Role of Innovation as Boundary between Cognitive Schema

A Cognitive Interpretation of Innovation

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Introduction

Information about the existence of innovations moves through the social system where potential adopters are located and this information is processed in the backdrop of environmental factors by adopters to form perceptions about it (Rogers 1995). When evaluating an innovation, potential adopters often use existing knowledge as a basis to form perceptions (Saaksjarvi 2003).

Wejnert (2002) argues that most descriptions of innovation diffusion have focused on the sources and nature of information about an innovation available to a potential adopter but little investigation has been conducted regarding how those potential adopters use that information to form perceptions. Accordingly this paper focuses on the cognitive aspects of innovation adoption by explaining the cognitive trade-off approach employed by potential adopters in forming perceptions of adoptability of an innovation.

Any new idea or stimulus perceived to be an innovation is evaluated by the product users and is either ignored or incorporated to a certain extent by modifying their pre-existing perceptions of the product's functionality and instrumentality. The consideration of an idea as innovative and any subsequent perceptual reformulation is likely to be guided by the previous experiences and

the cognitive makeup of the individual. The mechanism by which this process occurs involves describing the information perception and cognitive processes that act out inside an individual in response to the stimuli offered by the innovation. Cognitions refer to the belief systems that individuals use to perceive, construct and make sense of their world and to make decisions about what actions to take (Weick 1979). The focus of this work will pivot on the observation by Barsalou (1992) that cognitive processes can mediate the effects of stimuli on responses. The stimuli are provided by the attributes of an innovation as perceived by those exposed to it whereas response constitutes the ensuing reaction in the form of trial or rejection of that innovation.

Innovation and Human Information Processing

According to Broadbent (1958), mind is a channel whose capacity is limited by the number of things to which attention can be given. The process by which one recognizes and evaluates a new idea is essentially a process of stimuli awareness, perception, and processing. Information processing models are built around the relationships between stimuli inputs from the environment and the consequent responses elicited from or emitted by the organism (Estes 1978). Cognition essentially plays the processing role by acting upon the impinging stimuli, analyzing it as per its existing schemas and directing any subsequent response at the originator of the stimuli or any other entity considered eligible. However, cognition only acts upon the stimuli that are able to engage it. According to Neisser (1976) cognitive schema and the already available information decide what will be perceived. In case of innovation adoption, attributes of the innovation under evaluation are interpreted in the light of the existing cognitive schema and their usefulness is appraised in terms of cognitive costs and benefits. The comparison of costs

and benefits in turn adjudicates the nature of perception a person is likely to construct about that innovation.

Cognitive Processes and Innovation

For those stimuli that succeed in engaging the cognitive processes, to be perceived as an innovation is predicated upon the unexpectedness of their characteristics to the pre-existing categories of prior knowledge. Categories are used to code experience (Smith, 1990) and they help in structuring knowledge for decision making (Swan, 1997). Categories are also used to contextualize information in order to derive meaning from it where meaning is a shared social entity embodied in language and a cultural environment (Heelan & Schulkin 2003). Hence, social context forms the basis for creating cognitive categories. The attributes of the innovation are compared against the categories maintained by the cognitive schema of the potential adopter and evaluated in terms of similarity to the existing categories of the schema. The evaluation of these attributes, in turn, acts as input to the decision making process that concludes in either experimenting with an innovation or rejecting it. The more dissimilar the perceived attributes of the innovation to the existing schema, the greater the information processing effort in modifying the schema and thus the higher the perceived cognitive cost to the potential adopter. The greater the instrumental salience of the modified schema to potential adopter's goals, the greater is the perceived benefit of that innovation. Evaluation of the innovation attributes by the potential adopter in terms of costs and benefits assists in demarcating the influence of these attributes in determining the adoption of an innovation. According to Swan (1995) cognitive processes are important in determining the outcomes of attempts to implement new ideas. The decision to adopt a new technological innovation is the result of the interplay of the cognitive structure of the adopter and the attributes of the innovation. Fichman (1992) analyzed eighteen empirical

studies of the adoption and diffusion of technological innovation published between 1981 and 1991 and reached the conclusion that technologies that impose a small knowledge burden on their adopters obtained the most attention. Accordingly, any new perceived technological innovation is a challenge to the potential adopter which needs to be resolved by comparing its cost in terms of adjusting the existing cognitive schema and benefit in terms of the advantages ensuing from a modified schema that is in tune with the changed order of affairs as a result of the adoption of the innovation. Economy in schema adaptation serves the purpose of minimizing information processing effort inherent in negotiating complexity where complexity itself is a function of uncertainty (Fidler & Johnson, 1984). The interpretation of the innovation adoption advantage will be different for different individuals as dictated by their cognitive schemas. If the culmination of the comparison process results in the adoption of the innovation, it will be accompanied by an alteration of the cognitive schema, or the belief set of the individual, and the altered belief set in turn induces new expectations from the innovation and creates a new set of criteria for evaluating future innovations.

Innovation as Boundary between Existing and Modified Schema

The process of innovation plays the role of boundary between the existing cognitive schema of the potential adopters and the modified schema that comes into being as a result of the innovation being adopted. The choice faced by the potential adopters is whether to invest requisite cognitive effort and adopt the changed schema or ignore the stimuli offered to the cognitive faculties. This is a process of decision making. Decisions require selecting options or courses of action that have outcomes marked by some degree of uncertainty (Rettinger & Hastie, 2003). The current beliefs and values comprising the schema form the contextual background of

the decision making process and are used to evaluate the evidence and the information offered by the innovators. Humans, being limited by their information processing capacity, are likely to conserve their cognitive effort. Fiske and Taylor (1991) introduced the concept of cognitive miser, whereby information overload is managed by acknowledging easily recognizable attributes while ignoring the rest. Hence, the outcome of the decision process is likely to be guided by how the information is offered to potential adopters and how much of it is offered. According to Eiser (2003), from the point of view of decision making and judgment, what is needed is not an inclination to neglect information but a capacity to recognize patterns. By attending to the categorical cues potential adopters not only save information processing effort but are also able to predict the relevant characteristics of the offered information (Eiser 2003).

In the case of innovation adoption, the information contained in the attributes of the proposed innovation is interpreted and mapped on to the existing categories of the schema to judge their similarities to current makeup and make an estimate of the perceived differences. The mapping of attributes to schema helps in deciding the extent of effort required for creating the modified schema as demanded by the perceived attributes of the innovation by accommodating new characteristics and discarding redundant aspects of pre-existing schema.

The result of the modified schema will be a change in the way reality is interpreted in future as also the instrumentality and the end uses of the innovation under consideration. The act of accepting schema modification is therefore analogous to crossing the proverbial Rubicon into a new domain which reframes the perceptual underpinnings of constructing reality and allows the gestation of a new set of norms concerning the innovation in question.

The act of accepting modifications to the schema is fraught with uncertainties. The potential adopters are likely to take into consideration the risks involved in adopting a modified schema based on a conjecture of its instrumentality to favored goals. According to Kahneman and Lovallo (2000), presence of accountability and personal responsibility increase the risk of status-quo bias and other manifestations of loss aversion. Hence, the more significant and radical the changes introduced by innovation to issues considered vital by the potential adopters, the more weight they are likely to put on costs compared to benefits.

Costs Involved in Innovation Adoption:

Since cognitive schemas provide the interpretation mechanism by which individuals choose from a set of available meanings and alternatives (Hargadon & Douglas, 2001), introduction of an innovation creates a dislocation in the existing relationship between a product's attributes and their established meaning to the users. Given no pressing dissatisfaction with this relationship, users may see no *a priori* reason to welcome the dislocation and the subsequent restructuring of a new relationship. The information processing theory states that humans when faced with a problem seek ways to reduce their effort in solving that problem since they are limited information processors (Newell and Simon, 1972, Vessey and Galletta 1991). Aiman-Smith and Green (2002) argue that new technology initiates learning activities which in turn are affected by radicalness of the technology and the complexity. The information processing effort mitigation orientation is in effect a directed attempt at avoiding uncertainty since uncertainty represents presence of attributes which are alien to the context indigenous to the user and whose relationship to desired goals is vague at best. Assimilating these attributes into pre-existing cognitive schema and emergence of modified schema is an exercise whose extent will be a

function of the inherent uncertainty or in other words, information processing needs of the potential adopter. Hence it may be surmised that individuals when faced with an innovation, are likely to react less than favorably to those requiring substantial efforts at information processing.

Conclusion:

The cognitive aspects of innovation adoption are grounded in the trade-off involved in the information processing effort versus the benefit of obtaining a cognitive schema which is compatible with the changed reality introduced by the innovation. The stimuli representing an innovative idea are acted upon by the cognitive faculties of the potential adopters after those stimuli manage to attract their attention. The limited information processing capabilities of adopters coupled with available information play a pivotal role in the process of accepting or rejecting an innovation. The innovation thus represents a boundary between the existing and the new cognitive schema and the decision to cross that boundary is predicated upon perceptions of costs and benefits inherent in such situations.

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