E-(Embodied) Cognition and Experiential E-Commerce:

Challenges and Opportunities

José Antonio Rosa

Case Western Reserve University

Alan J. Malter

University of Arizona

This paper was presented at the Conference on Experiential E-Commerce, Michigan State University, September 27, 2001. All correspondence on it should be sent to José Antonio Rosa, 586 Enterprise Hall, Case Western Reserve University, 10900 Euclid Avenue, Cleveland, OH 44106. Phone: 216-368-6276. Fax: 216-368-4785. E-mail: jar23@po.cwru.edu.

Abstract

Advances in information technology make it possible to deliver multi-sensory information over the Internet, in effect facilitating experiential e-commerce that greatly exceeds the two dimensional capabilities of existing mass-market media. Delivery of sensorimotor stimuli is not enough, however, to fully generate and manage the embodied knowledge that is critical to consumer thinking about many types of products and services. Embodied knowledge refers to information elements that are generated and stored outside the brain cavity, and which are incorporated into consumer assessments of products and services. The contemporary view that embodied and conceptual knowledge are integrated into mental simulations of products and services by consumers is used as a foundation for a more detailed exposition of embodied knowledge than what has appeared in the literature to date. Three elements of embodied knowledge, body mapping and monitoring systems, proprioceptive knowledge, and body boundaries, are discussed in depth, including their implications for experiential e-commerce theory and practice. The methodological challenges of better understanding and managing embodied knowledge are also discussed.

E-(Embodied) Cognition and Experiential E-Commerce: Challenges and Opportunities

Although the initial exuberance over e-commerce has diminished, as exemplified by plummeting stock valuations and dot.com layoffs, there is little doubt as to the long-term viability of Internet-based marketing for many consumer and business-to-business (B2B) products and services. The growth of enterprises such as Expedia, e-Bay, and Amazon, and the proliferation of copycat ventures who quickly secure at least some repeat customers, suggest that e-commerce is not a passing fad. The buying and selling of goods and services over the Internet is no longer in question.

It is equally clear from the e-commerce debacle, however, that not all products and services can be sold using the same human interface approach – two-dimensional analogs of print catalogs that rely almost exclusively on the consumers' conscious processing of visual (and some audio) stimuli to convey information. It may be possible to sell standardized products such as airline tickets, books, CDs, and computers with little more information than pictures and short descriptions of key product attributes. The consumption of such products, after all, involves primarily the same mind mechanisms (e.g., the processing of audio and visual inputs) as those used to market the product, making it easy for consumers to envision the consumption experience based on simple verbal descriptions. It is a more significant challenge, however, to market products for which consumption involves other mind mechanisms (e.g., emotions, touch,) through constrained two-dimensional interfaces, as can be seen from the limited success of sensory product retailers and the high return rates in these product categories (e.g., Business Week, 2000). In ways similar to print catalogs, traditional e-commerce approaches have for the most part failed in the mainstream marketing of products such as food, apparel, cosmetics, and even automobiles. These are products for which the consumption experience involves the assemblage of rich mental representations from complex arrays of sensorimotor and higher-level knowledge. Such products can be decisively sold through current e-commerce practices only to expert consumers, who can envision consumption in spite of impoverished inputs from the media. Reaching non-expert mass-market consumers in these product domains through e-commerce media, however, demands consumer interfaces that better replicate the inputs that occur when the product is physically present. The low-hanging e-commerce fruit have been picked and further expansion of on-line marketing of new product categories will require considerable effort.

In addition to solving technological hurdles, such as limited broadband distribution and in-home sensory simulation devices that are presently expensive and unreliable, we believe that a different and more complete model of the mind also needs to be developed and assimilated by the field. Such a model would account for the role of embodied knowledge in the consumption experience along with more commonly considered consciously processed information. By embodied knowledge, we mean knowledge that is generated and resident in mechanisms outside the brain cavity, and which is combined with stored knowledge from memory to conceptually simulate interaction with products and services. Moving the field toward such a model of the mind is the primary purpose of this manuscript. In the next section, we briefly summarize an integrative model of the mind which is gaining popularity in mainstream cognitive research, and which allows for equally important roles for conceptual and embodied knowledge. The ensuing section delves into three components of embodied knowledge and their influence on purchasing and consumption experiences, along with arguments for why experiential e-commerce initiatives need to give more attention to these components. The final section of the manuscript discusses some of the research and practice challenges involved in understanding and managing the role of embodied knowledge in experiential e-commerce.

Conceptual Simulations from Pre-Existing and Embodied Knowledge

Pre-existing knowledge is our label for the contents of memory, which provides only a portion of the knowledge that is involved when consumers are thinking about products and services. *Embodied knowledge* refers to basic or primitive elements generated by vision, touch, kinesthetic posture and movement and other sensorimotor mechanisms, and is a second source of consumer knowledge. Important to our arguments is the idea that embodied knowledge structures are processed in the same way and by the same cognitive system as those generated from memory, although they are different in content and origin. Treating embodied experiences as essential knowledge used in information processing has not been part of the marketing and e-commerce research or practice agendas, but the time has come for its inclusion.

For several decades, cognitive science has compartmentalized the mind into perceptual and higher-level processes, and most of the theories that have informed marketing and consumer behavior research have focused on higher-level processes such as memory, beliefs, attitudes, judgment, and choice. Influential research voices (e.g., Barsalou, 1987; Lakoff, 1987; Vygotsky 1978) have repeatedly advised us, however, that the boundaries between primitive and higher level processes are neither as well defined nor inviolate as tacitly imagined, and they have called for theories and research that challenge such assumptions. Integrative theories of the mind (e.g., Barsalou, 1999; Damasio, 1999) take up the challenge, arguing that the mind is a "simulator" where concrete and abstract concepts, ranging from sensations to meta-physical abstractions, are treated in like manner and processed by common mechanisms. Figure 1 offers an illustration of the workings of the integrative mind.

---------- Insert Figure 1 here ----------

Integrative theories of the mind argue that pre-existing knowledge and embodied knowledge are combined to mentally "simulate" whatever entity is consciously being addressed. Conceptual representations of pre-existing knowledge are stored in memory, while embodied representations are created and re-created as needed to complete the simulation. Drawing on decades of research in memory, information processing, and perception, integrative theories of the mind propose that, although sensorimotor systems (e.g., olfactory, gustatory, etc.) differ in function, they deliver similar knowledge inputs to the brain, and that these inputs are processed by the same mental systems. These knowledge elements are called embodied representations in Figure 1. Integrative theories further propose that pre-existing conceptual knowledge (see Figure 1) comes from different types of inter-related frames, which capture spatial and object relations between concepts, but may leave out details of embodied knowledge (Barsalou, 1992; 1999). The information missing from frames when they are activated is filled in by embodied knowledge inputs from sensorimotor systems, which the simulator also activates.

Upon seeing and test driving a brand new automobile model, for example, a consumer's mind will "simulate" the various experiential elements involved, generating a rich and context-sensitive representation of the vehicle which can be further manipulated to envision abstract properties such as ownership or use of the product. Such a simulation will probably involve conceptual knowledge related to past vehicles owned or experienced by the consumer, including their features, brands and models, beneficial elements, and past usage situations and concerns. The simulation will also involve large amounts of embodied knowledge, such as new car smell, the feel of seat contours and fabrics, road noise, how the vehicle handles curves and the open road, and even the small-of-the-back pressure that comes with quick acceleration. Conceptual knowledge and embodied representations are combined into a mental simulation of the vehicle that can be used to asses owning it, including imagined instantiations such as the daily commute, Sunday afternoon drives, car payments, and envious looks from the neighbors. The pattern of brain activation that occurs when the product is experienced, or when it is mentally simulated, is stored in memory, and it remains ready to serve as the basis for future mental simulations of the product (Barsalou, 1999). Of course, subsequent simulations and experiences of the product will incorporate new embodied inputs and contextual factors that are present at the time such simulations take place.

Integrative theories further suggest that whenever the customer thinks about the auto again, the pre-existing knowledge is activated, along with the sensorimotor systems that generate the embodied representations needed to complete the new simulation.[1] A few days or weeks after visiting the auto showroom, the brand new model seen earlier may be simulated once again. This new simulation will draw on the memory created by the initial episode, and possibly other pre-existing automobile knowledge as needed. Since conceptual knowledge often lacks certain details, however, embodied inputs will be required to supplement the simulation. The needed embodied knowledge will be generated by activating many of the same sensorimotor processes that were active when the auto was physically present, adjusting for context demands on sensorimotor systems at the time of the simulation and for whatever is motivating contemplation of the new model. Whereas part of the knowledge used to simulate the new model will be "old" knowledge, some of it will be new, in that it is generated as needed by the simulator.

Two important postulates of integrative theories of mind highlight the importance of embodied knowledge to marketing in general, and to experiential e-commerce in particular. First, some detailed knowledge about products and services is not stored in memory intact, but is instead partially constructed and re-constructed as the need arises. Second, activation and combination of embodied and conceptual knowledge during simulation takes place regardless of whether or not the focal concept is physically present. An important implication from these postulates is that the knowledge elements involved in mental simulation are differentially responsive to context factors, and hence differentially consistent between time-distinct simulations of the same concept. All other things being equal, conceptual knowledge about a

[1] Research suggests that the same sensorimotor systems are activated whether a product is physically present or simply being recalled when simulated (e.g., Kosslyn, Thompson, Kim, and Alpert, 1995; Crammond, 1997).

product or service (e.g., the brand new auto) should be more consistent across its various simulations than the embodied knowledge involved, since the latter comes from multiple sensorimotor systems that are highly responsive to the environment. Time-distinct mental simulations of any product or service, in other words, can differ based on how environmental factors are affecting sensorimotor systems at the time of the simulation. This, in turn, undermines some of the potential influence that marketers can exert on consumer assessments across their simulations of experienced products. In the case of experiential e-commerce, matters are even more tenuous, given that whatever embodied knowledge is activated relies on digital inputs that seek to replicate natural stimuli, and which may interact in unexpected ways with the consumers' actual environment while browsing.

Until now, the role of embodied knowledge in consumer thinking about most products and services could be safely ignored, given that marketing was for the most part done in naturalistic settings, or relied on memories from naturalistic exposure. Experiential e-commerce, however, can potentially disrupt how consumers come to think of products and services, by engaging select sensorimotor systems while ignoring others that would normally be involved if exposure occurred in natural settings. In the marketing of existing products, for example, experiential e-commerce could activate some systems (e.g., seat fabric feel) but ignore others that would normally be engaged (e.g., seat contours), with unanticipated outcomes. Likewise in marketing new product and service concepts: embodied knowledge that is digitally induced for the simulation can be highly targeted and can later interact in unanticipated ways with environmental factors when the product is actually consumed. Understanding the nature of embodied knowledge and its role in mental simulations of products and services is important to the long-term success of experiential e-commerce.

Embodied Knowledge: An Explanatory Framework

Although embodied knowledge has not been a major concern in marketing research (see Babbes & Malter (1997), Malter (1996), Rosa (1995) for exceptions), it has been a concern among psychologists for some time. As early as the 1920s (Head, 1926) we find discussions of embodied knowledge and various body concepts in the academic literature. Such discussions rise to a crescendo in the 1950s and 1960s (e.g., Secord & Jourard, 1953; Wapner & Werner, 1965a; Fisher 1970), before subsiding to their current mature research status (e.g., Fisher, 1986; Cash & Pruzinsky 1990). A thorough review of the literature is beyond our current scope, but we draw on it to discuss different components of embodied knowledge and some of their implications for marketing in general and experiential e-commerce in particular.[2] Figure 2 will serve as a roadmap for our discussion. Body image will be covered only briefly, since it constitutes frame-like knowledge to which traditional information processing approaches are applicable, and is a psychological consequence of embodied knowledge. Its intricate and inseparable relationship to embodied knowledge, however, merits a brief discussion here. The three components of body schema listed in Figure 2 will be discussed in greater detail.

---------- Insert Figure 2 here ----------

Body Schema and Body Image

The terms body schema and body image are often used in reference to a wide and varied range of phenomena, and are sometimes applied interchangeably. We limit the term *body schema* to the embodied representations supplied by sensorimotor systems to the mental simulator (see Figure 1), representations that we have already acknowledged to be primitive (i.e., foundational) and transitory, though easily re-created as needed. In ensuing sections, we discuss three types of embodied representation that compose body schema.

Body image refers to the conceptual representations or frames (Barsalou, 1992) that people hold of themselves, and which influence much of their conscious interaction with the outside world [e.g., Cash (1990)]. In Figure 2, body image is illustrated as residing in the head because it is a stored knowledge structure not unlike what people hold for automobiles or washing machines in its fundamental nature. Clearly, body images are much more complex and impinge on many more aspects of life than what product frames touch, given that we are in constant touch with our bodies and experience the physical world through them. One important aspect of body image is that it has historical depth. At any point in time our body image is informed by who and what we have been as well as by whom we currently perceive when viewing and thinking about ourselves. Because of this historical depth, our body images often distort self-perceptions, relative to externally derived and more objective assessments of our physical size and attributes (e.g., Shontz, 1974). When we look at physical entities that are separate from us (e.g., a baseball, a vase), our mind simulates the object based on its perceived characteristics in the here and now. When we see ourselves, however, the simulation uses a

[2] See Fisher (1986) for a comprehensive review and commentary on different aspects of embodied knowledge.

compendium of historical information and not merely current data points. Discomfort with studying ourselves in the mirror for long periods of time (e.g., Schwarz and Fjeld, 1968) most probably stems from incompatibilities between what is being perceived *in vivo* and the body image with which it is being reconciled.

As it pertains to marketing, and by implication to e-commerce opportunities, body image has been found to influence the consumption of products such as cosmetics, apparel, and even tattoos (e.g., Cash and Cash, 1982; Solomon and Douglas 1978; Rubinstein 1978), and it should certainly be considered in any e-commerce ventures involving such products. Being consciously prosecutable knowledge, however, suggests that many of the principles and theories already developed in consumer behavior research should apply to the role of body image in experiential e-commerce. More important to our current challenge is the fact that human behavior research in consumption and other areas suggests that the influence of more primitive embodied knowledge on body image may be what ultimately shapes behavior. Fisher (1986) argues that body knowledge from multiple sources forms a grid or system of coordinates upon which life impressions are traced and made sense of. The experiences of consumers involved in experiential e-commerce form part of such life impressions. We now turn our attention to three types of embodied knowledge and their possible implications for experiential e-commerce. This list is not exhaustive, but should reinforce the importance of the topic to e-commerce efforts and start shaping a new research agenda.

Body Mapping and Monitoring System

One of the many functions served by the interaction between autonomic and higher-level systems is the mapping and monitoring of body components, covering extremities such as hands, arms, feet, legs, and the head, and internal components such as the stomach, heart, and lungs. Although we refer to it as the Body Mapping and Monitoring System (BMMS) in the singular, it is actually composed of a large number of simple systems interacting with portions of the body image. The BMMS delivers embodied representations of the health status and capabilities of different body components to the simulator (see Figure 1). Such information is delivered as required by simulation processes, and can be triggered by external stimuli (i.e., the need to simulate new or re-occurring experiences) or by internal conditions (i.e., the need to make sense of unusual conditions such as abdominal pain or malfunctioning limbs).

The embodied representations delivered by the BMMS are primitive and simple. They are considered knowledge, however, because they serve as a basis for updates to body image. The frequency and volume of such representations serve to offset their simplicity, particularly in situations where radical changes to body image are required. Consider phantom limb syndrome as an extreme example – a condition common among people who have recently suffered the loss of body parts, such as hands, arms, feet, and even breasts in the case of women (Tiemersma, 1989). Persons suffering from phantom limb syndrome will "feel" that the removed body parts are still present, even when confronted with visual and BMMS evidence that these parts are gone (e.g., Simmel, 1959; Simmel, 1966). Phantom limb syndrome exemplifies dramatically the mutual influence between BMMS and body image, and that although they are for the most part congruous, their information is not in perfect agreement 100% of the time. As mentioned earlier, body image has historical depth, and its updating seems to require multiple and repeated embodied representations being brought to bear on body image through simulations of entities and events (see Figure 1). When BMMS and body image become grossly and suddenly misaligned, as in the case of phantom limb patients, body image can cause false sensations where a limb should be, as mind systems seek to reestablish coherence between embodied and pre-existing knowledge. Eventually body image and BMMS are reconciled.

The BMMS is just as important to how 'normal' people make sense of and navigate their environments, even if the effects are not as dramatic as in the case of amputees. As mentioned above, the BMMS delivers embodied representations of the status and health of various body parts to the simulator. Research shows, however, that the preeminence of BMMS representations can vary based on gender, and be further influenced by task and environmental factors. Starting with the work of Jourard and Secord (e.g., Secord & Jourard, 1953; Jourard & Secord, 1955) and supported by other studies (e.g., Berscheid, Walster & Bohrnstedt, 1973; Lerner, Karabenick & Stuart, 1973; Mahoney & Finch, 1976), research has shown differences between men and women in the importance they attach to different body parts, and in how satisfaction or dissatisfaction with different body parts is related to their self-esteem. Satisfaction or dissatisfaction with body parts, otherwise known as body-cathexis, is in itself more indicative of body image than BMMS, suggesting that body image has various components and is linked to other psychological aspects of self-representation, such as self-esteem.

When the results of extensive multi-method research on body part size estimation (e.g., Shontz, 1969) are compared to those of body-cathexis studies, however, satisfaction and dissatisfaction with body parts correlate with over- and under-estimation of size, and some differences between men and women are once again revealed. Body part size estimates across measurement methods are dependent on BMMS knowledge, given that the contexts in which the estimates are derived are changing. It seems reasonable to conclude, therefore, that gender is related to differences in the knowledge that the BMMS delivers to the simulator, which is in turn affected by the person's body image.

Research also shows that active movement (e.g., Fuhrer & Cowan, 1967; Shontz, 1969), spatial context, and task (e.g., Wapner and Werner 1965b) influence body-part size estimation. Body parts in motion are reported to be larger than static ones, with the effect being stronger in women. When people are asked to estimate the size of non-body parts, however, motion had no influence on size estimates, and neither does gender. Furthermore, spatial context influences size estimates. Outstretched arms are perceived as longer, for instance, when the space in front of the arms is wide open (as in a large room) than when a wall is close by (as in a closet). Arms are also perceived as longer when holding a tool or pointing at something. Both movement and spatial context effects are reduced or eliminated, however, if the outstretched arm is even lightly touched. In all of these cases, the interaction between the BMMS and body image is clear. Variations due to spatial context are most likely caused by visual information being part of the simulation when estimating limb size, and interacting with BMMS knowledge. In the case of body motion, it is likely that larger amounts of information are sent to the simulator by the moving limb. The same applies to a body part connected to a tool, presumably because a tool would not be held unless a task was being considered consciously, and the execution of tasks demands simulator attention. The attenuation or disappearance of the overestimation effect when limbs are touched suggests that checks and balances operate within the BMMS.

Gender and contextual differences in the influence and content of BMMS knowledge delivered to the simulator, and in the importance given to this information, is of critical importance when designing experiential e-commerce systems. In the marketing of apparel, for instance, the importance of, and satisfaction/dissatisfaction with, different body parts is likely to have bearing on the product types and styles that men and women favor, and in their responses to visual stimuli. Designing different digitized experiential stimuli for the two sexes to accentuate those body aspects that each gender considers most important and de-emphasize those about which they are most sensitive, is thus likely to enhance the satisfaction of shoppers for apparel on the Internet. Furthermore, differences in consumer personal size estimates based on gender predispositions, the spatial context while visiting the e-commerce website, and the activities for which the apparel is being considered, should also be considered. Experiential e-commerce sites, for example, should take into account that women tend to overestimate their waist size (Shontz, 1969), and possibly compensate for this tendency in the visual stimuli that they provide to women consumers. Experiential e-commerce sites should also consider that both men and women tend to overestimate head and chest size and underestimate hand and foot sizes (Shontz, 1969). Further considerations should include the fact that websites are typically visited while sitting at a computer, often inside a small cubicle or other compact space, in contrast to the open environment of most apparel stores (though fitting rooms are typically small, they contain mirrors that affect the perceived size of the space). Thus, spatial context is likely to influence consumer mental simulations when considering a purchase. Given that web designers cannot control for consumer surroundings, they may want to look for ways of nullifying spatial context effects. One such device may be to encourage consumers to actively envision themselves using the products in active naturalistic settings (i.e., while in motion), and provide them with visual and/or audio cues that facilitate this type of mental simulation. Some apparel e-tailer, such as Land's End, already offer static personal mannequins that demonstrates the fit and combination of selected clothing items on a person with the shopper's own physical dimensions and features. (See ‘My Virtual Model’ at the Land’s End website: www.landsend.com.) More sophisticated programming, VRAM, and faster connection speeds will be needed to put these figures in motion and more realistically simulate consumer usage situations. Such combinations of technology and mental exercises may help overcome spatial context effects.

Some readers may argue at this point against the need for such considerations, given that the apparel industry has developed numerical equivalents of body size, and that substantial amounts of apparel are already sold through two-dimensional e-commerce sites. We respond to such arguments in two parts. First, it is important to consider the experience of buying apparel at the store. Consumers know that industry size information is subject to deliberate (e.g., using generous sizes) and accidental misrepresentation, and that it leads to unavoidable size variations between manufacturers, and sometimes even between the production facilities of a single firm.

Consumers address this problem by ‘trying on clothes’ in front of a mirror at the store, which allows them to make visual and embodied assessments of the apparel while envisioning themselves wearing the clothes in different settings. At experiential e-commerce sites there is no opportunity to “try things on,” which causes the purchase process to tax consumers' imagination (simulation resources) more than in-store shopping, while at the same time raising the risk of making a bad purchase. Digital multi-sensory information delivered at experiential e-commerce sites, however, can reduce the mental simulation burden, and may even improve the accuracy of simulations over those of in-store shopping experiences. To achieve such objectives, however, experiential e-commerce must be responsive to embodied knowledge considerations.

Second, we must keep in mind who bears the burden of returns due to consumer error. In traditional apparel stores, the customer bears the burden of transporting the goods from and to the store, while the retailer addresses re-stocking and returns to the manufacturer. In current e-commerce practices, retailers often assume from and to transportation costs in addition to re-stocking and returns, in part to reduce consumers’ risk perceptions when buying on line. Perhaps due to the inefficiency with which consumers can simulate consumption using static, two-dimensional e-commerce sites, however, the return rates for apparel purchased on-line tend to be higher than those of apparel purchased in brick-and-mortar stores (Business Week, 2000). Thus, it makes sense for e-commerce enterprises to invest in the necessary technology to assist consumers in simulating the consumption experience. Although our examples for the importance of considering the BMMS come from apparel, similar simulation processes apply to other products for which consumption involves body experiences. The consumption of foods, tools, furniture, sports equipment, autos, and even appliances involves the body, and consequently involves mental simulation and how the imaginal body interacts with the product. Furthermore, since embodied knowledge is managed in similar manner regardless of its origins, the justification for paying attention to the BMMS in experiential e-commerce designs and execution is equally applicable to proprioceptive knowledge and body boundaries.

<u>Proprioceptive Knowledge</u>

Proprioceptive knowledge or proprioception is a term used to describe various phenomena associated with body awareness (e.g., O’Shaughnessy 1995). We limit its use to embodied representations of body posture and movement, such as what would be generated when dancing, running, riding a bicycle, skiing, or playing tennis. When engaged in such complex physical activities, conscious processing cannot handle all of the hundreds of body adjustments involved. In fact, attempting to consciously focus on such adjustments leads to decreased performance, reinforcing the common wisdom that the only way to perform such activities well is to “practice, practice, practice.” Some proprioceptive knowledge generated by physical activity, however, is stored as embodied knowledge. Professional athletes, for example, know when their game is “off,” apparently because whatever proprioceptive knowledge is being generated by their current activities does not match their expectations based on past ones. Such knowledge is not consciously available, however, which is why professional athletes cannot fully articulate how they perform a specific athletic movement, such as hitting a "fastball" in baseball. Even average consumers hold proprioceptive knowledge for activities, such as riding a bike or throwing a football, that they can perform but not articulate.

Some of the immediate and long-term effects of proprioception on body image are also clear. Sensorimotor training, for example, has been shown to permanently enhance general body image in normal and retarded children (e.g., Ball and Edgar, 1967; Maloney and Payne, 1970). Estimates of body-part sizes (discussed in the preceding section) have been found to be affected by movement limitations and paralysis (Shontz, 1970). Alternatively, athletes are more accurate than non-athletes in body-part size estimation, presumably because of their more extensive and significant experiences with body movement (Rossi and Zoccolotti, 1979). It has also been shown that proprioceptive knowledge can enhance field independence – the ability to maintain a clear sense of body position in a changing or unusually structured environment (e.g., Ruggieri & Mazza, 1980; Kurie & Mordkoff, 1970). Field-independence has also been shown to be more pronounced in children than adults (Wapner and Werner, 1965b), possibly because children tend to be more active and hence process greater amounts of proprioceptive knowledge than what adults process.

We believe that proprioceptive knowledge is important to experiential e-commerce in itself, as well as through its influence on field independence. Consider as an example the marketing challenge of selling products that must be evaluated, at least in part, on the proprioceptive knowledge that their use generates, such as tennis rackets, fishing poles, and bicycles. A typical approach to buying tennis rackets, at least among knowledgeable consumers, is to “try them out” by serving a few balls and possibly volleying with a companion or against a wall for a few minutes. Throughout these trials, consumers develop mental representations of how each racket "feels," and often make a final choice based on those "feelings." But where does this mental representation or "feel" come from? A dissection of the activities involved suggest that while consumers may be consciously focused on the ball as they serve and volley, they are also registering hundreds of muscle adjustments involved in the use of each racket into knowledge that is integrated into the mental representation of each object. Moreover, it is clear that this knowledge must be quite detailed, since it can lead to differentiation between rackets that are very similar in objective attributes but differ in how they "feel" when hitting a tennis ball. Proprioceptive knowledge is integrated with body image knowledge into mental simulations of owning and using the different rackets that are being considered, and possibly compared to simulations of rackets that were used in the past. Similar processes are involved in the evaluations of fishing poles, bicycles, baseball bats, yard and workshop tools, and many other products for which consumption (or use) involves physical activity. It is clear, therefore, that experiential e-commerce must find ways of generating facsimile proprioceptive knowledge even when consumers cannot physically grasp or interact with the products that are being evaluated. The digital replication of proprioceptive knowledge is not impossible, as can be seen from electronic fishing games that attempt to replicate the feel of casting a line or fish bites on the hook. (Visit www.miacomet.com for more information on the Real Feel Fishing Controller.) Such replication requires detailed and methodical studies of the proprioceptive knowledge that is generated by the different products, and the careful design of digital stimuli that mimics such activities. The technological challenges are great, but the key concerns are managerial -- the need to recognize the importance of the embodied aspect of on-line shopping.

The influence of proprioceptive knowledge on field independence also has bearing on experiential e-commerce, particularly as it pertains to the adverse physiological responses that discontinuities between visual and proprioceptive inputs can generate. It is well known that discontinuities between what is seen and proprioceptive knowledge of body position can induce physical discomfort (e.g., Wapner and Werner, 1965b). Experiential e-commerce sites could generate such discontinuities, however, if they deliver sensori-rich information streams about products or services to people who are sitting instead of moving in a manner that is compatible with what is being processed mentally. Physiological discomfort has been a major problem with virtual reality applications (e.g., Regan & Price, 1994) and is likely to become an issue as experiential e-commerce applications increase in sophistication. If intensifying body experience is enough to increase field independence (Kurie & Mordkoff, 1970), however, the solution for e-commerce sites may be to introduce exercises that raise the amount of proprioceptive knowledge being processed prior to delivering information that could cause reduced field independence and its adverse effects. Kurie & Mordkoff (1970) were able to raise field independence simply by asking people to concentrate on bodily sensations and experiences, something that can be done in an entertaining manner through an e-commerce site.

Body Boundary

Body boundary refers to the manner in which the individual experiences the limits of his or her physical self, and is a fundamental aspect of body schema (Fisher 1970). It was initially proposed as a research construct by neurologists (e.g. Head 1926), who found that some brain damaged patients could not recognize body parts as their own, while others struggled to separate things occurring outside their bodies (e.g., a car driving by) from internal activities. The construct was more formally developed by Schilder (1935/1950), who extended its applications to psychologically disturbed patients (e.g., schizophrenics), and provided the impetus for over four decades of fruitful research in the area.[3] Most prominent throughout the period has been the work of Seymour Fisher and his associates (e.g., Fisher, 1970; Fisher, 1983; Fisher & Cleveland, 1958), which has explored the nature of body boundaries systematically and their influence on different aspects of human behavior.[4] Their research has firmly established that body boundary variability is common in healthy people, and not merely found among the mentally impaired.

Body boundaries seem to vary along two related dimensions: location and permeability. People vary in where they locate their body boundaries naturally, and in how far they relocate their boundaries depending on environmental factors. For most people, body boundaries are equated with the skin and edges of the extremities. For some, however, their natural boundaries recede from the skin and extremities, leading to detachment from their physical appearance, and in extreme cases to depersonalization of specific body parts (e.g., Freeman & Melges, 1977). It is possible that extreme cases of discomfort with viewing oneself in the mirror (Schwarz & Fjeld, 1968) may also be associated with body boundary location being deeper than the skin.

[3] Paul Schilder's book, The image and appearance of the human body, was initially published in Germany in 1935, and translated into English by International Universities Press in 1950. Schilder died in 1940.

[4] Fisher's work in this area is much more extensive than the three citations convey, although two of the citations (Fisher, 1970; Fisher, 1983) are books in which the literature is reviewed and critiqued. Interested readers are referred to these works as a starting point towards a deeper understanding of body boundaries.

Boundary location can also be altered by environmental factors. Fisher (1973: p. 22) relates as an example the experiences of Dr. John C. Lilly, who studied the effects of submerging himself in a tank of water that was set to the same temperature as his body.[5] With all lights and sounds eliminated, Lilly reported that after a short time he could not distinguish where his body left off and the water began, i.e., that he sensed himself as merged and indistinguishable from his surroundings. Similar effects have been induced in studies using LSD (e.g., Liebert, Werner, & Wapner, 1958), in which subjects extend their body boundaries to encompass artifacts that surround them. Although these are admittedly exaggerated circumstances, Fisher (1973) explains that slight variations in the perceived body boundary location can be induced by factors such as temperature, attire, and physical arousal, bringing the relocation of body boundaries into the mainstream of human experiences.

Related to body boundary location is the concept of boundary permeability, i.e., its rigidity and resistance to penetration by external forces. Research on boundary permeability has been more extensive than research on boundary location, and its effects on other aspects of the human psyche are widespread (see volume 2 of Fisher (1983) for an extensive discussion of research in this area). People vary in their boundary permeability, with some people having a clear sense of their boundaries and confidence in boundary resistance, while others are unsure about how well their boundaries can protect them. High boundary permeability leaves one feeling vulnerable, and this sense of vulnerability causes boundary permeability to affect many areas of human behaviors. Similar to boundary location, boundary permeability has a natural state around which variations can be induced by factors such as gender, childhood development, and the environment. In the case of body boundary permeability, however, the environmental factors affecting it need not be as dramatic.

Men tend to have more rigid body boundaries than women, possibly due to acculturation, or to the fact that men's fundamental psyche does not need to be prepared for reproductive intrusion and extrusion in the same way as women do. At the same time, men tend to display higher levels of anxiety about their boundaries being penetrated than what women display. When facing the prospect of surgery, men experience higher levels of anxiety and distorted visions than women experience (Fisher, 1970), and even as children they tend to display higher

[5] Starting in 1954, Dr John C Lilly, a medical practitioner, experimented with devices that would deprive or restrict the number of external stimuli. His objective was to test brain functions in an atmosphere of complete isolation. The devices were called Sensory Deprivation Chambers.

preoccupation with injuries that violate their boundaries (e.g., Pitcher & Prelinger, 1963). Women's accentuated levels of boundary permeability, in contrast, make them more susceptible to artifacts that enhance their perceived boundaries, such as fashion apparel (e.g., Fisher 1970) and uniforms (Popplestone, 1963), although the boundary perceptions of both men and women are responsive to attire. It appears that both men and women who suffer from permeable boundaries tend to "extend" their boundaries to their clothes, to other personal artifacts, and even to wearable appliances such as automobiles. Fisher (1973: p. 23) speculates that "being inside the gleaming metal capsule of a highspeed (sic) car also provides great backup for weak body boundaries," an idea that may be equally applicable to the currently popular sport utility vehicles. One additional environmental factor that affects body boundaries and merits discussion is general arousal, be it physical or emotional. Fisher (1970; 1986) notes how touch and other forms of skin stimulation (e.g., a hot bath, massage, flagellation) heighten perceived boundary solidity. In addition, he discusses that general arousal such as fear, anger, or that which is caused by multi-sensory overloads (e.g., loud music, psychedelic light displays, etc.) can also induce heightened boundary rigidity.

The natural state and environmental sensitivity of body boundary location and permeability can influence the effectiveness of experiential e-commerce. An example is the marketing of apparel discussed earlier. Given the role of what we wear in reducing boundary permeability (and possibly relocating boundary location), part of what consumers seek when purchasing clothes may be the skin arousal that comes simply from trying on clothes. Shifts in body temperature caused by putting on clothes taken off the rack, and from exposing the skin to the climate-controlled air of the dressing room, may be reassuring to consumers with weakened boundaries, and cause them to find the purchasing of apparel on the Internet less inherently satisfying. Couple this loss with the impoverished visual representations of the apparel due to poor web site design and outdated computer hardware (which makes it difficult to envision oneself as protected by what is being purchased) and the experiential e-commerce website may fall to a considerable disadvantage relative to physical apparel retailers.

Similar concerns are applicable to products that may be used to extend or solidify body boundaries, such as hats, shoes, some types of jewelry and other personal artifacts. Even automobiles, as mentioned earlier, may fall into this category. Autos are a particularly thorny problem for experiential e-commerce. Since autos are expensive, and thus highly committing, consumers give the purchase decision considerable attention, and may spend many hours gathering data and comparing model attributes. It is on the strength of such rational behavior that producers and dealers have sought to expand their markets through the Internet, by providing extensive attribute information on their models. A disappointing outcome from Internet marketing of autos, however, has been that although consumers use the Internet to narrow their final consideration set, they still rely for their final decision on embodied knowledge that can only be gained from visiting the local dealer (Business Week, 2001). Internet pure-plays in the automobile market seem to be great sources of information but not of sold products, and producers remain frustrated in their attempts to wrestle power away from dealers through their Internet sites.

One of the factors that consumers may be seeking from driving the vehicle is to gauge how well the vehicle adds solidity to their body boundaries, and maybe how it helps to relocate their boundaries. If this is the case, experiential e-commerce sites can be developed to either meet some of these needs or to at least reduce their influence on consumers' final decisions. For example, it may be challenging but possible to deliver multi-sensory digital information that can replicate some of the "feel" of driving a vehicle, and in the process help consumers partially assess how well the different models enhance their body boundaries. Similar procedures may be applicable to the marketing of apparel and other boundary enhancing products.

An alternative approach may be to provide stimuli that are unrelated to the products being sold but raise general arousal levels, and by so doing enhance body boundaries to the point that they cease to be a factor in the purchase decision. Implicit in the idea that some people have rigid and impermeable body boundaries is the fact that boundary enhancement does not feature among the benefits that such consumers seek from products. When boundary enhancement is not an issue, it may be possible to persuade consumers on the basis of other features and benefits, arguments for which experiential e-commerce may be better suited. Instead of trying to replicate the embodied buying experience, the experiential e-commerce site may simply try to disrupt typical purchase decision patterns by disguising or deactivating boundary deficiencies. This may be a dangerous approach, however, if customer satisfaction with the product subsequent to the purchase is still being shaped by boundary enhancement expectations. If the boundary enhancement evaluation is disrupted by the website but later re-emerges as an important criterion, the practice may result in costly merchandise returns. Needless to say, body boundaries must be considered in the development of experiential e-commerce sites as part and parcel of everyday consumer decision-making for different product categories.

Research and Practice Challenges in Embodied Knowledge Research

The literature leaves little doubt that BMMS, proprioceptive knowledge, body boundaries, and other types of embodied knowledge are important phenomena that influence self-perception, cognition, and social interaction, and we can draw inferences from the same literature as to their influence on consumption behaviors. Very little research to date, however, has specifically focused on the role of embodied knowledge in how consumers buy and consume products and services.

One possible reason for this lack of research interest is that most embodied knowledge is processed subconsciously, influencing assessments of products and services but not playing a visible role in consumers' retrospective sensemaking of such assessments. For example, very few consumers or retailers consider the embodied knowledge that is involved in apparel purchases at department stores, and that the act of trying on clothes may be as much of a contributor to the final purchase decision as the product's fit or durability. Likewise, there has been little concern over the possibility that consumers may retrospectively rationalize that buying a Ford Explorer was smarter than buying a Nissan Xterra because of its door post mounted air bags, but in reality had been swayed by the Explorer's superior delivery of proprioceptive and BMMS knowledge. Consciously processed information, such as attributes and product category fit, has been enough to generate some predictability of consumer behaviors, and other influential factors have consequently been relegated to the error term.

By attempting to market products and services outside of the physical environments in which transactions have traditionally taken place, experiential e-commerce brings this subconsciously processed and heretofore taken-for-granted embodied knowledge front and center. Experiential e-commerce must sell apparel without it being physically present, and automobiles without test drives, while delivering all of the information that is consciously <u>and</u> subconsciously featured in more traditional environments, if it is to achieve consumer satisfaction rates that meet or exceed those of more traditional shopping venues. Thus, the field must come to understand the role of embodied knowledge in the purchase and consumption process, and not merely measure its presence. Fortunately, experiential e-commerce is not alone in its quest for understanding the role of embodied knowledge in everyday behaviors, and can borrow from the methodologies already in place to achieve its goals.

Two general types of studies of embodied knowledge are applicable to e-commerce consumer behavior. The first is experimentation studies that test the influence of boundary permeability, body part importance, and other embodied factors on attitudes and behavior. Of critical importance to experiential e-commerce, we believe, is experimentation with digitized multi-sensory inputs (e.g., sound, smell, touch) to determine how these influence embodied knowledge and subsequent behaviors. It is unlikely that consumers will respond in the same way to a computer screen representation of themselves wearing a business suit while being fed the feel of the material through a virtual touch device as they would to actually wearing the suit in the store. How different will the reactions be? Will consumers be able to reconcile the different experiences and arrive at similar outcomes on their own? And can experiential e-commerce developers be able to instruct and lead consumers into information integration that achieves the same or even better outcomes? These are some of the questions that experimental studies can address. Yet experimentation may not be enough to fully uncover the relationship between embodied knowledge and consumer behavior. Such experiments tend to treat the mind as a black box, into which embodied knowledge manipulations are entered, and from which behavioral outcomes are extracted. They yield what Andersen (1994) calls 'creata,' – responses that have been created or constructed. These may be styled and controlled but also somewhat sterile. Many of the subtle ways in which embodied knowledge shapes the mental simulation of entities and events (see Figure 1) remain hidden in such studies, and important insights to enhance experiential e-commerce may be overlooked. As a complement to classical experimental research, therefore, we propose experiments in which more qualitative data are also collected, using a personologic approach (Shontz, 1985).

The personologic approach focuses on a small number of subjects carefully selected to represent a target population. It collects large amounts of objectively measured dispositional and attitudinal data from these subjects (for control purposes), and also gathers *in vivo* or retrospective process data from which inferences can be made about the role of embodied knowledge. In a study of automobile purchasing behaviors, for example, body-cathexis and boundary permeability data can be gathered from a small number of consumers using standard measures (e.g., Secord & Jourard, 1953; Fisher & Cleveland, 1958). In addition, observational data and concurrent verbal protocols can be collected while the products are being test driven in controlled settings, which can be supplemented by Q-sorts of attribute and feel factors in the evaluation process. By feel factors we mean associations that are closely tied to embodied knowledge, such as feeling superior to other drivers because of the vehicle's raised driving position, or a sense of invulnerability stemming from the solidity with which the doors close. Observational, verbal protocol, and Q-sort results can be carefully analyzed and compared to the dispositional and attitudinal data for each subject, which should yield a more complex and complete picture of how embodied knowledge influences assessment of various car models. Such insights can in turn be applied to the design of experiential e-commerce sites that can market vehicles without their being physically present.

Clearly, these types of studies of the role of embodied knowledge in experiential e-commerce pose monumental data collection and analysis challenges. However, if experiential e-commerce is to achieve its lofty goals, we must unpack the mysteries of how embodied knowledge influences consumer behavior by developing creative new methods that incorporate embodiment in e-commerce studies.

REFERENCES

Andersen, M. L. (1994). The many and varied social constructions of intelligence. In Constructing the Social, Sarbin, T. R. & Kitsuse, J. J. (eds.), London: Sage.

Babbes, G. & Malter A. J. (1997). Embodied cognition: Towards a more realistic and productive model of mental representation. Advances in Consumer Research, 24, 39-41

Ball, T. S. & Edgar, C. L. (1967). The effectiveness of sensorimotor training in promoting generalized body image. Journal of Special Education, 1, 387-395.

Barsalou, L. W. (1992). Frames, concepts, and conceptual fields. In: A. Lehrer & E. Feder (eds.), Frames, fields, and contrasts: New essays in semantic and lexical organization (pp. 21-74). Hillsdale, NJ: Lawrence Erlbaum Assocs.

Barsalou, L. W. (1999). Perceptual symbol systems. Behavioral and Brain Sciences, 22, 577-660.

Berscheid, E., Walster, E. & Bohrnstedt, G. (1973). The happy American body: A survey report. Psychology Today, 7, 119-131.

Business Week. October 23, 2000, electronic edition. Cliff-hanger Christmas.

Business Week. March 26, 2001, electronic edition. Rethinking the Internet.

Cash, T. F. & Cash, D. W. (1982). Women's use of cosmetics: psychosocial correlates and consequences. International Journal of Cosmetic Science, 4, 1-14.

Cash, T. F. & Pruzinsky, T. (1990). Body images: Development, deviance, and change. New York: The Guilford Press.

Crammond, D. J. (1997). Motor imagery: Never in your wildest dreams. Trends in Neuroscience, 20, 54-57.

Damasio, A. R. (1999). Descartes' error: Emotion, reason, and the human brain. New York: Putnam.

Fisher, S. (1970). Body experience in fantasy and behavior. New York: Meredith Corporation.

Fisher, S. (1986). Development and structure of the body image, vol. 1 and 2. Hillsdale, NJ: Lawrence Earlbaum Associates.

Fisher, S. & Cleveland, S. E. (1958). Body image and personality. Princeton, NJ: Van Nostrand.

Freeman, A. M. III & Melges, F. T. (1977). Depersonalization and temporal disintegration in acute mental illness. American Journal of Psychiatry, 134, 679-681.

Fuhrer, M. J. & Cowan, C. O. (1967). Influence of active movement, illumination, and sex on estimates of body-part size. Perceptual and Motor Skills, 24, 979-985.

Head, H. (1926). Aphasia and kindred disorders of speech. London: Canbridge.

Jourard, S. M. & Secord, P. F. (1955). Body-cathexis and the ideal female figure. Journal of Abnormal and Social Psychology, 50, 243-246.

Kosslyn, S. M., Thompson, W. L., Kim, I. J., & Alpert, N. M. (1995). Topographical representations of mental images in primary visual cortex. Nature, 378, 496-498.

Kurie, M. D. & Mordkoff, A. M. (1970). Effects of brief sensory deprivation and somatic concentration on two measures of field dependence. Perceptual and Motor Skills, 31, 683-687.

Lerner, R. M., Karabenick, S. A. & Stuart,J. L. (1973). Relations among physical attractiveness, body attitudes, and self-concept in male and female college students. Journal of Psychology, 85, 119-129.

Liebert, R. S., Werner, H., & Wapner, S. (1958). Studies in the effects of Lysergic Acid Diethylamide. Archives of Neurology and Psychiatry, 79, 580-584.

Mahoney, E. R. & Finch, M. D. Body-cathexis and self-esteem: A reanalysis of the differential contribution of specific body aspects. Journal of Social Psychology, 99, 251-258.

Maloney, M. P. & Payne, L. E. (1970). Note on the stability of changes in body image due to sensorimotor training. American Journal of Mental Deficiency, 74, 708.

Malter, A. J. (1996). An introduction to embodied cognition: Implications for consumer research. Advances in Consumer Research, 23, 272-276.

O'Shaugnessy, B. (1995). Proprioception and body image. In The Body and the Self, Bermúdez, J. L., Marcel, A., & Eilan, N. (eds.), Cambridge, MA: MIT Press, 175-204.

Pitcher, E. G. & Prelinger E. (1963). Children tell stories: An analysis of fantasy. New York: International University Press.

Popplestone, J. A. (1963). A scale to assess hyperchondriasis. Psychological Record, 13, 32-38.

Regan, E. C. & Price, K. R. (1994). The frequency of occurrence and severity of side-effects of immersion virtual reality. Aviation, Space, and Environmental Medicine, 6, 527-530.

Rosa, J. A. (1995). Adaptive selling behavior: The role of the embodied system. Proceedings of the American Marketing Association 1995 Summer Conference, 400-410.

Rossi, B. & Zoccolotti, P. L. (1979). Body perceptions in athletes and non-athletes. Perceptual and Motor Skills, 49, 723-726.

Rubinstein, R. P (1985). Color, circumcision, tattoos, and scars. In The Psychology of Fashion, Solomon, M. R. (ed.). Lexington, MA: Lexington Books, 243-254.

Ruggierri, V. & Mazza, P. (1980). Effects of muscle tone and changes in autonomic balance on cognitive style. Psychological Reports, 46, 916-918.

Schilder, P. (1935/1950). The image and appearance of the human body. New York: International Universities Press.

Schwarz, L. H. & Fjeld, S. P. (1968). Illusions induced by the self-reflected image. Journal of Nervous and Mental Disease, 146, 277-284.

Secord, P. F. & Jourard, S. M. (1953). The appraisal of body cathexis: Body cathexis and the self. Journal of Consulting Psychology, 17, 343-347.

Shontz, F. C. (1969). Perceptual and cognitive aspects of body experience. New York: Academic Press.

Shontz, F. C. (1974). Body image and its disorders. International Journal of Psychiatry in Medicine, 5, 461-471.

Shontz, F. C. (1985). A personologic approach for health psychology research. American Behavioral Scientist, 28, 510-524.

Simmel, M. L. (1959). Phantoms, phantom pain, and “denial.” American Journal of Psychotherapy, 13, 603-613.

Simmel, M. L. (1966). A study of pahntoms after amputation of the breast. Neuropsychologia, 4, 331-350.

Solomon, M. R. & Douglas, S. P. (1985). The female workhorse: From aesthetics to tactics. In The Psychology of Fashion, Solomon, M. R. (ed.). Lexington, MA: Lexington Books, 387-402.

Tiemersma, D. (1989). Body schema and body image: An interdisciplinary and philosophical study. Amsterdam: Swets & Zeitlinger.

Tomasello, M., Kruger, A., & Ratner, H. (1993). Cultural learning. Behavioral and Brain Science, 16, 495-552.

Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Cambridge, MA: Harvard University Press.

Wapner, S. & Werner, H. (1965a). The body percept. New York: Random House.

Wapner, S. & Werner, H. (1965b). An experimental approach to body perception from the organismic-developmental point of view. In The body percept, Wapner, S. & Werner, H. (eds.). New York: Random House, 9-25.

FIGURE 1

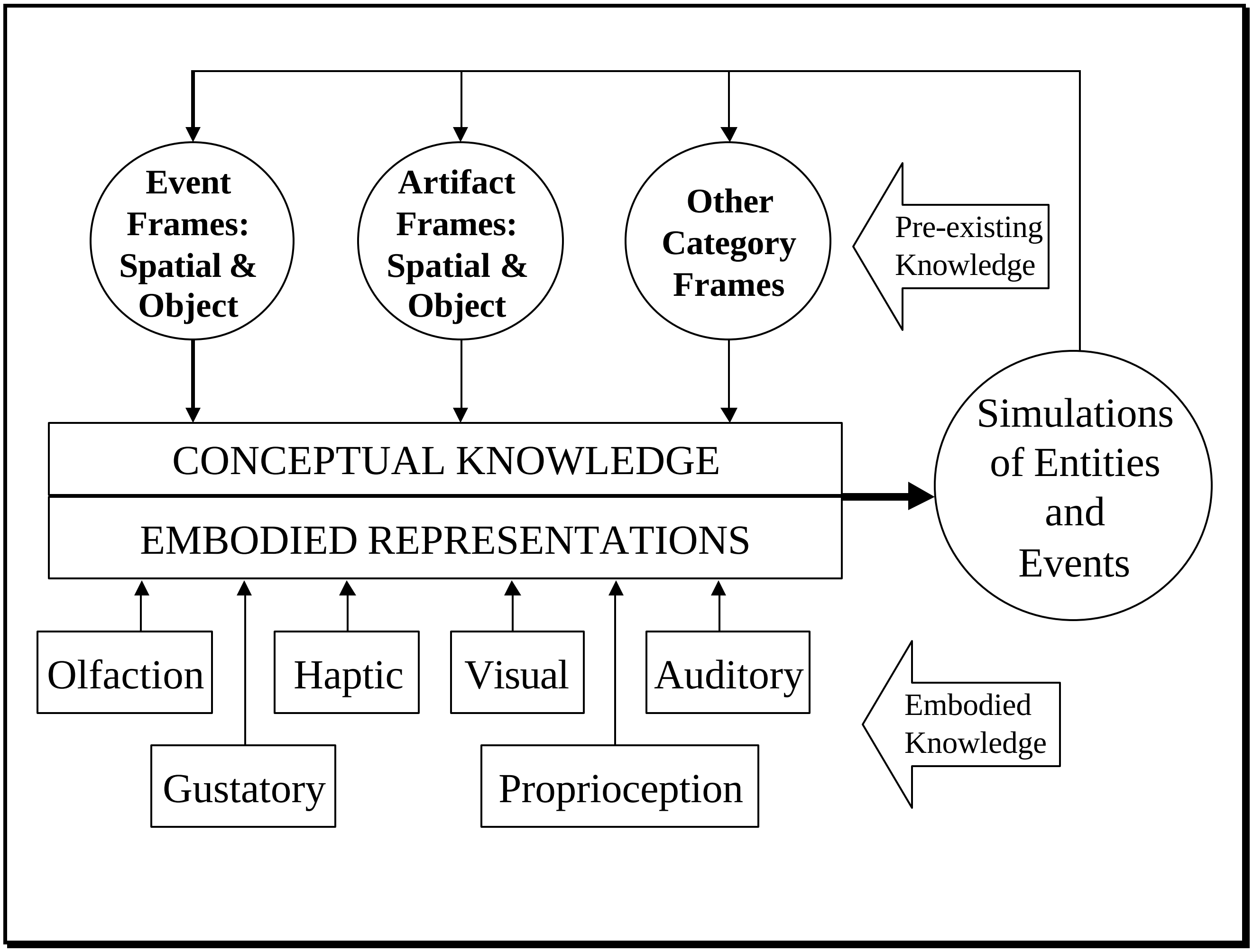
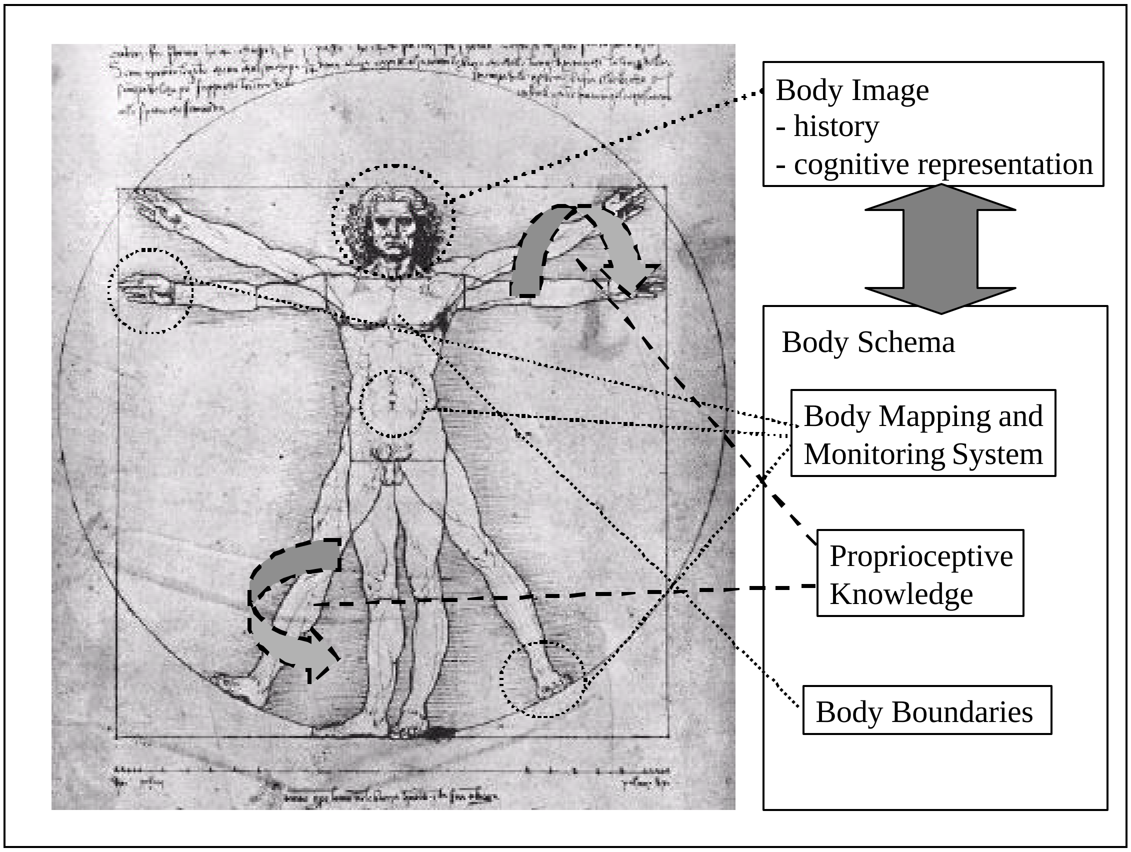

Event Frames: Spatial & Object
Artifact Frames: Spatial & Object
Other Category Frames
Pre-existing Knowledge
CONCEPTUAL KNOWLEDGE
EMBODIED REPRESENTATIONS
Simulations of Entities and Events
Olfaction
Haptic
Visual
Auditory
Gustatory
Proprioception
Embodied Knowledge

FIGURE 2



Body Image
- history
- cognitive representation
Body Schema
Body Mapping and Monitoring System
Proprioceptive Knowledge
Body Boundaries