted a social actor view of these artifacts and investigated the many social characteristics manifested by them (e.g., Al-Natour, Benbasat, and Cenfetelli 2006), introduce a unique and interesting setting for the study of users' interactions with IT artifacts over time. Also, they allow for a discussion of the model's constructs and propositions that is complemented by examples from prior research.

For the sake of brevity, our discussion of the model's constructs and relationships will be limited to a subset that directly relates to the study of user-artifact interactions and resultant relationships. The inter-construct relationships discussed, which are highlighted in Figure 1 by solid lines, are captured through several distinct propositions that lend the proposed model its novelty. These relationships focus on the model's three main components: 1) the interaction, 2) outcome and relationship beliefs, and 3) the dynamic component describing how prior interactions affect subsequent ones. Other effects shown in Figure 1, such as those between the user, task, and design characteristics vis-à-vis appropriation, or the effects of behavioral beliefs on reuse intentions, have been discussed in prior research. Examples of such discussions are seen in studies using TAM-like frameworks and models advocating a task-technology fit approach (Dishaw and Strong 1999; Goodhue and Thompson 1999; Pavlou and Fygenson 2006).

3. The Interactions: Appropriations and Object-Based Beliefs

The view adopted in the model regarding the effects of appropriations on object-based beliefs is similar to the feature-centric view that has been recently advocated in literature (Jasperson, Carter, and Zmud 2005). This view advocates the examination of the artifact's features used rather than the bundle of features available. It has been argued to be valuable because "the set of IT application features recognized and used by an individual likely changes over time, and it is the specific features in use at any point in time that influence and determine work outcomes" (Jasperson et al. 2005, p. 529).

To date, few studies have empirically examined the use of IT artifacts at a feature level of analysis (Cenfetelli, Benbasat, and Al-Natour 2008; Jasperson et al. 2005). They have confirmed the existence of differences in the number of technology features used and demonstrated that feature selection varied over time and with experience (e.g., Hiltz and Turoff 1981). In fact, Sun and Zhang (2006) have proposed a new construct named Adaptive IT Use (AITU) to capture the changes in an IT feature set. They argue that the five proposed dimensions of AITU (stopping, trying, switching, combining, and repurposing) conclusively describe possible feature-level appropriation moves.

In contrast to the Sun and Zhang taxonomy, which focuses on feature-level appropriations, we propose that appropriation of an IT artifact relates to the role the artifact performs, the process followed when performing this role, and the way in which it communicates with its users. A new appropriation takes an upward or a downward direction. An *upward appropriation* occurs when the user chooses: 1) a richer communication mode, 2) a more prominent role for the artifact to perform (increased dependence on the artifact), or 3) more user involvement in how the artifact performs its role (user-led vs. artifact-led processing). A *downward appropriation* occurs when the user chooses: 1) a leaner communication mode, 2) a less prominent role for the artifact to assume, and 3) less user involvement in the way in which the artifact performs its role.

3.1. Appropriating E-Commerce IT Artifacts

This section discusses the three ways for appropriating an e-commerce IT artifact. Specific examples of appropriations of artifacts involved in the different types of e-commerce interactions identified by Qiu and Benbasat (2005) are highlighted in Table 2.

Table 2: Appropriating E-Commerce IT Artifacts

Type of Interaction	Sample Artifact	Role / Function	Process	Communication Mode
Virtual Product Experience (VPE)	Direct Product Manipulation Interface	Support for functional control Support for visual control	On-demand vs. automated product demonstration	Text vs. voice descriptions Animation vs. video
Virtual Service Experience (VSE)	Live Help	Information vs. recommendation provider	Supplementing information / recommendations with links	Text vs. voice communication Photo vs. avatar vs. video representation
Virtual Collaborative Shopping Experience (VCSE)	Collaborative Shopping Medium	Notification vs. coordination vs. consolidation tool	How information from shopping partners is organized and presented	Supporting text vs. voice communication Photo vs. video representation
Virtual Advisor Experience (VAE)	Recommendation Agent	Information provider vs. recommender vs. delegated agent Type of decisional guidance provided	Type of decision-making strategy The use of explanations	Static text vs. interactive text vs. voice communication Photo vs. avatar vs. video representation
Virtual Company Experience (VCE)	Website	Support vs. no support for customer reviews and recommendations Type of decisional guidance provided	Product selection strategy Ranking and sorting method and logic	Static text vs. interactive text vs. voice communication

3.1.1. Appropriating the Artifact's Role / Function

Different types of IT artifacts that exist in the e-commerce setting support different aspects of the customer's interaction with the online store, ranging from pre-purchase to post-purchase activities (Cenfetelli et al. 2008). Regardless of the specific goal the artifact helps the customer to achieve (e.g., searching for a suitable product), most e-commerce IT artifacts offer a number of choices in terms of the roles to perform. For example, an online DA that acts as a recommender system offering advice based on predefined criteria can be downwardly appropriated to serve as an information provider that performs the role of a tutor educating customers about product attributes (West, Ariely, Bellman, Bradlow, Huber, Johnson, Kahn, Little and Schkade 1999), or upwardly to serve as a delegated agent that chooses the product and performs the buying transaction on the customer's behalf (Komiak and Benbasat 2006).

Similarly, the role of a communication medium that mediates interactions between the customer and other shoppers or service personnel can be appropriated in a number of ways. For example, a collaborative shopping medium that helps to coordinate the actions of different shoppers by supporting simultaneous shared browsing of web pages between the shopping partners (Zhu, Benbasat and Jiang forthcoming) can be downwardly appropriated to offer limited notifications of the shopping partner's actions, or upwardly appropriated to serve as a consolidation tool that integrates the information about the shopping partners' actions (e.g., list all products that were viewed by the two shoppers).

Finally, the functionality available on a website can be appropriated in a number of ways. A website's search functionality, for instance, can be upwardly appropriated to allow for the inclusion of product recommendations and reviews from other customers (Kumar and Benbasat 2006), or to offer different types of decisional guidance (Silver 1991).

3.1.2. Appropriating the Artifact's Process

In addition to potentially performing a number of different roles, an IT artifact can be appropriated in terms of how it performs its role. When performing any of its roles, an online DA can be appropriated to follow a number of processes. For instance, when acting as a tutor, an online DA can be appropriated so that the content of its guidance is: 1) specified a priori (predefined guidance), 2) generated dynamically to meet the customer's specific needs that are learned from observing her actions and behaviors (dynamic guidance), or 3) generated with the active participation of the customer (participative guidance) (Silver 1991). The timing of this informative guidance can also vary, ranging from concurrent guidance communicated as the information is needed (e.g., tutoring a customer on a certain product attribute while that attribute is being investigated), to prospective and retrospective types, where information is communicated before or after the customer realizes that this information is needed (Silver 2006). A tutor online DA can also differ in terms of how its assistance is invoked by the customer, ranging from an automatic invocation style, where guidance is offered without the need for customers input, to an on-demand one (Silver 2006). Finally, the content of the information provided, the phrasing of it, and the format in which it is presented can vary from one online DA to another (Al-Natour et al. 2006).

When acting as a decision-maker, an online DA can rely on any of a number of decision-making strategies (Al-Natour, Benbasat, and Cenfetelli 2008), and differ in the method in which it elicits customers' preferences (Komiak and Benbasat 2006), or the degree to which it provides explanations for its decisions and actions (Wang and Benbasat 2007). Conversely, when acting as a delegated agent, online DAs differ in terms of whether, how, and the degree to which they elicit customers' confirmation, how they complete the purchase transaction, and the extent to which they bargain on the customer's behalf.

Similarly, a communication-mediating artifact, such as a collaborative shopping medium (Zhu et al. forthcoming) or a medium facilitating interaction with the online store's service personnel (Qiu and Benbasat 2005), can be appropriated in how it presents suggestions from shopping partners or service personnel. For instance, a Live Help tool that supports a customer's interaction with a store's service personnel can be appropriated to provide links to products that are being discussed or

recommended.

Finally, the process followed by a website search, collaborative filtering, or product notification functionality, among others, can be appropriated to impose a certain process when performing these tasks (Kumar and Benbasat 2006). For instance, the search functionality can be appropriated to follow a certain decision strategy (e.g., elimination by aspect), or in terms of the attributes used as a basis for sorting the results.

3.1.3. Appropriating the Artifact's Communication Mode

An IT artifact can be appropriated in terms of how it communicates with users, or how it allows for users to communicate with others when that artifact performs the role of an interaction mediator. In general, whether in e-commerce or other contexts, social interactions can be classified by the degree of immediacy of feedback and the types of cues that are conveyed through the interactions (Kumar and Benbasat 2002; Te'eni 2001). Taking face-to-face communication as the standard for comparison, other types of interactions are evaluated based on the degree to which participants can express (and perceive) textual information, verbal information, and verbal and non-verbal cues.

Prior research has extensively looked at how online DAs can be designed to support a variety of communication modes. For example, Cowell and Stanney (2005) provide a detailed list of design features that can enable an online DA to manifest a number of verbal and non-verbal cues. Others have provided evidence that communication mode appropriations, such as deciding whether text or voice communication is used (Nass and Brave 2005), can significantly impact how users perceive online DAs.

Communication mode appropriations have also been investigated in the context of communication-mediating IT artifacts. Qiu and Benbasat (2005) have demonstrated how a medium used by customers to communicate online with a vendor's service personnel can be appropriated to offer text and voice communication capabilities, as well as allow for the embodiment of the service person in the form of a 3D avatar. Similarly, Zhu et al. (forthcoming) have looked at appropriation of collaborative shopping media that enable shopping partners to communicate using text and voice.

Finally, there have been attempts at investigating whether appropriating some of the communicative characteristics of a website can affect users' evaluations. For example, Kumar and Benbasat (2002) have provided an extended list of characteristics that can be used to differentiate between the communicative capabilities of different websites. At a more specific level, Nass and Lee (2001) provided a demonstration of how voice descriptions can be used by online bookstores instead of text descriptions.

3.2. Forming Object-Based Beliefs about IT Artifacts

Object-based beliefs represent information the user has about the IT artifact by linking that artifact to certain attributes that the user believes the artifact to possess. Specifically, consistent with the conceptualization of beliefs in the TRA (Fishbein and Ajzen 1975), object-based beliefs are defined as the user's subjective probability judgments concerning some discriminable characteristics of the IT artifact. Consequently, the strength of a specific object-based belief is represented by the user's perceived likelihood that the artifact has the attribute in question.

3.2.1. Object-Based Beliefs Formation Processes

As with all types of beliefs, the degree of association between the object and the attribute under consideration is influenced by direct observation, information received from outside sources, or by way of various inference processes (Fishbein and Ajzen 1975). These different learning processes result in different types of beliefs — descriptive, informational, and inferential beliefs, respectively. In addition to affecting the strength of an existing or newly formed belief, these different formation processes can further facilitate the formation of new beliefs or associations between the object and some attributes that were either not perceived to exist, or assigned zero weight.

In the context of user-artifact interactions, the three belief formation processes described above are applicable. First, direct experiences interacting with an IT artifact allow the user to assign to the artifact certain attributes that address characteristics and behaviors of the artifact that are discriminable within that interaction, and further assign values (strength) to these attributes. These descriptive object-based beliefs, as predicted by TRA (Fishbein and Ajzen 1975), will be held with maximum confidence and will be most influential on subsequent beliefs and behaviors. Examples of such beliefs have been numerous in IS adoption research, in general, and e-commerce research, specifically. While much of the empirical research in e-commerce has been directed at investigating the effects of these beliefs on subsequent evaluations (e.g., the effects of vividness on users' involvement with online DAs (Hess, Fuller and Mathew 2006) only a small portion of these studies have explicitly proposed and tested for how these beliefs can be enhanced using the artifact's design characteristics (Benbasat and Barki 2006).

Second, through a process of inference, a user can form additional beliefs about an IT artifact, typically concerning characteristics and behaviors that are unobservable. These beliefs, termed inferential beliefs, are typically based on prior descriptive beliefs that were formed via direct experiences with the same artifact or with a similar one. Other inferential beliefs can also serve as a basis for the formation of new inferential beliefs, which, in turn, can be traced back to some descriptive beliefs that were formed based on direct experiences. Not surprisingly, IS adoption models have been complemented with a host of inferential beliefs; albeit, the *inferential* nature of these beliefs has rarely been explicitly recognized. Commonly used examples are beliefs about an IT artifact's information and system quality (DeLone and McLean 1992; Wixom and Todd 2005).

Third, information received from outside sources (e.g., friends or written descriptions of the IT artifact) can facilitate the formation of informational beliefs, and/or change the strength of existing beliefs. In the context of IS adoption, informational beliefs represent many of the social influence variables recognized. For the sake of parsimony, and in accordance with our goal to investigate the determinants and consequences of users' direct experiences interacting with IT artifacts, these beliefs are excluded from the model.

3.2.2. The Effects of Appropriation on Object-Based Beliefs

In contrast to the above-described work focusing on belief formation, research on social interactions has differentiated between two main approaches to identifying and studying the effects of beliefs formed in the context of these interactions, namely, individualistic and dyadic. Individualistic approaches tend to focus on one person's unilateral awareness of another (Huston and Levinger 1978), and consequently, capture beliefs that link this individual to attributes that he or she is perceived to possess. These beliefs could address attributes of the target's characteristics and behaviors that are directly observable, or alternatively, those inferred based on some observable attributes.

Central to our view of IT artifacts as social actors is the notion that interactions with IT artifacts are perceived and processed by users in the same way as interpersonal interactions. As is the case with other social actors, IT artifacts are, thus, expected to manifest characteristics within the context of social interactions. It follows, then, that based on their "direct experiences" with IT artifacts, users will form a number of descriptive beliefs addressing characteristics and behaviors of these artifacts, some of which might be used as a basis for the formation of additional inferential beliefs.

What determines the nature of these direct experiences, however, are users' choices in terms of how to utilize the artifact in each interaction. In other words, because the type of appropriation determines the subset of artifact characteristics about which the new interaction offers information, only beliefs addressing characteristics that are salient within a certain appropriation will be updated, or formed, if not previously held.[1] When the new interaction offers additional information about the strength of a

[1] In preparation for the development of a new version of its widely used Office tool in 2003, Microsoft conducted a customer survey asking users what features they wanted the new version of Microsoft Office to offer. More than 90 percent asked for features that were already available in current versions of Microsoft Office (Microsoft 2006).

previously perceived association between the artifact and a certain attribute, then the user will update the strength of that association. Updating an already held descriptive belief by way of a new interaction will further lead to updating the inferential beliefs that are based on this updated descriptive belief (Fishbein and Ajzen 1975). Consider, for example, a user who typically employs an online DA as an information provider, and, based on prior interactions, believes the aid to be flexible. Subsequently, the user decides to employ the capacity of a decision maker. This new experience, if positive, will likely reaffirm and/or strengthen the user's belief regarding the aid's flexibility. Nonetheless, it is also possible that in the context of this new appropriation, the user might become aware of certain characteristics and behaviors of the artifact that negatively affect her belief in its flexibility. In either case, changes to this descriptive belief will likely affect the user's inferential belief regarding to the aid's system quality (Wixom and Todd 2005).

Alternatively, a new interaction can offer information about a novel object-attribute combination. In this case, the user will assign a new subjective probability that the artifact has this newly perceived attribute. In doing so, the user forms a new artifact-attribute link, and assigns a strength value to that link (e.g., responses on 1-7 Likert scale measuring whether the artifact has the characteristic). Consequently, the newly formed descriptive belief can serve as a basis for forming inferential beliefs and/or updating existing ones. For instance, it may be that "integration," which refers to the way the aid allows data to be integrated from various sources (Wixom and Todd, 2005), is an irrelevant belief when the aid is used as an information provider. Yet, this belief might be salient when the aid is used as a recommender system. Depending on the new belief strength, the user will likely update his or her belief regarding the aid's system quality, to which integration is an antecedent descriptive belief (Wixom and Todd, 2005).

Because upward appropriations, by definition, offer users more information about the artifact's attributes, they will have a stronger effect on individualistic descriptive object-based beliefs formed based on direct experience, and, as such, will indirectly exert stronger influences on inferential beliefs whose descriptive bases have been changed. Nonetheless, whether the artifact-attribute link is strengthened or weakened through a certain experience (i.e., whether the subjective probability that the artifact has that attribute is upgraded or downgraded), will depend in large part on whether these additional cues are *perceived* to be desirable or undesirable in that interaction. This is contingent on whether the artifact features are well designed, the characteristics of the task in which the artifact is employed, and the user's characteristics (DeSanctis and Poole 1994). The proposed model defines these factors as antecedents to appropriation, and, thus, controls for their effects within the context of a certain appropriation. It is then posited that the direction of an appropriation, in addition to affecting the magnitude of the strength of an individualistic belief, will also determine whether that change is positive or negative.[2]

> *P1: Upward appropriations have a stronger positive effect on individualistic object-based beliefs when compared to downward appropriations.*

In contrast to individualistic approaches to studying beliefs formed in the context of social interactions, dyadic approaches consider the dyad to be the appropriate unit of analysis (Montgomery 1984). Hence, they focus on capturing beliefs that inherently involve some sort of comparison between relevant characteristics of those involved in the dyad (Huston and Levinger 1978). For example, while the perceived physical appearance of a target individual is of concern in an individualistic approach, in the dyadic approach it is the similarity of that physical appearance to what that will be considered. This similarity might be directly measured by asking the evaluator to assess the similarity of the target

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Understandably, users who were unaware of these features could not express an opinion regarding them, and their overall opinions of Microsoft Office were adversely affected by what they perceived to be lacking.

[2] Not all attributes and constituent beliefs are created equal. When beliefs are based on a number of attributes and/or a number of constituent beliefs, individuals will assign values to each constituent attribute/belief in the form of a mental calculation to arrive at the constituted belief (Ajzen and Fishbein 1980). It is the role of the researcher to ensure that salient constituent parts are captured so as to understand the process by which beliefs can be cued and influenced. As such, changes to artifact designs intended to modify inferential beliefs need to be discerned by users, and subsequently, lead to changes in their descriptive beliefs on which these inferential beliefs are based.

individual's physical appearance to him or herself, or computed based on the evaluator's independent beliefs regarding his or her physical appearance and that of the target (Al-Natour et al. 2006).

Because such comparative beliefs intrinsically reflect characteristics of the belief object that cannot be directly observed (e.g., while the physical appearance of a target object is directly observed, the similarity of physical appearance is unobservable), these beliefs are inferential in nature. As with all types of inferential beliefs, in general, these dyadic beliefs will be directly or indirectly based on one or more descriptive beliefs. Specifically, dyadic beliefs are based on prior individualistic beliefs addressing characteristics of the target individual (i.e., his physical appearance) as well as characteristics of the evaluator (i.e., her physical appearance). Within the context of user-artifact interactions, the constituent beliefs are the individualistic object-based beliefs the user forms about the artifact, as well as his or her beliefs regarding her own characteristics.

Whether the effects of these two types of individualistic beliefs (beliefs about the artifact and beliefs about the user) will exert a positive or a negative effect on dyadic object-based beliefs depends in large part on the nature and strength assigned to these beliefs and cannot be determined a priori. Consider, for example, a user who holds beliefs about his or her decision-making style and that of a decision aid he or she interacts with. Based on these two individualistic beliefs, the user forms a belief about the *similarity* of the aid's decision-making style to his or her own style (Al-Natour et al. 2006). Changes to his or her belief about the aid's decision-making style that result from a new experience, however, can have either a positive or a negative effect on the belief regarding the aid's similarity. It could be that the user initially believed that the aid is dissimilar, and changes in the aid's decision-making style narrows that gap, or alternatively, widens it.

P2 (a): Individualistic object-based beliefs affect dyadic object-based beliefs.
P2 (b): Users' characteristics affect dyadic object-based beliefs.

3.2.3. Examples of Object-Based Beliefs in Adoption Research

A host of object-based beliefs have been proposed and incorporated into existing adoption models. While individualistic type beliefs have been more widely identified and recognized, more recent models have also included a number of dyadic beliefs, e.g., compatibility (Karahanna, Agarwal, and Angst 2006). This inclusion is most evident in e-commerce studies adopting a social actor view of IT artifacts. In addition to identifying new salient dyadic object-based beliefs, these studies have extended the list of individualistic object-based beliefs to include many new belief types.

Consider, for example, some of the research conducted in the context of online DAs. The studies that recognize that users tend to attribute a number of human-like characteristics to these artifacts have identified a host of new salient and relevant individualistic object-based beliefs that affect users' subsequent evaluations of these artifacts directly, or indirectly through newly identified dyadic beliefs. For example, users' of online DAs have been shown to attribute gender types (Nass, Moon and Green 1997), ethnicity (Nass, Isbister, and Lee 2000), physical attractiveness (Holzwarth, Janiszewski, and Neumann 2006), and personality types (Al-Natour et al. 2006) to these aids. Another example is the introduction of consistency, an inferential belief that captures the user's perception about the extent to which the artifact's characteristics fit together, as an antecedent to evaluations of online DAs (Isbister and Nass 2000).

In addition to these individualistic beliefs, some of these studies have further identified a number of dyadic beliefs that are anchored by individualistic beliefs addressing human-like characteristics. Of those, the similarity between the user and the online DA in terms of gender and personality (Al-Natour et al. 2006; Nass, et al. 2000) are prime examples.

4. Evaluating IT Artifacts: Behavioral and Relationship Beliefs

We now turn our attention to discussing the consequences of object-based beliefs. As highlighted in Figure 1, object-based beliefs affect: 1) behavioral beliefs, which address the outcomes of interactions with IT artifacts, and 2) relationship beliefs, which address characteristics of the

relationship between the user and the artifact.

4.1. Behavioral Beliefs

Given the abundance of adoption research that explores behavioral beliefs and their consequences (Wixom and Todd, 2005; Venkatesh et al. 2003), we limit our discussion to three central points: 1) behavioral beliefs differ in the types of outcomes addressed, 2) behavioral beliefs have different formation processes, and 3) some conceptualizations of widely used behavioral beliefs need to be revisited.

1) *Behavioral beliefs address various types of outcomes*: Three main groups of behavioral beliefs have been used to assess users' evaluations of IT artifacts: i) utilitarian beliefs, which are concerned with the functional benefits users achieve from using the artifact, or the costs associated with this use (e.g., website perceived usefulness (Kumar and Benbasat 2006); DA perceived ease of use (Wang and Benbasat 2005), ii) social beliefs, which address the social outcomes of using the IT artifact (e.g., social presence of email systems (Karahanna and Straub 1999; and Live Help (Qiu and Benbasat 2005), and iii) hedonic beliefs, which address affective states while using the system (e.g., perceived enjoyment using a DA (Al-Natour, Benbasat, and Cenfetelli 2005).

2) *Behavioral belief formation processes*: Similar to other types of beliefs, behavioral beliefs can be formed based on direct experiences and, alternatively, through some processes of inference (Ajzen 1991). Descriptive behavioral beliefs, which have enjoyed the most profusion in existing adoption models, address an outcome of using an IT artifact with the link between that behavior and the outcome being observable. Alternatively, inferential behavioral beliefs are those that are formed on the basis of prior descriptive behavioral beliefs. As with object-based beliefs, recognizing this distinction is necessary for understanding how certain behavioral beliefs can be changed. Yet, we find that, in general, existing research has not been successful in fully appreciating how constituent descriptive beliefs can affect more general inferential ones, or how some inferential beliefs can be traced to their constituent descriptive beliefs. This has been manifested by discussions surrounding whether perceived usefulness, for example, is in fact a salient belief, or conversely, constituted by multiple more basic beliefs such as efficiency and effectiveness (Benbasat and Barki 2007). A notable exception has been Venkatesh (2000), who identified a set of more basic beliefs that can affect the inferential belief perceived ease of use.

3) *Revisiting current conceptualizations of behavioral beliefs*: Regarding the first point, we find it important to highlight that behavioral beliefs address the expected *outcomes* of a specific *behavior* (Ajzen 1991), which are assumed to be salient within the context of this behavior. When acting as antecedents to behavioral intentions, these behavioral beliefs need to be consistent in time, target, and context with the behavior of interest (the correspondence principal (Fishbein and Ajzen 1975). Hence, when used to predict the intentions of adopting and using IT artifacts, behavioral beliefs have to be specified so they address the expected outcomes of using/adopting the artifact under study.

Although the new social and hedonic beliefs that were identified in recent e-commerce research were correctly judged to be salient within that context, the manner in which these beliefs were conceptualized is not completely consistent with the guidelines proposed for their inclusion proposed by Fishbein and Ajzen (1975) and Ajzen (1991). First, many of these beliefs were conceptualized to refer to a behavior that is different from the one specified in the behavioral intentions construct. For example, the most common conceptualizations of trust in e-commerce typically refer to trust in e-vendors (Gefen et al. 2003). Yet, this belief has been used in conjunction with the two behavioral beliefs of ease of use and usefulness, which refer to the behavior of using the website, to predict the behavioral intention of buying from the e-vendor. Similarly, perceived enjoyment is commonly used to refer to the perceived enjoyment of the shopping experience (e.g., Koufaris 2002), while the behavioral intention has been typically defined to refer to using the IT artifact in the near future.

Second, many of these beliefs were conceptualized in a way that does not make explicit the behavior, the outcomes of which these beliefs address. For example, a common conceptualization of social

presence refers to the degree to which a medium (the artifact) conveys the psychological presence of the message sender (Karahanna and Straub 1999). This conceptualization does not make explicit reference to the behavior of using the medium, and so is more appropriately classified as an object-based belief.

4.1.1. The Effects of Object-Based Beliefs on Behavioral Beliefs

The expectancy-value theory (ETV) put forth by Ajzen and Fishbein (1980), proposes that external variables, such as those addressing characteristics of the object, influence beliefs about the outcomes associated with performing a behavior involving that object. These, in turn, indirectly through attitudes toward performing the behavior, affect the intentions toward the behavior. Specifically, the theory rests on three tenets, the first two of which have been discussed in prior sections: 1) individuals respond to novel information about an object by developing or updating beliefs about that object, 2) individuals assign a weight to each attribute and/or constituent lower-level belief that form the basis for the object-based belief, and finally, 3) an expectation is created or modified based on the result of a calculation comprised of beliefs and values. For example, a moviegoer who finds out that a particular movie is humorous (object-based belief) will have the expectation that the experience watching that movie will be positive (behavioral belief). When the moviegoer attends the movie and finds the movie is in fact humorous, that individual will calculate that it is a good movie (attitude).

In the context of user-artifact interactions, object-based beliefs represent the information a user has about a certain artifact obtained through an interaction. Following an expectancy-value process, the user then forms beliefs about the outcomes of using the artifact that are continuously updated throughout an interaction, and which are assigned their final values at the end of that interaction. This mechanism is similar to that discussed in the context of social interactions. In these contexts, individuals have been proposed to use information obtained about interaction partners in their evaluations of the interaction outcomes (e.g., Kelley et al. 1983, 2003; Reis et al. 2002; Rusbult and Van Lange 2003). Take for example Reis et al.'s (2002) model of the effects of interpersonal interactions on relationships, based on interdependence theory (Kelley et al. 2003). Their model highlights how perceptions of another can lead to the formation of behavior outcome evaluations, which subsequently guide future behavior.

P3: Object-based beliefs will affect behavioral beliefs.

Adopting a social actor view of e-commerce IT artifacts, a number of studies have provided examples of how object-based beliefs addressing social characteristics, both at the individualistic and the dyadic levels, can directly affect users' behavioral beliefs. For example, Holzwarth et al. (2006) have provided evidence that the perceived expertise and physical attractiveness of an automated sales agent affect perceptions of its effectiveness when used. Likewise, the similarity between a user and an e-commerce IT artifact (e.g., recommendation agent), a dyadic object-based belief, has been shown to be an influential antecedent of a number of behavioral beliefs related to evaluations of the utilitarian outcomes of using an artifact (e.g., effects of decision strategy similarity on usefulness (Al-Natour, et al. 2008)), or the hedonic outcomes (e.g., effects of personality similarity on interaction enjoyment (Al-Natour et al. 2005)).

4.2. Relationship Beliefs

The model in Figure 1 proposes that in addition to the behavioral beliefs formed after an interaction, users form beliefs about their relationship with the IT artifact. As discussed earlier, relationships are essentially an *emergent* form constituted by the continuous interactions among participants. Accordingly, a relationship is more than the sum of interactions, but rather, it includes mental representations of past interactions (e.g., memories, attributions, feelings). Relationship beliefs, thus, do not address specific interactions or beliefs formed in the context of these interactions, but rather, represent the evaluator's residual and aggregate perceptions of his or her relationship with the target object. Thus, these beliefs involve the user's subjective probability judgment that the relationship possesses some attribute. This is the focus of the dyadic approaches to the study of social

interactions and relationships, where beliefs that concern the dyad rather than the individuals involved are largely considered (Montgomery 1984).

Numerous relationship beliefs have been proposed in psychology research. A subset of these addressing aspects of relationship depth, breadth, and quality have been widely adopted in marketing literature to study buyer-seller relationships (e.g., Dwyer, Schurr, and Oh 1987; Morgan and Hunt 1994; Wilson 1995). Essentially, these models emphasize the ongoing nature of buyer-seller interactions, and, thus, are more focused on capturing aggregate and residual beliefs about the interconnections between buyers and sellers (e.g., cooperation, interdependence, social bonds (Wilson 1995)). Some of these models have subsequently been adopted and replicated in the context of customer relationships with online vendors (e.g., Gefen and Straub 2003; Gefen et al. 2003).

At this point, it is important to highlight the distinction between *relationship beliefs* and *relational variables*. The latter is an umbrella term that has typically been used to refer to any factors affecting the development of relationships. Another worthy distinction is that between relationship beliefs and attitudes toward a relationship. While the first involves the linking of the relationship to specific attributes, a relationship attitude is a general affective evaluation of a relationship. Relationship satisfaction is, by definition, an affective general evaluation of a particular relationship, and, thus, is an attitude. In contrast, the perceived cooperativeness of a relationship, which measures the extent to which similar or complementary coordinated actions are taken to achieve mutual outcomes (Wilson 1995), is a belief that addresses specific characteristics of that relationship.

Similar to other types of beliefs, relationship beliefs can be descriptive, informational, or inferential in nature. Take, for example the belief regarding relationship interdependence, which concerns one individual's view of the extent to which the interacting people influence one another's experiences (Rusbult and Van Lange 1996). This belief can be further decomposed into four component beliefs addressing: 1) the level of dependence or the degree to which an individual relies on an interaction partner, 2) the mutuality of dependence or the degree to which two people are equally dependent on one another, 3) the basis of dependence: the way partners affect one another's outcomes, i.e., whether dependence derives from partner control or joint control, and 4) the covariation of interests or the degree to which partners' outcomes correspond.

The rich collection of research on interdependence has further identified and explained how beliefs about characteristics and behaviors of a relationship partner, and the outcomes of interactions with that partner, can affect beliefs about relationship interdependence. For example, consistent with relationship models that formulate our understanding of how these different types of beliefs interconnect (e.g., Clark and Reis 1988; Kelley et al., 1983; Reis et al. 2002), Anderson and Narus (1990) posit that the quality of outcomes, when judged against alternatives, constitute a measure of the dependence of one partner on the other. Similarly, adopting an information processing view of interactions, Rusbult and Van Lange (2003) discuss how information obtained about others through interactions and perceptions of interaction outcomes affects the different components of interdependence.

Relationship beliefs have been largely ignored in IS adoption research. A possible exception is trust, which has been widely explored in e-commerce research. Yet, even then, the focus has been on trust within the context of a particular interaction (e.g., initial trust within the context of buying from an e-vendor), where it was treated as an object-based belief that addresses characteristics of the IT artifact (e.g., Wang and Benbasat 2005) or the online vendor (e.g., Gefen et al. 2003). In contrast to this calculative-based trust, research has defined *relational trust* to be based on information available to the trustor from within the relationship itself (Rousseau, Sitkin, Burt, and Camerer 1998). It derives from repeated interactions over time, where information obtained in previous interactions affects expectations about the trustee's intentions, and thus, guides future behavior.

P4: Object-based beliefs will affect relationship beliefs.

P5: Behavioral beliefs will affect relationship beliefs.[3]

5. The Dynamic Component: The Effects of Behavioral and Relationship Beliefs on Subsequent Interactions

It has been observed in interpersonal contexts that positive evaluations of the outcomes of an interaction, in addition to fostering a desire for future interactions, lead to a desire to get better acquainted with the interaction partner (Duck 1973). Similarly, it has been demonstrated that beliefs an individual holds about his or her relationship with another affect how his or she chooses to interact with that person in the future (Byrne and Griffitt 1973).

These results can also be understood within the context of models of social interactions and relationships. First, these models describe how perceptions of another's characteristics and behaviors, within the context of a single interaction, can shape our own behaviors during that same interaction. Reis et al.'s (2002) model is a prime example, where they view individuals as processors of information obtained from observing others in interactions (the others' characteristics and behaviors are perceived and then processed cognitively and affectively, leading to certain behavioral responses deemed appropriate by the evaluator). When applied to the context of user-artifact interactions, this represents appropriation moves performed during a *single* interaction (e.g., the user could try a feature and then another during a single interaction). In this paper, we have not discussed this possibility in detail. Studying such appropriations performed in a single interaction constitutes a micro level of analysis. This, we believe, is minimally applicable to the study of user-artifact interactions in mainstream adoption research, because such research captures users' beliefs after the interaction is completed. Furthermore, our proposed model is based on an interaction-level unit of analysis rather than atomic behaviors. The use of process tracing can allow researchers to understand and capture these micro level beliefs and appropriations.

On the other hand, object-based beliefs formed in prior interactions can potentially affect appropriations. For example, viewing a certain artifact as reliable and highly operable can encourage certain future appropriations. Yet, consistent with ETV and relationship theories, we believe that these effects will be mediated by beliefs about the interaction outcomes and the relationship. In other words, viewing an artifact as highly reliable and interoperable will affect future appropriations only if such characteristics affect the outcomes that can be attained or the relationship itself. If such beliefs have no consequences, they will likely not induce behavioral changes.

Models of social interactions have also looked at how outcomes of prior interactions, and beliefs regarding existing relationships can shape future interactions. For instance, it has long been a main tenet of interdependence research that perceived benefits from past interactions affect choices made in subsequent ones, where individuals are assumed to go through a process of adaptation (Rusbult and Van Lange 2003). This is echoed in expectancy-value-based theories (e.g., Ajzen and Fishbein 1980), which postulate that individuals' choices to engage in a behavior and the form that engagement takes are shaped by perceptions of the outcomes of this behavior.

Additionally, research on interdependence and adaptation has further proposed an effect of relationship beliefs on subsequent behavior. For example, Rusbult and Van Lange (2003) discuss how commitment beliefs regarding a relationship can color emotional reactions to challenging interaction situations, and give rise to thoughts that support the decision to persist. Subsequently, commitment beliefs promote prosocial acts such as sacrifice and accommodation. Similarly,

[3] Research has recognized the possibility that these two causal links could operate in both directions. Specifically, it has been proposed that throughout an interaction, the beliefs we form about the characteristics of an interaction partner, and/or our evaluations of the outcomes of this interaction, are largely influenced by our beliefs regarding our relationship with that partner. A prime example is research in similarity that highlights how some relationship beliefs (e.g., the belief that the relationship is loving or committed) can, in fact, affect perceptions of similarity (Byrne and Griffitt 1973). To reduce the model's complexity, we limit our discussion to the effects of relationship beliefs on future appropriations, which act as antecedents to object-based beliefs.

researchers have observed that perceived intimacy of, or rapport in, a certain relationship can affect an individual's choices regarding the depth of future interactions (Berg and Archer 1983; LaBahn 1996).

In this paper, we present two general propositions about the positive effects of desired behavioral and relationship beliefs on the nature of future appropriations (i.e., upward vs. downward). The second of these two propositions has attained some empirical support in e-commerce research. As demonstrated by Komiak and Benbasat (2006), emotional trust, a relationship belief, positively affects users' appropriation of an online DA's role, where higher trust is shown to have a positive effect on intentions to use the online DA as a delegated agent (i.e., independent decision maker) in the future.

> *P6: Users' behavioral beliefs of an IT artifact will affect their future appropriations of the IT artifact, where positive (negative) beliefs will encourage upward (downward) appropriations of the artifact.*
> *P7: Users' evaluations of the relationship with an IT artifact will affect their future appropriations of the IT artifact, where positive (negative) evaluations will encourage upward (downward) appropriations of the artifact.*

6. Discussion

In this paper, we put forth the general proposition that understanding the user's relationship with an IT artifact is essential to fully understanding the user's decision to reuse the artifact, the nature of that usage, and the choice to switch to another artifact. In other words, only through understanding the dynamics of the relationship, and users' perceptions of it, can we explain why an artifact is being continually used or switched away from, and most importantly, why it is being used in a certain way (for a certain task). The model in Figure 1 embodies this major proposition, and adopts an interaction-centric approach to the study of users' evaluations of an IT artifact within a single interaction, and across repeated ones. By including the appropriation of an IT artifact as a mediator that determines the type of artifact-attribute links that can be established and updated, the proposed model captures the uniqueness of each interaction with an IT artifact. As such, the proposed model not only allows for the formation of differing beliefs of the same IT artifact over time, but also proposes that the basis on which an IT artifact is evaluated can change as the user-artifact relationship develops.

The model in Figure 1 is considered dynamic in two ways. First, it allows for the interaction of users' characteristics with those of the artifact. This is manifested in the form of dyadic object-based beliefs that act as antecedents to behavioral and relationship beliefs. Second, the model focuses on the ongoing pattern of interactions between a user and an IT artifact, in that it allows for the experience of an interaction, as well as temporally independent relationship beliefs, to affect the form subsequent interactions take. This idea is opertionalized in propositions 6 and 7, concerning the effects of behavioral and relationship beliefs on subsequent appropriations of IT artifacts.

While a user's behavioral intentions to reuse the artifact relate to the *continuity* of the user-artifact relationship, future appropriations of the artifact represent the extent to which this relationship *grows*. Appropriation choices made in subsequent interactions reflect the nature of the evolving relationship. Since the beliefs formed are based on past interactions, it is reasonable to suggest that the choices made in subsequent interactions exhibit the specific nature of the evolving relationship at every stage. When appropriation choices are altered, the cues manifested will after as well. As a consequence, this will affect the saliency and strength of the object-based beliefs formed, and subsequently, the behavioral and relationship beliefs. This is precisely why we propose that our model can capture the dynamics of user-artifact relationships not captured in prior models.

It is important to note at this point that the scope of this model has been reduced to allow for a parsimonious presentation of our ideas. The role of attitudes and emotions in guiding behavior and evaluations has not been discussed. Many of the theories reviewed in this paper provide detailed discussions on how attitudes and emotions interconnect with the constructs we discuss in this paper. Some of these discussions have been highlighted in IS research (e.g., Wixom and Todd 2005). In

addition, for brevity, we choose to exclude some of the inter-relationships between the proposed constructs, such as the well-documented effects of personal characteristics on behavioral and relationship beliefs. Finally, we have devoted little space to important issues such as belief saliency and learning processes underlying belief formation. These topics have been discussed in detail elsewhere (e.g., Fishbein and Ajzen 1975).

6.1. Contributions to Theory

This paper contributes to existing adoption research in two ways. First, the model proposed identifies a new set of beliefs, namely, relationship beliefs that help in understanding users' choices regarding interactions with IT artifacts. Second, this paper proposes a new approach for the conceptualization of IT artifacts and of user-artifact interactions. By proposing that IT artifacts are perceived by their users as social actors that manifest social characteristics, and further positing that users' interactions with these artifacts are social and interpersonal, we are able to utilize some of the rich theories from social psychology to: 1) reorganize our understanding of the causal effects that exist in adoption models and 2) identify new constructs that assist in understanding the determinants of the adoption process. This new approach allows for the inclusion of a greater diversity of adoption antecedents as a result of knowledge transfer from other disciplines, and by virtue of viewing user-artifact relationships through a wider lens.

6.2. Testing and Developing the Conceptual Model

The conceptual model presented in Figure 1 is a *causal* model, and its propositions should be tested as such. The antecedents to object-based beliefs as well as their effects on behavioral and relationship beliefs would preferably be tested utilizing a laboratory or a field experiment to facilitate the manipulation of independent variables (particularly the antecedents to appropriation) and the control of extraneous factors.

Since the complexity of the conceptual model makes it infeasible to validate it as a whole, we suggest that the model be broken into smaller and more manageable parts. For example, propositions 1-5 can be tested within the context of a single interaction with a specific type of IT artifacts such as an online DA. Whereas studies focusing on a single interaction are appropriate for validating most of the propositions, a longitudinal approach may be required to test for the proposed effects of behavioral and relationship beliefs about future appropriations (propositions 6 and 7). A practical alternative to the longitudinal approach for testing propositions 6 and 7 would involve treating future appropriations as an additional categorical dependent variable (e.g., Komiak and Benbasat 2006). In this case, appropriations should be categorized into "initial" and "future," and future appropriations should be treated as a dependent measure, where users are asked to indicate how they would appropriate the artifact if they were to interact with it again.

While all model constructs are perceptual variables, appropriation is a direct measure of users' choices. Therefore, for a test of the effects of appropriations to be meaningful, users should be afforded a number of possible appropriations, which is achieved through offering a number of choices in terms of process, role, and communication mode.

The constructs included in the proposed model are general in nature. Before attempting to test any part of the model, the researcher needs to decide what are the salient object-based, behavioral, and relationship beliefs given the choices made in terms of the manipulated design characteristics. Most interesting operationalizations of the proposed model will include a number of individualistic and dyadic object-based beliefs that will differ in whether they capture behaviors or dispositions, and a number of behavioral beliefs that that address hedonic, social, and utilitarian outcomes of the interaction.

6.3. Conclusion

Starting with a survey of concepts related to social interactions, we have presented an argument in support of regarding user-IT artifact interactions as social in nature. A wealth of studies support the

idea that users not only view their interactions with IT artifacts as social and interpersonal, but also attribute human-like behaviors and personalities to them. Depending on how an IT artifact is appropriated, the cues manifested and perceived will be different. Consistent with theories of interpersonal interaction, we propose that users are likely to form both individualistic and dyadic beliefs about IT artifacts' characteristics and behaviors. These subsequently act as antecedents to social, utilitarian, and hedonic behavioral beliefs and beliefs about the relationships with these artifacts. In a dynamic way as in social relationships, behavioral and relationship beliefs affect choices made in future interactions.

This paper complements prior adoption research by highlighting the importance of understanding users' interactions with IT artifacts and proposing a general structure of how design characteristics can affect users' beliefs about, and evaluations of, IT artifacts. Such considerations are especially important given the continually increasing sophistication with which IT artifacts are being designed.

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About the Authors

Sameh Al-Natour is a Ph.D. student in Management Information Systems at the Sauder School of Business, University of British Columbia, Canada. He holds an M.Sc. from the University of British Columbia, and an M.B.A and a B.S from Simon Fraser University. His research focuses on the design and evaluation of human-computer interfaces, e-commerce, and the adoption and use of information technology.

Izak Benbasat is a Fellow of the Royal Society of Canada and CANADA Research Chair in Information Technology Management at the Sauder School of Business, University of British Columbia, Canada. He received his Ph.D. in Management Information Systems from the University of Minnesota. He currently serves on the editorial board of Journal of Management Information Systems. He was editor-in-chief of Information Systems Research, editor of the Information Systems and Decision Support Systems Department of Management Science, and a senior editor of MIS Quarterly and Journal of the Association for Information Systems. The general theme of his research is improving the communication between information technology (IT), management, and IT users.

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