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Keywords: Appropriation, Marxism

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A MARXIAN MODEL OF TECHNOLOGY APPROPRIATION

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This paper explores the philosophical roots of appropriation within Marx's theories and socio-cultural studies in an attempt to seek common ground among existing theories of technology appropriation in IS research. Drawing on appropriation perspectives from Adaptive Structuration Theory, the Model of Technology Appropriation and the Structural Model of Technology for comparison, we aim to generate a Marxian model that provides a starting point toward a general causal model of technology appropriation. This paper opens a philosophical discussion on the phenomenon of appropriation in the IS community, directing attention to foundational concepts in the human ↔ technology nexus using ideas conceived by Marx.

Introduction

The interplay between human behaviour and technology is a central theme in contemporary information systems (IS) research (Cousins and Robey, 2005; Beaudry and Pinsonneault, 2005; Jones and Karsten, 2008). Its interdisciplinary nature, drawing from referent disciplines such as information technology studies and sociology, provides a rich field of research challenges. Two research areas that address the human ↔ technology interplay include studies of acceptance and use (Davis, 1989, 1993; Orlikowski, 1992, 2000) and adoption (Venkatesh et al., 2003; Ahuja and Thatcher, 2005; Davis and Hufnagel, 2007). A socio-cultural concept linked to these research areas is the notion of 'appropriation'.

'Appropriation' has been a central concept in the Social Constructivist School of Information Systems, which examines the relationships between human agency, technology and social structures. Early proponents of social structures as an influence on appropriation were DeSanctis and Poole (1994). Their Adaptive Structuration Theory (AST) combined the notions of appropriation and Giddens'

(1979, 1984) social structures to examine the relationship between human behaviour and information technology. Another view of this relationship is Orlikowski's (1992; 2000) Duality of Technology (later the Structural Model of Technology). Though Orlikowski (1992) initially supported DeSanctis and Poole's view that social structures could be embedded in technology (and were appropriated by users), she later refined this view into structures being emergent properties and appropriation as enactment of technology within social systems (Orlikowski, 2000). While these existing theories draw on social science principles to consider appropriation by groups, emerging theories such as Carroll's (2004) Model of Technology Appropriation present perspectives on the interplay between an individual and a technology. Addressing this diversity, Overdijk and van Diggelen (2006) considered the socio-cultural roots and philosophical origins of appropriation. Even DeSanctis and Poole and Orlikowski briefly drew on the appropriation philosophies of Karl Marx (and ultimately Hegel) through its interpretation by Ollman (1971). We believe that, with the research community still searching for unity, a foundational approach is timely.

Although these past studies have used social science theories, such as Giddens, to build frameworks for appropriation, surprisingly few have drawn on Marx. Bagozzi (2007) levels several criticisms at technology adoption and acceptance theories that have used social science bases e.g. a lack of clear theoretical underpinning, piecemeal understandings and a lack of predictive power. We feel that a Marxian perspective can help solve such problems. By adopting a Marxian stance, we provide a model that:

- Is a historically-rooted grand theory with sociological resonance across a large body of disciplines and naturally explores the subject/object relationship;

- In contrast to existing theories, considers *both* individual and group level appropriation. Furthermore, it illustrates these interactions in a process-oriented manner that yields explanatory and predictive power; and,
- Retains the ontological commensurability, underpinnings and constructs that are true to the Marxian intent, fuelling a model designed for the human-technology nexus without compromising the original theoretical notions.

In this paper, we first explore Marx's dichotomous view of human nature as *natural being* and *species being*. We then introduce *social being* as a way to integrate structural concepts into Marx's paradigm. A discussion of Structuration Theory follows to explain the various structurationist influences on social being. We return to Marx to introduce the important concepts of *perception*, *orientation* and *appropriation*, leading into a review of the latter's' socio-cultural development. From this, we review the major theoretical works on appropriation in the information systems literature. Following this discussion, we derive our Marxian technology appropriation model. Finally, we conclude with implications for IS research and our model's relevance to existing theories of technology appropriation, use and disappropriation.

Our objectives in this paper are threefold: (1) to demonstrate how the various conceptions of technology have common ground in Marx's philosophy, and in doing so open up philosophical discussion on a fundamental concept in the human ↔ technology nexus, (2) to propose a general conceptualization of technology appropriation that encompasses varying appropriation behaviours, and (3) to provide a starting point towards a general causal model of technology appropriation.

The Dichotomy of Human Nature

We begin by exploring Marx's conception of human nature, specifically the dichotomy of *natural being* and *species being*. Adding to this dichotomy is the notion of *social being*, which situates humans within their social context. A critical conception in Marx's philosophy is that of *dialectics*. This suggests that the way to view the world is as an evolving process rather than a collection of things (Sowell, 1985). Marx sees the basic unit of reality as *relations* - fact-value, cause-effect or nature-society, or, in our case, human-IS. He emphasizes the idea of *development* or the "transition from one form to another" (Marx, 1959, p.44), an idea that resonates in his views on the subject-object relation(ship) and the transformation of work into products during the process of labour.

Describing labour, Marx states that it is "a process in which both man and nature participate, and in which man of his own accord starts, regulates and controls the material reactions between himself and nature...by thus acting on the external world and changing it, he at the same time changes his own nature" (McLellan, 1980, p.164). The dialectic approach harbours the distinction between inner, inherent forces within humans and the outward, external appearance of objects. Humans themselves can be an object, but only in interaction with other humans. The development or transition that occurs between inner forces and external appearance is the freeing of the inner senses, or the unravelling or unfolding of human essence, which allows us to realize our *essential powers* (Ollman, 1971).

Human beings possess powers and needs: natural needs (e.g. procreation) and powers (e.g. senses) are shared with all living entities, while species needs and powers are possessed by humans alone (e.g. creative expression). Ollman (1971) makes clearer the distinction between needs and powers, with needs being the

desire one feels toward an object that is not always immediately available, and powers equating to the faculty, ability, function and capacity that enable an individual's fulfilment with the object and the object's future forms or potential. All of these needs and powers comprise the *essential powers* of humans and represent Marx's dichotomy of *natural being* and *species being*.

Natural Being – Species Being – Social Being

Natural being can be equated to animal functions or physical needs. Ollman (1977, p.77-78) identifies two outstanding characteristics of natural being: (1) natural powers exist in humans as tendencies, abilities or impulses; and (2) natural powers seek fulfilment in objects outside of the body. At the level of natural being, humans are suffering and limited, albeit objective and sensuous, unable to distinguish themselves from their acts through imagination, are without ability or self-awareness, and are spontaneously controlled by the availability and qualities of objects in nature (Marx, 1977). Natural being is guided by senses and basic functions, with behaviour driven by unconscious use of senses. It is through relations with objects that humans define their higher powers and needs.

When Marx speaks of objects, he does not specifically refer to material things. For Marx, objects are 'the object of a subject', that is, ethereal. Natural powers manifest in and through objects, and in turn humans require objects to express their powers. *Realization* is the fulfilment of powers and the objectification of these powers in nature. Through realization, humans are established by objects and objects in turn "reside in the very nature of [our] being" (Marx, 1977, p.156). Thus, objects can be understood as either material or ethereal. In the case of the latter, the virtual existence of objects likens to the idea of structures (see Giddens, 1979). Structures can only be wholly realized through the perspective of *social being*.

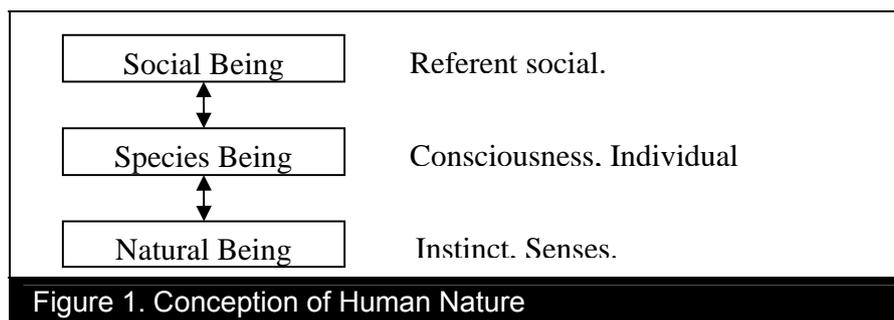
Because humans create a world of objects through activity, we prove ourselves as conscious *species being* (Marx, 1977). The conscious life activity of *species being* is separate from the animal life activity of *natural being*. Where the animal does not distinguish itself from its life activity, humans are self-conscious, self-aware and able to confirm themselves through knowing. Two characteristics of species being are: (1) the peculiar physicality that establishes us as human; and (2) the way we manifest ourselves as a species through activity of quality and pace that is unique to human beings (Ollman, 1971, p. 82).

Species powers are driven by the same 'physical' senses that drive natural powers but have the added 'mental senses' unique to humans. Although we have explored the difference between natural and species being, the two are not necessarily opposing contrasts in the dialectic of human nature. Since humans also possess animal functions (i.e. sight, touch, smell), natural being is subsumed within species being. Natural being is driven by instinctive behaviour, while species being employs senses and functions in a reflexive human fashion as part of species life activity. Species life activity places the individual (natural being and species being) within the social system as *social being* (Marx, 1977).

Through social relations, humans confirm and establish their existence as species being (Marx and Engels, 1942). Marx conceives of society as the cooperation of individuals: relations in society can be external as the product of reciprocal activities, and sometimes society exists within an individual through social relations. Importantly, humans do not only relate to each other through contact, but can relate to one another through their objects (Ollman, 1971).

Beyond the dichotomy of natural and species being, a *social being* has social needs that reflect the powers of other humans. These powers have developed – through similar experience – to the analogous wants, demands and utility of society (Ollman,

1971). Giddens (1979) holds a similar view of social systems, being emergent by nature, and shaped by the mutual recursiveness of structure and agency. *Social beings* are the product of their context, while at the same time contribute to their environment through interactions. Figure 1 summarizes the hierarchical but integrated nature of natural, species and social being:



Species being is the individual conscious actor, subsuming the powers and needs of natural being, and acting as social being in relation to others in society. To further consider social being and its relationship with species and natural being, we now briefly describe Giddens' Structuration Theory.

Social Structures – Giddens' Structuration Theory

Structuration Theory (ST) explores the mutuality between virtual, ethereal structures that comprise social systems and the human agency that creates them. As a framework of unification, ST sought to bridge the divide between determinism (those who consider social phenomena as objective social structures) and voluntarism (those who see social phenomena as products of human agents subjectively interpreting the world) that had existed in sociology prior to its construction (Timbrell et al., 2005). Giddens saw social systems as comprised of day-to-day social interactions involving 'situated activities' of human agents existing in time-space, and are constituted by regular, reproduced relations of 'interdependence' between

either individual agents or a collective group. These are also 'recurrent social practices', or the *mutual dependence of structure and agency*.

In ST, structure refers to virtual 'patterns' of social relationships and exist only as structural properties. These structural properties are rules and resources that, in social reproduction, bind time and result in enduring practices in social systems (reproduced relations between actors or groups, organized as regular social practices that occur in time and space). To regard structure as a 'virtual order' implies recognizing the existence of: (a) knowledge –as memory traces – of how things are to be done (said, written) on the part of social actors; (b) social practices organized through the recursive mobilization of that knowledge; (c) capabilities that the production of those social practices presupposes (Giddens, 1979, p.64).

Structural properties of social systems then are both "the medium and outcome of practices constituting those systems" (Giddens 1979, p. 69) and institutions are a product of human agency but are an "outcome of action only in so far as they are also involved recursively as the medium of its production" (op. cit. p. 95).

Structuration refers to 'the dynamic process whereby structures come into being' (King, 2004, p.121) and structures only manifest from social interaction.

Structures (Giddens, 1979) are understood as systems of semantic rules (structures of signification), as systems of resources (structures of domination) and as systems of moral rules (structures of legitimation). These three modes of structure are in turn related to three moments of interaction, summarizing the relationships as signification-communication, domination-power and legitimation-sanction. Across *communication of meaning, operation of power relations* and the *enactment of normative sanctions*, actors draw upon what Giddens refers to as *modalities* in the production of social interaction. These modalities are *interpretative schemes* used in the communication of meaning, *facilities* used in the exercise of power relations,

and *norms* applied to the sanction of social behaviour. The modalities are not only the factors of social production but also its media and output.

Although Marx does not directly address the notion of structures, the idea of human actors as comprising of and shaped by these structures resonates within his work. Marx (1977) considers social being, for instance, as an actor whose cognitive behaviours are both shaped by instinct and consciousness and guided by external social influences. These referent social frameworks influence the *perception*, *orientation* and *appropriation* of an object (or artefact) by an individual. We now discuss these three Marxian processes.

MARX: PERCEPTION – ORIENTATION - APPROPRIATION

To piece together the fragments of Marx's theoretical lattice, we begin with *natural* and *species powers*. There are three interconnected processes that establish the link between the essential powers of humans and the world around them: *perception*, *orientation* and *appropriation* (Ollman, 1971; Marx, 1977). Defining the first two concepts (Ollman, 1971, p. 85):

- *Perception* is the immediate contact a human (natural being) has with nature through the instinctive senses; and
- *Orientation* is the way that humans (species being) relate to things by establishing patterns, places and worth, and [cognitively] construct the framework for subsequent actions within the social world.

Thus, *perception* is the exercise of *natural being* powers while *orientation* is the exercise of powers by *species being*. Humans exercise perception and orientation in an integrated fashion, just as they employ structures in an integrated way. Marx also discusses the concept of realization: an object is realized as 'fulfilling of the natural senses' or an object is realized as 'attributive or enhancing of the species

powers'. In the act of realization, humans see an object as an 'instance of themselves', residing within their natural or species being (Marx, 1977).

In Marx's philosophy, the two concepts of perception and orientation link together irrevocably. Perception leads immediately to orientation, with the latter establishing meaning, structure and future goals for perception. However, orientation can be present before perception since humans choose objects that are realized or deemed irrelevant before perceiving it directly (e.g. based on a colleague's description). Both of these concepts carry the act of *appropriation*. The most general definition of appropriation is "to utilize constructively; to build by incorporating: the subject is man's essential powers" (Ollman, 1971, p. 89). In Marx's view, appropriation is the way humans relate to nature. Perception is appropriation through the exercise of the natural needs and powers of the individual, while orientation is the individual realizing the consciously held potential an artefact harbours.

We note at this point that Marx applied his concept of appropriation to his work on alienation. For Marx, labour is seen as external to the worker and not belonging to his intrinsic nature. The product of the worker's labour is an object. It is the objectification or realization of labour to which humans become alienated or estranged (Marx, 1977). It is not the intention of this paper to pursue the notion of appropriation into such mainstream and previously well-covered political discussions, but rather focus on its applicability to the field of IS.

In this paper we see appropriation as *humans realizing essential powers as fulfilled by objects in nature*, and in the context of this research, the objects of interest are technology. Pomeroy (2004) notes that the fundamental condition for all human activity is the existence of an objective world. The activity of a subject cannot operate in isolation from the objective world, and all perception requires both the senses and the object sensed. Pomeroy (2004) refers to Marx (1959, p.106) who

describes this subject-object relationship as being “each human relation to the world...seeing, hearing, smelling, feeling, thinking, [awareness], sensing, writing – in short, all the organs of the individual being, like those organs which are directly social in their form, are in their objective orientation or in their orientation to the object, the appropriation of that object, the appropriation of the human world.”

Technology is a collective of objects in which a human, either as natural or species being, can realize his or her needs for the expression of essential powers. Ollman (1971, p. 137) states: “Appropriation is Marx’s most general expression for man incorporating the nature he comes into contact with into himself. *Activity* enters this account as the chief means by which man appropriates objects... [Objects] become the most effective medium between the individual and the outer world.”

Marx gives three moments of activity relating to human powers: (1) activity is the foremost example of the combined operation of humans’ powers and needs (or essential powers); (2) activity establishes new possibilities for fulfilment of needs and powers by transforming nature and nature-imposed limitations; and (3) activity is the means by which the potential of powers are developed.

Ollman (1971) states that appropriation occupies the most prominent space in Marx’s works, and in his later writings, perception and orientation are “wholly subsumed under it” (p.86). Appropriation is the relation between human senses and nature, but appropriation can be a changing state, with the potential to affect future perception and orientation through the effect it has on humans and objects. This changing state recognizes the complex, emergent nature of human relations within the complex environments in which these human relations operate, or, as we conceive it, a *complex world*. In contrast, technology, and information technology in particular, is a much more *linear world* in nature. The interaction between the complex and emergent world of human agency and the linear world of technology

such as information systems is mediated by both individual and group behaviour and beliefs. This is consistent with other usage theories such as the Theory of Reasoned Action (see Fishbein and Azjen, 1975).

The notion of appropriation has been further developed and discussed in socio-cultural learning and information systems literature. In the next section we briefly review this literature before describing our Marxian model in detail.

Appropriation

A key motivation of socio-cultural studies is the relationship between human mental processes and the cultural, historical and institutional settings within which they are situated (Wertsch, 1995). In the socio-cultural field, appropriation refers to cultural learning, or the appropriation of cultural tools (Overdijk and van Diggelen, 2006). Wertsch (1998) describes appropriation as the act of taking something that belongs to another and making it one's own, a notion that stems from Bakhtin's (1981) process of one speaker adopting a word from another system of language and assigning it their own semantic meaning or expression. Appropriation of cultural tools or resources, such as systems of communication, occurs through cultural activities where the tool plays a role among the individuals (Newman et al., 1989).

In her study of personal, interpersonal and community development, Rogoff (1995) identifies three uses of the term appropriation: (1) *Internalization* (Berger and Luckmann, 1966), whereby something external is imported; (2) A process *preceding transformation* (Harre, 1983), where what is imported is also transformed to fit the purposes of the new owner and (3) Rogoff's own conception of *participatory appropriation*. The final use refers to the way in which people, by participating in an activity, adopt and change its meaning through ongoing communication, and in turn change themselves and are prepared to engage in subsequent similar activities. Her

view deviates from Harre's (1983) concept of appropriation as a *precondition* for transformation, instead calling appropriation a "process of becoming rather than acquisition" (Rogoff, 1995, p. 142), and that change is a result of activity and not internalization of an external instantiation. This accords with the view of information systems potential and use (Bia and Kalika, 2005).

Rogoff's (1995) conceptualization of appropriation as a process of transformation also resonates with Marx's view. Realization is not only the *perception* of an object by a human, but also the *orientation* toward it - the fulfilment and ratification of essential powers by use. The object undergoes transformation from something external to something 'naturalized' to the inherent senses of the *natural being* and 'embedded' within the cognitive processes of the *species being*.

Mackay and Gillespie (1992) posit that appropriation of technology is a subjective and social activity, stating that "people are not merely malleable subjects who submit to the dictates of a technology...they are active, creative and expressive – albeit socially situated – subjects" (p. 698). They allude to the way in which people are not conceptualized entities that predicatively lend themselves to rigid theories, but are social beings part of a cultured, institutional setting wherein 'complex' interactions take place. Consequently, appropriation is not always a linear process, since "people may reject technologies, redefine their functional purpose, customize or even invest symbolic meanings to them" (p.699). McKay and Gillespie subsequently view technology as interpretive and flexible, which we will later see is consistent across the IS frameworks. This view however does not specifically relate to the features of a technology, but the structures a technology brings or alters as individuals engage with it. A technology designed rigidly for a specific purpose or task may be seen as inflexible, however, this may be because the structural properties of the technology – as Marx might say - have already been realized.

In socio-cultural literature, appropriation of technology has two outcomes consistent with a Marxian view. Firstly, a technology is perceived and oriented to by *species being* (i.e. institutional member) as a cultural tool – when it matches inherent senses and cognitive processes and is realized in the fulfilment of needs and powers, it is appropriated. Secondly, a technology becomes appropriated through the process of transformation by *social being* utilizing it within their dynamic ‘world’ (i.e. institution). The fundamental notions of socio-cultural appropriation by Bakthin (1981), Wertsch (1998) and Rogoff (1995) hold across the IS frameworks, yet their applicability in the IS field has not been fully explored. Theories embracing appropriation have also tended to employ the work of Giddens (1979) as a framework for considering group motives that influence technology. We now look at three of these IS theories: Adaptive Structuration Theory (Poole and DeSanctis, 1989, 1990, 1992; DeSanctis and Poole, 1994), the Structural Model of Technology (Orlikowski and Robey, 1991; Orlikowski, 1992, 2000), and the Model of Technology Appropriation (Carroll et al., 2002, 2003; Carroll, 2004).

Adaptive Structuration Theory

As a techno-centric extension of Structuration, Adaptive Structuration Theory (AST), has proved a popular lens in IS studies across the last decade (e.g. Gopal et al., 1992; Chin et al, 1997; Salisbury et al., 2002). The context of its development was Group Decision Support Systems (GDSS), leading to a theoretical lens that examines the organizational effects of technology appropriation.

Initially, Poole and DeSanctis (1990, p.150) defined appropriation as the process of “how users alter systems, thereby enacting socio-technical change within the group”. Later, DeSanctis and Poole (1994, p. 128) called “the immediate, visible actions that evidence deeper structuration processes, appropriations of the technology” and cited Ollman’s (1971) work as a source in this definition.

When users appropriate a technology, they also appropriate the 'structures' embedded within the technological artefact. AST proposes four modes of appropriation: (1) *appropriation moves*, otherwise known as consensus on appropriation; (2) *faithfulness of appropriation*, being the way an Advanced Information Technology (AIT) is used with respect to its original intent; (3) *instrumental uses* that incorporate what features are used by the group to understand why the AIT has been employed; and (4) *attitudes toward appropriation*, representing the beliefs and views work group members have toward an AIT.

In contrast to AST, Orlikowski's model moved away from the idea of *appropriation of technology structures* to a complementary notion of *enactment* - appropriation, in her view is a purely social process.

Structurational Model of Technology

Using Giddens' (1979, 1984) concepts of recursiveness, mediation and duality of structure, Orlikowski and Robey (1991) developed the Structurational Model of Technology. This framework attributes a recursive notion to technology, or a *duality of technology* (Orlikowski, 1992), where technology is regarded as a product of human action and a consequence of human interaction. In this model, she proposes the following (Orlikowski, 1992, p.410): (a) technology is a product of human action, such as design, development, appropriation and modification; (b) technology is a medium of human action, facilitating and constraining it through provision of interpretive schemes, facilities and norms; (c) institutional conditions of interaction with technology influence humans in their interaction with it; and (d) institutional consequences of this interaction influence institutional properties of an organization by reinforcing or transforming structures of signification, domination and legitimation. Her duality of technology view consists of technology physically built by designers and the product of a particular temporal and organizational context. This idea is

enhanced by the notion of interpretive flexibility (Orlikowski, 1992), which considers two modes of interaction in technology: the design mode and the use mode. In the former, designers impart certain interpretive schemes, facilities and norms into technology, while in the latter, agents appropriate technology through assigned meaning and are influenced by it through execution. She emphasizes however that any constraining structures are institutional and not within the technology itself.

Another proponent of technology-in-use as a building block of appropriation in the human ↔ IS nexus is Carroll et al. (2002, 2003).

Model of Technology Appropriation

The Model of Technology Appropriation (MTA) as proposed by Carroll et al. (2002, 2003) depicts the appropriation process as the transformation of a *Technology-as-Designed* into a *Technology-in-Use*. A technology-as-designed embodies the views of designers and marketers and the requirements of users, and a technology-in-use captures the needs of users as they are expressed through the action undertaken as the technology is utilized in everyday activities.

The MTA was originally developed in the context of single-user appropriations - unlike AST that predominantly examines group appropriations. The MTA sought to capture the process or act of appropriation from filtering of initial attractors, to the establishment of evaluative criteria and the subsequent reinforcement of these criteria through use (Carroll et al., 2003). Carroll (2004) later extends the model to represent a Technology Appropriation Cycle, purporting that developers first construct the technology and users close the cycle in their use of it.

MTA suggests that appropriation involves a systematic evaluation by users as they progress through three levels: encountering the technology (Level 1), adopting and adapting it (Level 2) and then 'stabilizing' it by integrating it into routines and practices (Level 3). Level 1 is when initial judgments occur. Here, the user first

encounters a technology as designed and makes an initial evaluation based on its innovation and expectations of its value (Carroll, 2004). The user enters a filtering process, recognizing certain attractors that will encourage appropriation. Conversely, a lack of attractors will result in non-appropriation. During Level 2, users begin to fashion criteria through continued evaluation of the technology - they explore, adopt and adapt to it. In this process, the technology will afford some activities or constrain others, and in turn, users may configure or personalize technology to either find innovative new uses.

Level 3 is what Carroll (2004) calls appropriation. Users persist with the technology over time, developing *reinforcers* that fortify the technology as part of their activities and practice. The technology becomes 'stabilized' during this period; alternatively, changes in the reinforcers may lead to re-evaluation of the technology and possibly disappropriation. In extending the MTA as a technology appropriation cycle, Carroll (2004) suggests that a technology as designed reaches its final stage of transformation through the appropriation of it by users.

The Appropriation Dilemma

With our review of these IS frameworks, we feel that there are three issues that affect the understanding of appropriation within the field:

- While the existing literature generally recognizes the interplay and interaction between human and technology, the process that leads to how the interaction might play out is neither well understood nor incorporated into these theories. Carroll (2004) has made an attempt in this direction but her description still focuses on the behavioural outcome rather than the integral processes that lead to those outcomes. In order to fully understand and account for technology

appropriation, we propose a model that takes into consideration the processes that lead to appropriation.

- While literature appears to rely on various elements from the social sciences, e.g. the ideas of structures, subject-object distinction, appropriation, object-as-artefact vs object-in-use, etc., all of which, as we pointed out, could be traced back to the Marxian root, they have not been considered in a holistic manner. We believe that by using ideas piecemeal, emphasizing one component while neglecting the others could result in a piecemeal understanding of technology appropriation.¹
- Relating to the above issue, the transition of the state of relationships between an individual and technology, from perception to orientation, realization to appropriation, and then to disappropriation, is not well understood. We argue that a clear understanding of this transition is critical to the development of a theory for not only appropriation but also adoption and rejection of technology.

On the final point, the existing models consider appropriation at the point of a technology being introduced into a system. Carroll's model does attempt an understanding of drivers or behaviours that begin an appropriation, but the discussion still remains unclear. A Marxian approach can correct these dilemmas. By considering the entire process of appropriation, including pre-adoptive factors such as motivation (perception), behaviors throughout the process (orientation) and the subsequent socialization of a technology as it is subsumed into group activities (appropriation), we can potentially assess non-appropriation, unintended use and disappropriation and provide a predictive, explanatory depiction of the process.

¹ We recognize that the authors may have started with a different ontological base, rather than the Marxian paradigm, and thus this comment may not be entirely fair. We argue that in as much as these concepts have their roots in Marxian paradigm, such comparison is both reasonable and constructive.

We now present our integrated three-tier model of appropriation constructed from Marx's conceptual building blocks.

THREE-TIER MODEL OF TECHNOLOGY APPROPRIATION

Our technology appropriation model is derived from the literature, building upon the concepts of Marx (1977) as reiterated by Ollman (1971). The major integrated concepts are natural being, species being, social being, perception, orientation and realization (Marx, 1977; Ollman, 1971); appropriation (Marx, 1977; Ollman, 1971; Rogoff, 1995); technology as artefact (Orlikowski, 2000) and technology in use (Carroll et al., 2002, 2003; Orlikowski, 2000).

The model defines three levels of interaction with technology: the intrinsic behaviour and senses of *natural being*, the consciousness of *species being* and the structural modalities of *social being*. The model is presented below in Figure 2.

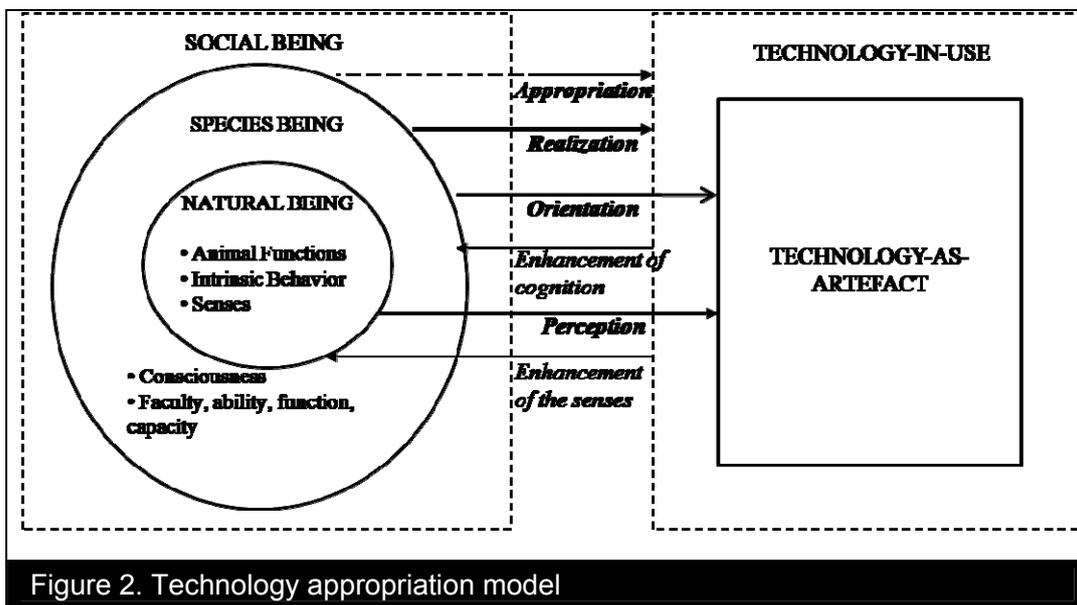


Figure 2. Technology appropriation model

In essence, the model applies the Marxian process of appropriation to the information systems context. However, we feel that the perspective of this model is not bounded by this context and, in contrast to AST, SMT and the MTA, is not

limited to a specific instance of technology. Because the Marxian approach sits within a wider framework of sociology, it affords an understanding of actions and motivations that are not restricted to a specific feature or intended use.

Further, existing appropriation theories separate units of analysis within appropriation into individuals or groups. Marx's dialectic approach covers both individual and group behaviors. Moreover, it attempts to understand these actions from the very point when a technology comes into play, including what drivers incite appropriation, the manifesting actions from the individual and group members as the technology is appropriated, and post-adoption effects on both the social system and the technology. With this dichotomy of individual and social patterns of behavior over the course of appropriation, we are able to account for culture, personal action and occupational influences. We now describe this model from the inside out.

Natural Being: Perception of Technology

Natural being perceives a technology in its artefact state; that is, technology in its static form without prior observations or established patterns of use for that technology. An individual encounters this artefact through physical senses - sight, hearing and touch, through which the tangible immediacy of the object, its function and form, is considered. Judgments are formed of the essential needs or powers that this artefact will fulfil purely through instinct. In perception, natural being intuitively forecasts the *sensory enablement* a technology-as-artefact might offer.

It is through perception that our senses find essentiality (see Marx, 1977) in the technology. Natural being intuits that when the technology is placed into use, it will provide an *enhancement of senses* that enables essential powers or fulfils essential needs. This instinctual recognition occurs either prior to or simultaneously with the conscious orientation to the technological artefact by species being.

Species Being and Social Being: Orientation of Technology

Where *natural being* employs intrinsic senses to seek physical fulfilment of essential powers and needs in a technology, *species being* employs the unique human characteristics and the faculty, ability, function and capacity of conscious behaviour to assess the species powers and needs (see also Maslow (1943) for a discussion of human needs). During orientation, *species being* projects future behaviour, envisioning the subject-object relationship between the user and the artefact. Species being forecasts the transformation of work arising from the human ↔ technology interplay into products and services during the labour process. Species being may orient to a technology in a presumptive or pre-supposed manner (a socially 'intended' use) or engage unique creativity and expressiveness to exploit uses of a technology-as-artefact in an innovative manner. Orientation is thus the future *imagined use* of the artefact by species being.

In the orientation process, species being relates to technology through cognition. This subject-object relationship manifests through experientially developed or consciously held routines, guidelines and behaviours driven by occupational or cultural practice. Additional frameworks or meanings held in abstract social structures may be employed in the individual's connection with the technology-as-artefact. One may socially associate intended use patterns with an artefact or an individual may assign new meanings or uses to the artefact. Orientation towards a specific technology, therefore, may be guided by individual choice (voluntarism) or socially-based structurationist modalities (determinism). The notion of use-as-intended vs. innovative use is merely an outcome of orientation by species being.

We reaffirm at this point that perception and orientation occur simultaneously or iteratively, depending on the context. Both are at the individual level and combine as *realization* (Ollman, 1971). The technology-as-artefact is realized through the

natural and species needs and powers, respectively fulfilled through the sensory enablement or enhancement of cognition arising from the technology-in-use.

Realization

It is at the point of realization when the technology-as-artefact becomes technology-in-use that the desired needs and powers of the individual begin to manifest through preliminary engagement with the technology. This is the beginning of the appropriation process. Realization is the active fulfilment of natural (intuitive) and species (imagined) needs and powers, which are confirmed through use. For the purposes of this discussion let us assume that the human ↔ technology interaction has some positive outcome and is not immediately disappropriated.

The effects of the adoption and application of the artefact can be seen firstly at the level of species being. As the individual discovers that the technology presents an *enhancement of the senses* and/or an *enhancement of cognition*, the technology might begin fulfilling needs and powers not previously anticipated. As the individual (subject) *realizes* the technology (object), the individual also *realizes* themselves through the technology-in-use. This process of reflexivity yields the patterns of behaviours and meanings that a person ascribes to the technology. The use patterns as recognized by species being are reiterated by social being. These uses of the technology proliferate throughout the organizational system to result in social activity that both shapes and is shaped by technology-in-use (Giddens, 1979; Orlikowski, 2000).

If one individual verbally describes a potential technology and draws on referent frameworks or behaviours in their description, another user is able to *orient* to a technology without necessarily perceiving it.

In light of these discussions, we posit three propositions:

P1: Regardless of the intended use of a technology (be it for individual or group purposes), one could influence the orientation of an individual towards the technology either by directly appealing to the senses of the individual (natural being) or indirectly through the social being (or both).

P2: An individual will orient positively towards a technology if the technology is presented to be able to enhance the individual's senses or cognition (or both).

P3: While an individual's orientation towards a technology could be influenced socially, the ultimate realization of a technology, however, is dependent on the individual being able to perceive it directly.

What this leads to is the conception that species being, while retaining unique creativity and expressiveness of self, also patterns behaviours off their social environment. Species being performs the specific sets of behaviours that result in technology-in-use not only enhancing his or her own senses and cognition, but also contributes to the ethereal structures of their social system (Giddens, 1979). Ongoing behaviours, either predetermined or new, are socially constructed and recursively executed.

Appropriation

Full appropriation yields the notion that a technology-as-artefact is taken possession of by an individual, for that individual's ownership and use (Marx, 1977). Social being is the principal subject in the appropriation process post-realization. Appropriation connects humans at the level of species being to the technology by a process of objectification, or as Marx (1977, p. 102) states: "it is only when the objective world becomes everywhere for man in society the world of man's essential powers...that all objects become for him the objectification of himself, become objects which confirm and realize his individuality, become his objects: that is, man himself becomes the object."

From this, we can consider the interplay of human ↔ technology-as-realised as an essential feature of the appropriation process. Using the Marxian approach, the technology user themselves become an object. The user is oriented and perceives the technology and realizes it, allowing it to be appropriated by higher level ethereal concepts such as an organization. The organization is an ethereal object that may seek fulfilment of essential needs and powers through the appropriation of technology-in-use and the user.

At the core of appropriation is the concept that a technology whether as artefact or in-use, does not itself embody a structure or behaviour but represents guides to certain actions that manifest through use and engagement. Additionally, engagement with the technology might stimulate previously unrealized new needs and powers. The process of re-orientation is when new uses for the technology are found by a social group as a result of social structures being changed or reshaped or individuals in the group changing or being replaced.

This reflects Ollman's (1971) idea of social needs being drawn from other humans who have developed essential powers through similar experience - technology-in-use behaviours therefore can mimic prior human experiences as they are actively defined by them. These technology-in-use behaviours draw on the structuralist triumvirate of legitimation, domination and signification (Giddens, 1979).

This mechanism is consistent with Orlikowski's (2000) view that technology does not embody structures but structures are instead embodied in ancillary social activities. This is also consistent with Rogoff's (1995) participatory appropriation whereby users engage in activities that are similar to ones they have previously experienced. Thus, technology-in-use is guided by behaviours external to the artefact and, from time-to-time, species being may orient differently to a technology artefact, producing

alternative technology-in-use behaviours to those that were socially intended. DeSanctis and Poole (1994) refer to these phenomena as appropriation moves.

This leads us to different social groups appropriating technologies differently. Differentiations may be a result of different orientations – that is, behaviours and intended uses for one group may not be the same as those for another. These differing behaviours might result from an individual within the group finding an unintended realization of essential powers. Different cultural or occupational groups possessing certain expectations for behaviour will appropriate technology-in-use in different ways. These differences support the notion of *social being*, with the individual drawing on referent frameworks for behaviour or the structures of their social setting to create meanings for a technology-in-use according with the rules of the group. A resultant use of the technology that is radically different or beyond the bounds of the system rules may occur when several individuals begin to invent new technology applications. These new appropriations can change the behaviours of the social group, a process Giddens (1979) describes as recursiveness.

Behaviours within cultural or occupational groupings, driven by structural modalities (interpretive schemes, rules and resources and norms) drive perception and orientation (realization) in natural and species being, and maintain the appropriation process in social being. This leads us to our fourth proposition:

P4: It is easier to perceive and orient towards a technology-in-use already previously realized and socially appropriated than one that has not been realized and socially appropriated (even though it might better enhance senses and cognitions).

As shown in our model, social being appropriates a technology-in-use, meaning that appropriation is a constant re-orientation and re-perception and therefore, an ongoing realization of the technology-in-use. Social being appropriates in accordance with how others within their cultural or occupational group are using the

technology. As long as a technology fulfils the senses of natural being and enables the cognition of species being, the process of appropriation is ongoing, subject to continued social appeasement and existing structures. As a result, when a new technology is to be adopted, it is at the initial point of realization, perception and orientation that individuals draw on the established expectations and patterns of use that they have embedded within their active species consciousness.

Implications for IS research

Our model has the following implications for research:

Technology adoption

The most comprehensive model of technology adoption is arguably the seminal work by Venkatesh, Morris, Davis, and Davis (2003). They proposed a unified model of technology adoption and use, positing the following main constructs, which are collected from extant technology adoption models: performance expectancy, effort expectancy, social influence, and facilitating conditions, intention to use and actual use. A closer examination of correspondence between the constructs in their model and the various key conceptions in our model (although their basis for deriving these construct differ from ours) is beyond the scope of this paper but it is worthwhile considering, albeit briefly, where are the points of similarity and departure between their model and ours. For example, the constructs of performance expectancy and effort expectancy in their model mimics the notion of how an individual perceives whether the object would enhance his/her senses or cognition, while the social influence construct captures the element of social structures and associated facilitating conditions. These constructs are posited as influencing the intention of use but their influences are moderated by several demographic factors such as age, gender, experience, and voluntariness of use. The intention of use, together with

facilitating conditions, is hypothesized as affecting directly the use behaviour (defined as usage in their model). Again, the relationship between the constructs and the intention of use could be explained by the process of orientation in our model. However, unlike Venkatesh et. al. (2003), our model suggests that positive orientation would only first result in *realization* of the technology, i.e. the trying out of the technology, rather than the actual usage (in its steady state). Our model suggests there is still a gap between realization and appropriation, which we propose must be accounted for in a causal model of technology adoption in order to fully explain whether a new technology will ultimately be adopted.

In addition, Bagozzi (2007) sees several flaws in contemporary technology adoption and acceptance models. These include the absence of a sound theory or method for determinants; neglect of group, social and cultural influences on decision to adopt; over-simplified notions of individual effect or emotion; and over-dependence on purely deterministic notions that exclude self-regulation. Regarding the latter point, most adoption models, which have their roots in TAM (Davis, 1989), do not assume that a technology can be subject to incentives or mandatory use within organizations. The Marxian approach makes no such assumptions, accounting for both deterministic and voluntary notions of appropriation, beyond superficial descriptions. Furthermore, it delivers a theoretical base that considers a range of individual and group level cultural, behavioral and motivational factors that drive the successful appropriation process, whether it is mandatory or not.

Technology appropriation

While Adaptive Structuration Theory is the only theory that attempts to directly develop the construct of appropriation, this construct is developed in the context of a group support system and thus assumes as its underlying concept and measures such notion as group consensus. As our model suggests, appropriation could occur

at both the individual and group or organization level. A more general construct of individualistic appropriation that accounts for the species and natural being as well as the social influence is essential for further research in technology appropriation. In contrast to contemporary theories such as AST (DeSanctis & Poole, 1994), our model does not draw largely from Giddens' (1979) structuration theory. As a result, we free ourselves from two concerns: (i) the difficulty in defining objects and structures; and (ii) Giddens' own ontological problems with technology being equated with rules and resources (Orlikowski, 2000). On the second issue, Giddens has expressed concerns about information systems or technology in general being placed as the central point of examination within his framework (Jones, 1997). Because the Marxian philosophy naturally deals with the subject vs. object relationship, this phenomenon is not an incidental analysis.

Following the previous point, with this clear divisibility between structures and objects, a Marxian approach is naturally suited to the human-technology nexus. This resolves the issues of theory conjecture in the structure vs. object debate, and the issue of combining two ontological bases (i.e. appropriation and structuration theory). With this model, we retain a pure Marxian intent, merely refining his framework rather than retro-fitting it.

Technology use and disappropriation

The ultimate purpose of technology adoption and appropriation research is to shed light into how technology could be designed so that it will be accepted quickly and used to effectively enhance individual and organisational performance. It is critical therefore that we understand not only the initial adoption behaviour but also the continued use and very importantly, the non-appropriation or disappropriation of technology.

Our model (see proposition P1-P4) suggests that technology that fails to appeal directly to the senses or be perceived directly as enhancing cognition, for example, is unlikely to be appropriated. Similarly, a competing technology or changing circumstances could result in a negative orientation towards an existing technology and ultimately its disappropriation. Our model thus suggests that non-appropriation or disappropriation of technology can be mitigated through (i) ensuring that there is continuity with existing technology use, (ii) highlighting the appropriate signal to the natural being through ensuring that enhancements to senses and cognitions are easily perceived, and (iii) incremental buying-in starting with small social groups. Coupled with the transformative process, our model thus allows us to go beyond current theoretical models of appropriation and feasibly understand and account for inter-dependent behaviours such as non-appropriation and disappropriation.

Towards Technology Appropriation

As it explores the dichotomy of human nature, a Marxian approach can be used to further ratify the divisibility between technology-as-artifact and technology-in-use. Through the separation of species being and social being, we can elicit respective behaviors and attitudes toward each stage of a technology – first as it is considered and secondly as it is appropriated. This is consistent with socio-cultural theories in which appropriation is seen as the transformative process an object undergoes, whereby changing social practices coincide with the introduction of a technology. The changing state of technology-as-artifact into technology-in-use is central to appropriation and the Marxian perspective allows us the following explorations:

- The perception an individual has toward an artifact, which may identify what specific designs or features invested in a technology initiate a higher process of realization; and

- The way a technology shapes and is shaped by cultures or organizations as it is placed into use, allowing us to consider the ostensibly social nature of many technologies and how they become cultural tools. This provides a new design perspective that may predict actions on the part of individuals and groups, and suggest social patterns for which a technology is more easily realized.

In terms of what we can provide the social sciences, the field itself has admitted to grappling with the problem of empirical evidence (Conference on the State of the Social Sciences, 2004). IS research methods can bring rigor and relevance to a Marxian approach while retaining its rich sociological foundations. The human-technology nexus within information systems is the ideal testing grounds for an investigation of such theory, and there are limitless empirical settings with which to engage it. Furthermore, by employing a social science underpinning, we can bring the IS field:

- A general understanding and prediction of behaviors and drivers for the successful take-up of a new system or device that focuses on the individual employee in the context of their subsuming hierarchies. Such insight can assist the training, promotion or distribution of a new technology that takes note of the anticipated perception, orientation and realization processes of an individual's setting while mitigating the risk of 'non-' or 'dis-' appropriation; and
- A model that allows designers to understand how individuals within a particular social setting might perceive a technology and its subsequent orientation process. Technologies can be designed with social patterns in mind and marketed to capitalize on these predicted responses.

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