Journal of the Association for Information Systems

JAIS

# The Legacy of the Technology Acceptance Model and a Proposal for a Paradigm Shift.

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Abstract:

This article presents a critique of a number of shortcomings with the technology acceptance model (TAM) and points to specific remedies in each case. In addition, I present a model for the purposes of providing a foundation for a paradigm shift. The model consists first of a decision making core (goal desire → goal intention → action desire → action intention) that is grounded in basic decision making variables/processes of a universal nature. The decision core also contains a mechanism for self-regulation that moderates the effects of desires on intentions. Second, added to the decision making core are a number of causes and effects of decisions and self-regulatory reasoning, with the aim of introducing potential contingent, contextual nuances for understanding decision making. Many of the causal variables here are contained within TAM or its extensions; also considered are new variables grounded in emotional, group/social/cultural, and goal-directed behavior research.

Volume 8, Issue 4, Article 7, pp. 244-254, April 2007



Journal of the Association for Information Systems

## Introduction

In this commentary, I attempt to point out limitations with the Technology Acceptance Model (TAM) and lay the groundwork for an alternative approach for studying information technology adoption/acceptance/rejection. Let me begin by disclosing that my perspective is largely that of an outsider to the field of information systems (IS). and my approach will be to bring a critical eye to research on technology acceptance in this field. At the same time, it should be noted that at one time I had one foot in IS research, so to speak, in that I was a co-author on three early articles in the TAM tradition (i.e., Bagozzi, Davis, and Warshaw, 1992; Davis, Bagozzi and Warshaw, 1989, 1992) and published a few other technology acceptance articles in other fields as well (e.g., Bagozzi,1990; Bagozzi and Lee, 1999a,b; Dabholkar and Bagozzi, 2002; Gaither, et al., 1996, 1997). Furthermore, I was privileged to have interacted with Fred Davis when he was a doctoral student at MIT and I was on the faculty there, and then again when he and I were faculty members together at the University of Michigan, as Fred began his career. Hence, although I am obviously not a disinterested, unbiased commentator, I will attempt to give as objective an appraisal of TAM as possible, yet at the same time I do not wish to be perceived as hostile to TAM or Fred Davis, his coauthors, or many others contributing to the evolution and validation of TAM. Nevertheless, by necessity and design, my commentary points out what I believe to be fundamental problems with TAM and with the current state of the field. Indeed, I submit that the field is at the threshold of crisis, if not chaos, in regard to explaining technology acceptance, and a paradigm shift is needed if progress is to be made.

## The Legacy of TAM and General Shortcomings

By any measure, TAM qualifies as a remarkable accomplishment, even reaching the status of a paradigm of sorts. The number of citations of Davis et al. (1989) alone is over 700 to date, which is a very high number indeed for an article in an applied field. And the stream of research in the TAM tradition is impressive in its volume and scope (Lee, Kozar, and Larsen, 2003). TAM has stood the test of time by being the leading model for nearly two decades and earning many commentaries and the focus of this special journal issue. In sum, the importance and impact of TAM are impressive.

The main strength of TAM is its parsimony: intentions to use a technology influence usage behavior, and perceived usefulness (PU) and perceived ease of use (PEU) determine intentions to use. The former linkage makes TAM overlap with the theory of reasoned action (TRA) and the theory of planned behavior (TPB); the latter linkages replace the effects of attitudes (A) and subjective norms (SN) under the TRA and the effects of A, SN, and perceived behavioral control (PBC) under the TPB. Significantly, TAM has consistently outperformed the TRA and TPB in terms of explained variance across many studies (e.g., Davis et al., 1989; Venkatesh et al., 2003).

Parsimony has also been an Achilles' heel for TAM. It is unreasonable to expect that one model, and one so simple, would explain decisions and behavior fully across a wide range of technologies, adoption situations, and differences in decision making and decision makers. As with the TRA and TPB, TAM has seemingly seduced researchers into overlooking the fallacy of simplicity. That is, in favoring a simple model, researchers have overlooked essential determinants of decisions and action, and turned a blind eye to inherent limitations in TAM.

Nevertheless, nearly from its inception, and accelerating over the course of almost 20 years, researchers have attempted to add to TAM. Most of these efforts have, from my point of view, constituted a broadening of TAM in the sense of introducing additional predictors for either PU or intentions. Almost no research has deepened TAM in the sense of explaining PU and PEU, reconceptualizing existing variables in the model, or introducing new variables explaining how the existing variables produce the effects they do. Large gaps exist in TAM in this regard between intentions and behavior and between PU and PEU on the one hand and intention on the other; these are topics I will return to below. Likewise, the few attempts that have been made, introducing moderators into TAM to qualify the effects of PU and PEU on intentions, have focused on demographic variables (e.g., gender, age), experience, or a crude classification into voluntary versus mandatory contexts of use (see Figure 3, Venkatesh et al., 2003). The problems with most tests of moderating effects to date are that little theoretical insight is provided into the mechanism, or "the why", behind proposed interaction effects, and a potentially infinite list of such moderators exists, making such broadenings of TAM both unwieldy and conceptually impoverished. The consideration of moderating variables is one way of deepening any model, but introductions of these should be grounded in theory and with an aim toward including policy variables whenever possible. Finally, the bases for PU and PEU, including basic and applied determinants, have been given scant attention in the field. Later in this commentary, I will sketch a

proposal based on goal-setting that addresses this shortcoming of TAM. But before turning to specific suggestions, I wish to mention more directly what the limitations are of TAM.

## Particular Shortcomings with TAM

Why should we be concerned with the shortcomings of TAM? The study of technology adoption/acceptance/rejection is reaching a stage of chaos, and knowledge is becoming increasingly fragmented with little coherent integration. A good example is the recently proposed unified theory of acceptance and use of technology (*UTAUT*, Venkatesh et al., 2003). The exposition of *UTAUT* is a well-meaning and thoughtful presentation. But in the end we are left with a model with 41 independent variables for predicting intentions and at least eight independent variables for predicting behavior (I say "at least" because there are plausible direct effects not tested by Venkatesh et al., 2003; see Table 17 therein). Even here, arguments can be made that important independent variables have been left out, because few of the included predictors are fundamental, generic, or universal, and future research is likely to uncover new predictors not subsumable under the existing predictors. The IS field risks being overwhelmed, confused, and misled by the growing piecemeal evidence behind decision making and action in regard to technology adoption/acceptance/rejection. What is needed is a unified theory about how the many splinters of knowledge cohere and explain decision making. Before attempting to provide some guidelines and suggestions along these lines, I will summarize what I perceive are the key problems with TAM and hints at remedies.

The problems with TAM are not entirely peculiar to it, but inhere as well in the TRA and the TPB, which should bring pause to accepting any proposal suggesting that the TRA and TPB constitute panaceas for the field. For purposes of organization, I maintain that the primary shortcomings of TAM (and the TRA and TPB) reside in (1) two critical gaps in the framework, (2) the absence of a sound theory and method for identifying the determinants of PU and PEU, as well as other bases for decision making, (3) the neglect of group, social, and cultural aspects of decision making, (4) the reliance on naïve and over-simplified notions of affect or emotions, and finally (5) the over dependence on a purely deterministic framework without consideration of self-regulation processes.

## Two Critical Gaps

Venkatesh et al. (2003, Figure 1, p. 427) propose three classes of variables and two linkages in their "Basic Concept Underlying User Acceptance Models": individual reactions to using information technology → intentions to use information technology → actual use. The critical gaps lie with the proposed linkages. Consider first the intentions–to–actual use linkage. Venkatesh et al. (2003, p. 427) state: "The role of intention as a predictor of behavior is critical and has been well-established in IS and the reference disciplines…" Presumably this crucial linkage rests on the logic espoused by Ajzen and Fishbein (1980, p. 41): "From our point of view, intention is the immediate determinant of behavior, and when an appropriate measure of intention is obtained it will provide the most accurate prediction of behavior."

From my point of view, the intention-behavior linkage is probably the most uncritically accepted assumption in social science research in general and IS research in particular. There are three major issues here. First, the models resting on an intention → behavior linkage (e.g., TAM, TRA, TPB) treat behavior as a terminal goal and fail to consider that many actions are taken not so much as ends in and of themselves but rather as means to more fundamental ends or goals. For example, adoption of IT is often for the purpose of more accurately and efficiently storing, processing, and using information than that obtained from currently used means. By focusing on use, TAM slights the benefits of use and their actual attainment. The use-to-goal-attainment gap is neglected in TAM except as an anticipated belief up-stream in the model. Also more is needed in TAM explicitly focusing on end-state goals/objectives of technology use. More on this later. Second, because intentions are made prior to taking action, and the gap in time can be large, with many intervening steps needed and obstacles occurring, often unanticipated; and because intentions are often ill-formed or incomplete or need to be adjusted over time, it is important to consider various psychological and instrumental steps that go on between intention formation and action initiation. This is another aspect of the intention-behavior gap. Third, because decision makers often realize that impediments and temptations may arise following the decision to take action, they view their situation as one filled with uncertainty and in need of putting forth effort in a dynamic way. As a consequence, decision makers often focus on trying to adopt an action or acquire a technology, which changes the orientation of decision makers in fundamentally different ways than focusing only on behavior, per se (Bagozzi, 1992; Bagozzi and Warshaw, 1990; Bagozzi and Kimmel, 1995; Bagozzi and Edwards, 1998).

What all this really means with regard to technology adoption/acceptance/rejection is that it is important to conceive this as a process and one constituted by goal striving (Bagozzi and Dholakia, 1999). In goal striving, intention formation is succeeded by planning (e.g., when, where, and how to act instrumentally), overcoming obstacles, resisting temptations, monitoring progress to goal achievement, readjusting actions, maintaining effort and willpower, and reassessing and even changing goals and means. These processes fill the gaps between intention and behavior and between behavior and goal

attainment and are crucial for the successful adoption and use of technology. In other decision contexts, dealing with goal striving, my colleagues and I have studied the roles of physical and mental trying (Bagozzi and Edwards, 1998; Taylor, Bagozzi, and Gaither, 2001, 2005), how self-efficacy, outcome expectancies, and affect function (Bagozzi and Edwards, 2000), motivation (Dholakia and Bagozzi, 2002), and planning and plan enactment (Bagozzi, Dholakia, and Basuroy, 2003; Dholakia, Bagozzi, and Gopinath, 2007).

The second critical gap in TAM occurs for the linkage between individual reactions to using information and intentions. There are many, many reasons for acting that decision makers might take into account in the formation of an intention to act. TAM specifies two, the TRA two, and the TPB three direct reasons for acting, but in reality, each of these can be thought to be functions of many beliefs (and evaluations). Two broad issues here deserve scrutiny. One concerns the possible, and in practice frequently occurring, absence of compelling motivations for acting on putative reasons for acting (Bagozzi, 1992, 2000, 2006, 2007a). For example, a person can recognize and even accept that PU or attitudes are favorable criteria for deciding to act, but have no desire to act and even explicitly decide not to act in the face of these reasons. In other words, PU and attitudes need not contain or constitute motives to act for any particular decision maker or for any specific situation. A second issue for concern is how multiple reasons for acting or not, which can be considerable in number, are reconciled and transformed into a decision or intention to act.

To address the problems of motivational content in reasons for acting and how the many reasons are translated into a specific decision to act, I built upon a leading theory of behavior in the philosophy of action and the philosophy of mind literatures, known as the belief-desire model, to form a general, parsimonious motivational mechanism most proximal to actual decision making. That is, an action desire is hypothesized to function as an essential mediator between the many reasons for acting, on the one hand, and the decision or intention to act on the other hand. The theory behind desires can be found in Bagozzi (1992, 2000, 2006, 2007a) and Perugini and Bagozzi (2004a), and some tests of the theory can be found in Bagozzi and Kimmel (1995); Bagozzi and Dholakia (2002, 2006 a,b); Bagozzi, Dholakia, and Pearo (2007); Dholakia, Bagozzi, and Pearo (2004); Dholakia, Gopinath, and Bagozzi (2005); Dholakia, Gopinath, Bagozzi, and Nataraajan (2006); Perugini and Bagozzi (2001, 2004b); and Dholakia et al. (2007).

## Goal-setting

The determinants of PU and PEU, as well as of A, SN, and PBC, consist of distinct salient beliefs, and under the TRA and TPB at least, these beliefs are multiplied by corresponding evaluations or importances and the product terms summed to form an overall summary term. For example, the determinants of A consist of the $\Sigma b_i e_i$, where $b_i$ and $e_i$ are belief i and evaluation i, respectively, for n consequences of acting. Benbasat and Barki (2007) recommend that focus in the future be placed on salient beliefs and their role in TAM and TPB, which I echo. However, I definitely recommend that researchers abandon the summated multiplicative models so constitutive of the TRA and TPB for four reasons. First, the summated models treat all belief-evaluation pairs as equal in importance and obscure the differential contributions of salient beliefs, if any, to PU, PEU, A, SN, and PBC. Second, and related to the first point, belief-evaluation representations fail to allow for or specify an underlying structure of salient beliefs, such as might exist in human memory. Rather, products of beliefs and evaluations are summed to yield a single aggregation expressed as a single number for each decision maker. To the extent that knowledge in the form of beliefs is organized in memory in hierarchies or complex patterns, the classic belief-evaluation summations may overlook how specific components of knowledge affect PU, PEU, etc. in terms of the processes decision makers go through. To regress PU, PEU, etc. on the summative products or even on individual product terms might misrepresent how information is used to form PU, PEU, etc. Third, the summative representations do not take into account or represent relationships among salient beliefs. Because beliefs can be interconnected causally, with some more vulnerable to outside influence than others and more promising as avenues for persuasive communication attempts needed to change PU, PEU, etc., it would be better to model and test for causal relationships among beliefs, which are ignored under summative models. Finally, because measures of beliefs and evaluations are not ratio scaled, it is necessary to model all additive and multiplicative effects in summative models with multiple regression; but this can (1) be unwieldy (because it multiplies the number of independent variables), (2) make analyses hypersensitive to measurement error (because product terms are less reliable than their individual constituents), and (3) yield a model conceptually different from the one proposed by theory (because the multiplicative model is indistinguishable from the additive plus multiplicative model). See Bagozzi (1984) and Evans (1991) for discussions of the technical issues here.

As an aside, there are two ways to conceive of PU, PEU, A, SN, and PBC. One is to treat each of these as summary psychological representations and use global measures to operationalize them. For instance, A is one's overall attitude toward an act and is usually measured by summing a small number of evaluative semantic differential items. The summary representation conceptualization then can be modeled as a function of individual or summative belief-evaluation product terms. This is now the most common interpretation in psychology and applied fields. A second way to conceive of PU, PEU, etc. is defined by the summation of belief-evaluation product terms. For example, $A \equiv \Sigma be$, where the researcher takes

either A or Σbe as the representation of attitude. Researchers have moved away from this conceptualization in recent years and instead have accepted that the summary representations are conceptually and empirically distinct from the summated product term representations (see for example, Bagozzi, 1981 a, b).

With the above-mentioned limitations of summated product terms, what to do? In my research, I have conceived of the determinants of A, SN, and PBC, not as summated products of beliefs and evaluations, but rather as functions of either goals, motives, or values organized hierarchically, depending on the circumstances (Bagozzi, Bergami, and Leone, 2003). This approach is especially useful if we conceive of decision making in goal-setting terms. Then goal-setting becomes a precursor to goal striving. More specifically, goal-setting → goal desire → goal intention → goal striving. As discussed in section 3.1, goal striving consists of action desire → action intention → planning → trying. A qualitative methodology can be used to derive goal, motive, or value hierarchies, and the individual goals, motives, or values, plus their linkages, can be treated as independent variables predicting PU, PEU, etc. The advantage of such an approach is that it identifies (1) the relative efficacy of individual goals, motives, or values, as well as (2) the influence of linkages between them on PU, PEU, etc. The former is analogous to declarative knowledge, because it represents factual categories, whereas the latter is analogous to procedural knowledge, because it captures if-then deductions or conclusions implicitly held by decision makers. For example, in a study of body weight management, SN was found to be a function of one superordinate goal, being socially accepted by one's peers, but 11 inferences based on perceived linkages between goals were found to also influence SN: 'look good' → 'happiness', 'achievement' → 'health', 'energy' → 'social acceptance', 'energy' → 'endurance', 'energy' → 'feel good', 'energy' → 'achievement', 'fit into clothes' → 'social acceptance', 'fit into clothes → 'save money', 'fit into clothes' → 'look good', 'fit into clothes' → ''self-esteem', and 'feel good' → 'achievement' (Bagozzi and Edwards, 1998, p. 616). Another advantage of the goal-setting approach is that it gives a situation-specific model of decision making as opposed to general approaches. My colleagues and I have applied this goal-setting methodology for uncovering salient beliefs, their organization, and their effects in studies of consumer recycling (Bagozzi and Dabholkar, 1994), body weight management (Bagozzi and Edwards, 1998), voting for President Clinton (Bagozzi and Dabholkar, 2000), joining the army (Bagozzi, Bergami, and Leone, 2003), self-regulation of hypertension (Taylor et al., 2006), entrepreneur investment decisions (Morandin, Bagozzi, and Bergami, 2006), and brand community participation (Morandin, Bagozzi, and Bergami, 2007).

## Group, Cultural, and Social Aspects of Technology Acceptance

Why is it important to consider group, cultural, or social aspects of technology acceptance? Much of human behavior is not best characterized by an individual acting in isolation. To be sure, we sometimes act seemingly as individuals spontaneously, deliberatively, or in response to social pressure. But perhaps more often than not we act interpersonally, or as agents of organizations, or jointly with others, or in a holistic sense as members of collectivities. Decisions with regard to technology acceptance and actual usage are often done collaboratively or with an aim to how they fit in with, or affect, other people or group requisites.

The TAM is conceived largely as a framework for explaining decision making by individual persons. Indeed in a recent article, where the "basic concept underlying user acceptance models" is highlighted, it is explicitly stated that decisions and usage are initiated by "individual reactions to using information technology" (Venkatesh et al., 2003, Figure 1, p. 427, emphasis added). When so-called "social influence processes" have been introduced into TAM, the practice has been to treat social influence in the limited senses of either a constraint or force on the decision maker and perceived as originating from "other people whose opinions are important to me" (e.g., Venkatesh and Davis, 2000) or as an attempt to "enhance one's … status in one's social system," such as a reference group (e.g., Moore and Benbasat, 1991, p. 195). These can be important influences on decision making, but it is important to recognize that they apply to a limited sense of social behavior, i.e., that related to interpersonal influence and all too often treated in a largely unidirectional sense; empirical research with TAM in this regard has found either mixed results or evidence for social influence in only restricted contexts (e.g., when social influence, gender, age, and voluntariness interact, see Venkatesh et al., 2003, Table 21).

It appears that technology acceptance research has not considered group, cultural, or social aspects of decision making and usage very much. Four issues here seem apt for technology acceptance. First, it is important to differentiate social normative influence from the role of group norms. Kelman (1974) noted that social normative influence is a species of compliance and is based on the need for approval, acceptance, or fear of reprisal. This mode of social influence operates on people as individuals (a) in relation to others in interpersonal senses, such as between peers, a parent and child, or an informal group and one of its members or (b) through the policies, rewards, or sanctions one is subject to as a member in a formal group. The role of group norms functions differently from compliance and is obviously situated in a group context. This mode of social behavior is close to what Kelman (1974) termed internalization, which refers to acting out of congruence between one's own and a group's shared values or goals. Internalization occurs with regard to one's membership in gender, ethnic, family, or other cultural groups through processes of socialization and psychological



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development (e.g., Higgins, 1991; Kochanska, 1993, 1994); internalization also occurs through processes of education, training, and indoctrination in organizations, institutions, or collectivities. So-called reference group influence seems to be a combination of compliance and internalization processes.

Compliance and internalization processes operate on and within individuals, respectively, so to speak, and can occur when a person sees oneself as an individual but in relationship to either another person or a group. A second broad concern for TAM deals with yet another kind of social process relevant to technology acceptance, which is close to what Kelman (1974) termed identification. By identification, Kelman meant influence based on a self-defining relationship a person has with another person or group. A more group-based interpretation of identification was proposed by Tajfel (1978) who desired to account for what he saw to be a fundamentally unique kind of social behavior distinct from intraindividual and interpersonal modes of behavior. Tajfel called this social identity and suggested that it has three parts: a cognitive component composed of self-awareness of group membership, an affective component consisting of feelings of attachment or belongingness, and an evaluative component comprised of a positive or negative value connotation connected to group membership and sometimes termed collective or group self-esteem (see Bagozzi and Lee, 2002).

My colleagues and I have shown how social identity influences decision making in small friendship groups (Bagozzi and Lee, 2002; Bagozzi and Dholakia, 2006a; Bagozzi, Bergami, Marzocchi and Morandin, 2007), network- and small-group-based virtual communities (Bagozzi and Dholakia, 2002; Bagozzi, Dholakia, and Pearo, 2007; Dholakia et al., 2004), open source software user communities (Bagozzi and Dholakia, 2006b), and recreational chatters and collaborative browsing in online environments (Bagozzi, et al., 2006).

A third issue related to group, cultural, or social aspects of technology acceptance that is neglected by TAM concerns the conceptualization and specification of decision making and, indeed, of all variables in TAM. For decision making involving two or more people, where decisions involve mutual, shared, or in some other way joint processes, it is necessary to respecify intentions. Intentions in TAM might be characterized as personal intentions (or I-intentions) in that they refer to a person's individual decision or plan to achieve a goal or perform an action by him/herself alone (Eagly and Chaiken, 1993). For example, "I intend to use expert system X to solve a problem I have been working on." But group and social decision making involve what I have termed, based on discussions in philosophy on plural subject theory (Bagozzi 2000a, 2005), collective intentions (Bagozzi, 2006, 2007a). One kind of collective intention is actually a personal intention to do something with a group of people or to contribute to, or do one's part of, a group activity (e.g., "I intend to take my son shopping tomorrow so that we can examine together a replacement for his obsolete computer."). A qualitatively different form of collective intention is what we might call a "we-intention." A we-intention is a collective intention rooted in a person's self-conception as a member of a particular group (e.g., an organization) or social category (e.g., one's gender, ethnicity, or religious affiliation), and action is conceived as either the group acting as a unit or the person acting as an agent of, or with, the group. Such we-intentions exist in two closely related versions. The first is the shared we-intention and is expressed in the form, "I intend that our group/we act" (e.g., "I intend that our work group interact tomorrow via the web to collaboratively solve an issue recently uncovered by accountants."). The second version of the we-intention is communal and framed in the form, "We (i.e., 'I and the group to which I belong') intend to act" (e.g., "We intend to switch decision support systems and undergo training with the new system on Monday.").

Collective intentions have been studied recently in a number of studies. See Bagozzi and Lee (2002); Bagozzi and Dholakia (2002); Dholakia, et al. (2004); Bagozzi, et al. (2006); Bagozzi and Dholakia (2006a, b); and Bagozzi, Dholakia, and Pearo (2007).

A fourth way that group, cultural, or social processes can be integrated into TAM or the TPB is by considering individual differences between cultures. For example, people from independent- versus interdependent-based cultures react differently in terms of certain cognitive, emotional, or motivational processes (e.g., Markus and Kitayama, 1991). Another individual difference variable, which also can be elicited situationally, is regulatory focus (a promotion versus prevention strategic orientation), which has been found to moderate the effects of certain variables on evaluations and on decisions (Dholakia et al., 2006; Leone et al., 2005). Independent versus interdependent self construals have also been found to interact with regulatory focus to influence decisions.

## Emotions

The role of emotions in technology acceptance has been treated in a rather ad hoc way in extensions of TAM and in other treatments of affect in IS. For instance, intrinsic motivation, affect toward use (joy versus sadness emotions), affect (liking for a particular behavior), and anxiety toward performing a behavior have been proposed as direct predictors of effort and/or performance expectancies and, therefore, are claimed to be indirect determinants of intentions (Venkatesh, 2000; Venkatesh et al., 2003, Figure 3). Indeed, affective reactions are considered to be instances of attitudes and thus to not

produce effects independent of traditional measures of attitudes by Venkatesh et al. (2003, Table 13). I would argue that attitudes, classically construed as evaluative responses, and emotions are distinct phenomena. Further, tests to date that included both attitudes and emotions as copredictors of intentions or of antecedents to intentions probably exhibited sufficient multicollinearity (in the sense of being more highly correlated among themselves than with intentions or with antecedents of intentions treated as dependent variables) so as to obscure, mask, or distort predictions and yield indeterminant findings. Equally important, I submit that treatments of affect with respect to technology acceptance have not been grounded in theories most appropriate to the decision processes people go through. Instead of developing a theory specifying how affect functions at various stages of decision making, the practice has been to take a rather empirical approach by adding various measures of affect to TAM or extended TAMs as parallel predictors of both intentions and antecedents to intentions. What are needed are specific theories of the effects of emotions tailored to technology acceptance.

A number of recent developments in psychology are worth considering in this regard. One approach is to consider attitudes (Bagozzi, Moore, and Leone, 2004) and emotions (Bagozzi, Baumgartner, and Pieters, 1998) as prefactual appraisals of achieving and failing to achieve one's technology use goals. These appraisals, perhaps weighted respectively by expectations of success and expectations of failure (Bagozzi and Warshaw, 1990), then function as dynamic determinants of intentions (or desires). Unlike the role of attitudes classically conceived (Eagly and Chaiken, 1993), where it is claimed that attitudes influence intentions following their retrieval or activation as stored, passive evaluations, prefactual attitudes are posited to be dynamic constructions of how a decision maker feels about anticipated effort and outcomes related to a personal goal (Bagozzi, 2006; Bagozzi et al., 2004). The decision maker considers his/her goal, thinks about and imagines three aspects thereof (achieving the goal, failing to achieve the goal, and striving to achieve the goal), and then expresses evaluations (in the case of attitudes) or positive and negative emotions (in the case of affect) of each aspect. The dynamic decision making process consists of the sequence of consider-imagine-appraise-decide, hence the label prefactual processes. In addition to prefactual processes, which refer to anticipated attitudes or emotions, it has been shown that real-time anticipatory positive (e.g., hope) and negative (e.g., anxiety) emotions also can initiate decisions to act (Baumgartner et al., 2007).

Prefactual attitudes (including also affect toward means) have been studied with regard to body weight goals (Bagozzi and Warshaw, 1990; Bagozzi and Kimmel, 1995; Bagozzi and Edwards, 1998), regulation of hypertension (Taylor, et al., 2001), and dieting goals (Bagozzi, et al., 2004). Prefactual emotions have been investigated with respect to body weight maintenance (Bagozzi et al., 1998), exercising and dieting (Perugini and Bagozzi, 2001), participation in virtual communities (Bagozzi and Dholakia, 2002; Dholakia et al., 2004; Bagozzi et al., 2007), open source software communities (Bagozzi and Dholakia, 2006b), and brand communities (Bagozzi and Dholakia, 2006a). In the latter study, attitudes, positive anticipated emotions, and negative anticipated emotions all had unique effects on desires enroute to influencing intentions. Finally, one investigation of decision making with respect to the upcoming millennium found that both anticipated and anticipatory emotions influence decisions (Baumgartner et al., 2007).

Other promising roles for emotions in explaining technology acceptance can be identified. We already mentioned that affective commitment is an essential component of social identity, and a number of studies in group settings demonstrate the role of social identity in influencing desires and intentions. Second, the so-called social or self-conscious emotions (pride, gratitude, guilt, shame, embarrassment, envy, jealousy) play a key role in self-regulation, as we sketch below (Bagozzi, 2006, 2007a). Third, desire can be considered related to emotions and represents a special mode of motivation, as we mentioned above. Finally, during attempts at trying to reach a goal, it is likely that emotions stemming from appraisals of progress or lack of progress will moderate the effect of trying on goal achievement (see Bagozzi, 2006, 2007a, for reviews of research in psychology supporting such a possibility).

## Self-Regulation

A final omission in TAM (and the TPB) is consideration of self-regulatory processes in decision making. TAM is a completely deterministic model in the sense that the causes at the foot of each arrow in the model are presumed to inevitably lead to the effect at the head of the arrow. That is, when an independent variable increases (decreases), the dependent variable is expected to increase (decrease) by some amount to be estimated empirically. The mechanisms governing the dependence of an effect on a cause are built into the rationales linking causes to effects. If a moderating variable is hypothesized to regulate the impact of an effect on a cause, it too is presumed to operate deterministically, though contingently. The discovery of nonsignificant empirical relationships, where theoretical connections are hypothesized, represents a failure to sustain the hypotheses. These are necessary implications of deterministic theories, which underlie TAM, TPB, and indeed nearly all theories in psychology and the social sciences. Another way of stating the issue is to recognize that TAM, TPB, and most other models rest on cognitive laws of information processing and emotional and motivational laws of responding, where the regularity theory of causality is presumed to operate.

TAM and other contemporary approaches do not permit human agency, which is rooted in causal powers or the new essentialism, to be alternatives or compliments to their specifications. To be sure, the received view in psychology (e.g., Wegner, 2003) and in much of philosophy (e.g., Dennett, 2002) is strictly deterministic and predicated on physicalist or materialist points of view. By human agency, we mean that a decision maker is capable at times of choosing to act in a way that is neither impulsive, compulsive, habitual, coerced, nor bribed, but rather results as an intentional response (Searle, 1992) to the question, "How shall I act?" Blackburn (1994, p. 9) summarizes the issues here nicely: "[an agent is] one who acts. The central problem of agency is to understand the difference between events happening in me or to me, and my taking control of events, or doing things."

Deterministic theories of behavior explain it as physical processes going on in the brain in the form of either automatic reactions to outside stimuli or hard-wired responses following law-like information processing. True self-regulation in an agentic sense, by contrast, entails an activation of the will, which operates on felt deterministic urges or desires via reasoning processes.

In my own work, I have attempted to formulate a theory of consumer behavior and action whose main processes are deterministic, but at the same time can, under certain conditions, come under control of self-regulatory input (e.g., Bagozzi 1992, 2000b, 2005, 2006, 2007a). I turn to a skeleton representation of this theory hereafter.

## Foundation for a New Paradigm

A unified approach to understanding and explaining technology adoption/acceptance/rejection is needed and, in particular, one that aims for comprehensive questions and answers. My proposal for consideration is to begin by specifying a common core of basic variables and processes that are universal in scope, or at least approach universality. Let us call this common core, the technology user acceptance decision making core (see Figure 1).

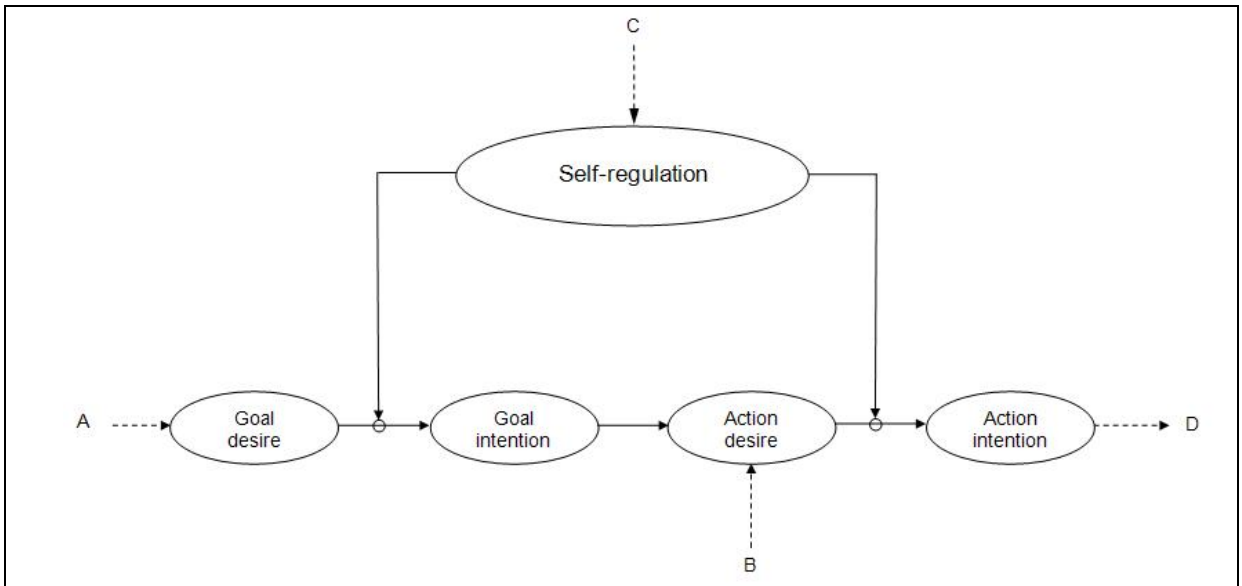


Figure 1. The Decision Making Core

The heart of the decision making core consists of goal desire → goal intention → action desire → action intention. These processes and their causes or constraints (labeled A and B in the figure) and their effects (D) constitute fully deterministic processes. Moreover, these processes capture the basic stages in decision making, bridging goal-setting (A) and goal-striving (D), making overall goal-directed behavior the center of focus for user acceptance. In somewhat different forms, similar goal-directed behavior models have arisen in psychology (e.g., Gollwitzer, 1996), organization behavior (e.g., Locke and Latham, 2002), marketing (Bagozzi, 1992, 2006, 2007a; Bagozzi and Dholakia, 1999; Bagozzi, Dholakia, and Basuroy, 2003; Dholakia, Bagozzi, and Gopinath, 2007), and such applied areas as health behavior and communication research. The decision making core is intended to represent fundamental processes of a universal kind in the sense of addressing essential decision making processes that occur in most, if not all, user acceptance situations.

To briefly point to various causes and effects linked to variables in the decision making core, I offer the following. Here it is recognized that there are many causes and effects that in any particular case require the development of contingent theories

tailored to those cases and, therefore, drawing upon only the most critical variables and processes connected to the decision core. In this way, we suggest that it is important to specify that which is basic (the decision core) and that which is contextual (specific instances in A, B, C, and D applicable to the problem context at hand).

The causes under A are suggested to inhere in goal setting activities as expressed in hierarchical, superordinant goals, values, or motives leading to the formation of a focal goal, such as adoption of a particular technology (Bagozzi, Bergami, and Leone, 2003). Additional candidate causes in A, depending on the situation, include positive and negative anticipated and anticipatory emotions (Bagozzi et al., 1998; Baumgartner et al., 2007); affect toward the possible means of goal pursuit (Bagozzi and Edwards, 2000; Bagozzi and Warshaw, 1990); PU; PEU; relative advantage (Moore and Benbarat, 1991), job fit, attitudes toward success, failure, and the process of goal pursuit (Bagozzi and Warshaw, 1990); and outcome expectancies (expectations of success and of failure, Bagozzi and Warshaw, 1990). The causes under B entail such instances as group norms, subjective norms, social identity (Bagozzi and Lee, 2002), effort expectancy, PBC, and attitudes toward the act. The effects of decision making (D in Figure 1) consist of planning, plan enactment, trying to reach a goal, monitoring progress, evaluating progress and its relationship to planning, goal desire, goal intention, action desire, action intention, overcoming impediments, resisting temptations, deflecting goal pursuit, goal realization/failure, and feedback and its appraisal (Bagozzi, Dholakia, and Basuroy, 2003; Dholakia et al., 2007).

So far everything discussed with respect to the decision core and its linkages entails deterministic processes. Human agency involves, I claim, an additional feature of decision making that is more executive in function and is labeled self-regulation in Figure 1. Much of human behavior gives the illusion of control (Wegner, 2002) or else is automatic with little or no thought and application of action. By automatic I mean we have beliefs, values, subgoals, etc. that drive our felt desires, and we act more or less straightaway in response to our felt desires. However, under some circumstances or for some decision makers, people become aware of their desires (or lack of desire) and examine them with an aim to engage in practical decision making.

There are two board categories of self-regulation: reflectivity and reflexivity (Bagozzi, 2007a). Reflective self-regulation, for me, means the active imposition of personal moral or self-evaluative standards to a felt or possible goal desire or action desire (Bagozzi, 2006). That is, decision makers evaluate their desires and then reason and decide whether they want to have or want to not have the desires they experience and scrutinize. They do this in such a way as to cancel, override, modify, or postpone further consideration or implementation of the desire to act. More specifically, I propose that, when thinking about one's desire to act (or one's goal desire), a decision maker asks him/herself such questions as the following: Am I the kind of person who should have a desire? Am I the kind of person who acts on this kind of desire? Is the desire consistent with the kind of person I wish to be? Will acting on this desire lead to personal flourishing? What effect will acting on this desire have on other people important to me, other people whom I might not even know, or social welfare writ large? In answering the question what to decide or do, the decision maker brings to bear reasons for deciding or for acting or not (e.g., duty, obligations, or other personal standards and social requisites). Such reasons both justify and motivate the decision or action. Thus self-regulatory reasoning comes to interact with our desires to influence our intentions and through intentions action. In a parallel manner, I suggest that a decision maker can reflect upon his/her lack of felt desire for a goal or to act in a particular decision context. Here the person considers whether to accept, embrace, or construct a desire for a goal or to act; questions analogous to those noted above could be posed self-reflectively with regard to self-perceived lack of felt desire (e.g., "Is my not feeling a desire to act consistent with the type of person I wish to be?").

So, self-regulation serves to moderate the effects, if any, of desires on intentions, and the processes are reflective ones based on reasoning. Note that desires, intentions, and their antecedents are empirical in the sense that they can be measured or manipulated as physical phenomena. The reasoning processes in self-regulation, by contrast, are largely composed of ideals and constitute transcendental-type concepts, although we leave open the possibility that some or at least part of such reasoning processes can be represented empirically as well. Thus decision makers can exercise a certain degree of control over their desires and intentions. Left by themselves, desires operate deterministically to influence intentions. But by the willful imposition of self-evaluative standards, one can stop the effect of a desire on decisions or create or activate a desire to influence intentions where no such desire currently exists. Note further that self-regulation can also occur reflexively. That is, learned values, dispositions, traits, virtues, and vices can function as moderators of the effects of desires on intentions (Bagozzi, 2007a; Sekerka and Bagozzi, 2007). An example would be a virtuous decision maker deciding seemingly spontaneously to resist his/her personal desire to purchase a technology that harms the environment. Here the virtue is presumably internalized and has been operating for a while as a personal policy that is activated upon being confronted with the possibility of adopting a new technology. Finally, I wish to stress that another way that people self-regulate their desires is by being thankful or expressing their gratitude for that which they have, by limiting their wants through regular self-examination, by consciously resisting the persuasive effects of advertising, peer pressure, and the larger culture to consume or in other ways expand their wants, and by, in general, being satisfied with much of what they already have.

The final aspect of the decision core I wish to briefly comment upon is depicted in Figure 1 as C. The processes represented by C impinge upon, constrain, or capture the development of self-regulation. Elsewhere I have pointed out three broad classes of such processes: social or self-conscious emotions; social identity; and such feelings for others as caring, love, and empathy (Bagozzi, 2006, 2007a). Note that the processes under C constitute deterministic processes, and thus self-regulation is affected, in part at least, by such processes. Again, we leave open the possibility that some aspects of self-regulation are transcendental and not completely explicable deterministically.

## Conclusion

TAM is a remarkable model and has had an incredible effect on empirical research for a long time. But it seems to have reached a turning point. On the one hand, it is too simple and leaves out important variables and processes. On the other hand, recent extensions of TAM (e.g., the *UAUT*) have been a patchwork of many largely unintegrated and uncoordinated abridgements.

In this paper, I attempted to point out the limitations of TAM and point the reader to new developments in psychology and applied disciplines in this regard. I also attempted to propose a dual approach that rests first on specifying fundamental psychological processes of decision making, grounded in universal principles, and second on providing a basis for delineating contingent, contextual causes and effects of the basic decision making core. This approach results in deepening the theory of technology use acceptance, while suggesting fruitful avenues for better understanding how, when, and why decisions are made in various technology applications.

A couple of topics I was not able to address are the broader role of social processes and methodology. I presented some ideas on how the heretofore construed individualistic conception of intentions can be treated in a social sense. A parallel approach could be taken with the other variables in TAM, TPB, or the model I proposed (see Bagozzi, 2000a, 2005). Methodology is important to consider because it so closely interfaces with theory and theory testing and interpretation, and because how we study a phenomenon constrains how we think about it. I am not sure, but I get the sense that little methodological pluralism exists in the IS area and that most phenomena have been studied by multiple regression or PLS. We have a parallel problem in my field in that ANOVA and SEMs are the primary methods of choice, with some use of multiple regression too. Much of psychology is even narrower and relies on ANOVA as the main method of choice. It is no wonder then that theories and knowledge evolve so narrowly in fields, and coupled with the inevitable conflicts, censorship, and gate-keeper effects all fields undergo in the review process, we see a reluctance to discard that which has grown stale, to borrow knowledge from other areas, and to be open to new ideas within our own fields. Finally a specific methodological caution to leave the reader with is to be wary of using formative indicators, except in very special cases (Bagozzi, 2007b).

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Journal of the Association for Information Systems
ISSN: 1536-9323