Diffusion of Innovation: A Conceptual Framework for Implementing Data Analytics as an Organizational Innovation in Higher Education

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October 14, 2016

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I. Project Summary

Multiple institutions in the Tennessee Board of Regents system have increased their focus and resources to enhancing student success initiatives on their respective campuses. The utilization of different types of technology such as predictive analytics has been adopted in pursuit of increased retention and persistence rates. While many institutions have adopted predictive analytics to aid in improving student retention, the process in which to implement the analytics is complicated and unclear. The goal of this project is to identify a framework for institutions of higher education to adopt when implementing data analytics within their organization.

II. Data Analytics in Higher Education

Data analytics has grown in popularity within higher education over the last few years. However, there is a large variety of terminology used to describe analytics. Data analytics simply defined is the extensive use of data, statistical analysis, and modeling to drive organizational decisions and actions (Davenport & Harris, 2007). The use of data analytics has been widely used in industry to assist companies in building their customer base. Companies can enhance customer relationships by segmenting customers and by understanding their behaviors, including identifying those at greatest risk of attrition in order to design interventions to keep them (Foss, 2014).

Colleges and universities, already have vast stores of data that exist. In 2005, approximately 30 percent of institutions had data warehouses (Goldstein & Katz, 2005). Seven years later, 62 percent reported using data warehousing and business intelligence systems as a way of integrating, organizing, and summarizing large data sets (Foss, 2014). By analyzing this

data, analytics applications have the potential to provide a predictive view of upcoming challenges both for the institution and for students. The resulting data-driven decisions can support optimal use of both economic and pedagogical resources while offering a structure for improved educational outcomes (EDUCAUSE, 2010).

III. Diffusion of Innovation with an Organization

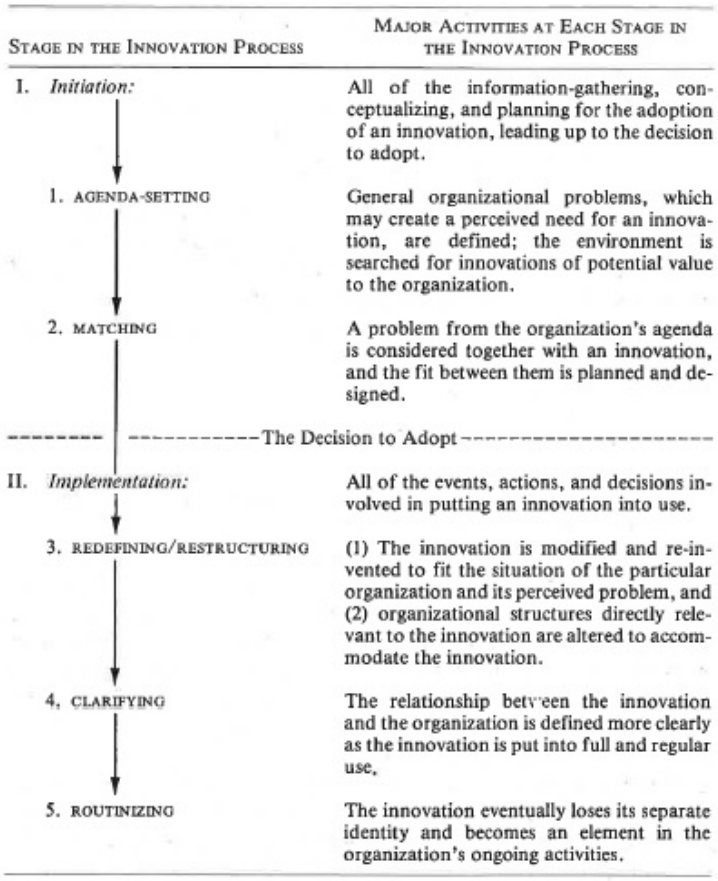
Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system. Diffusion research began in the 1940s as a by-product of the Smith-Lever Act of 1914. The Smith-Lever Act of 1914 established the Agricultural extension agency with the stated purpose: "To aid in diffusing among the people of the United States useful and practical information on subjects relating to agriculture and home economics and to encourage the application of the same" (Rogers, 2003). With the growing trend of utilizing data analytics to drive decisions, it becomes increasingly important to consider the process by which data analytics is diffused throughout an institution or system.

The four core elements within the diffusion of innovation process are the innovation, communication channels, time, and the social system. Innovation is an idea, practice, or object that is perceived as new by an individual or another unit of adoption (Rogers, 2003). For this project, data analytics is the innovation that is diffused throughout the organization. Institutions of higher education are organizations, a stable system of individuals who work together to achieve common goals through a hierarchy of ranks and division of labor (Rogers, 2003). While diffusion research began with investigations of individual decision makers, such as farmers, it did not address concerns of diffusing innovations within an organization. As a result, researchers began to shift their focus from variance research to process research as it relates to organizational innovativeness. Process research involves a type of data gathering and analysis that seeks to

determine the time-ordered sequence of a set of events. Whereas, variance research is a type of a data collection and analysis that consists of determining co-variances among a set of variables, but not their time-order (Rogers, 2003). In essence, the researcher learns more about less, rather than less about more. This research approach led to the development of the innovation process in organizations.

The Innovation process within organizations consists of five stages, each characterized by a particular range of events, actions, and decisions made at that point. The process is linear in nature, and later stages cannot be realized until earlier stages have settled, either explicitly or implicitly.

The five stages in the Innovation Process in Organizations proposed by Everett Rogers (2003) are below:



Stage in the Innovation Process	Major Activities at Each Stage in the Innovation Process
I. *Initiation:*	All of the information-gathering, conceptualizing, and planning for the adoption of an innovation, leading up to the decision to adopt.
1. AGENDA-SETTING	General organizational problems, which may create a perceived need for an innovation, are defined; the environment is searched for innovations of potential value to the organization.
2. MATCHING	A problem from the organization's agenda is considered together with an innovation, and the fit between them is planned and designed.
The Decision to Adopt	
II. *Implementation:*	All of the events, actions, and decisions involved in putting an innovation into use.
3. REDEFINING/RESTRUCTURING	(1) The innovation is modified and re-invented to fit the situation of the particular organization and its perceived problem, and (2) organizational structures directly relevant to the innovation are altered to accommodate the innovation.
4. CLARIFYING	The relationship between the innovation and the organization is defined more clearly as the innovation is put into full and regular use.
5. ROUTINIZING	The innovation eventually loses its separate identity and becomes an element in the organization's ongoing activities.

Stage 1- Agenda Setting: One or more individuals in an organization identify a significant problem and then seek an innovation as one means of coping with the problem. On the other hand, most organizations engage in an opportunistic surveillance by scanning the environment for new ideas that might be beneficial to the organization. Consequently, most organizations continuously scan for innovations and match any promising innovation with some relevant problem.

Stage 2 – Matching: At this stage, conceptual matching of the problems with the innovation occurs to establish how well they are likely to fit. Of course, the organization's decision makers may conclude that a mismatch of the innovation with the problem occur; this decision will lead to rejection, terminating the innovation process prior to implementation. The initiation process is

constituted by agenda setting and matching. Initiation is defined as all the information gathering, conceptualizing, and planning for the adoption of innovation, leading up to the decision to adopt.

Stage 3- Redefining/Restructuring: At this stage, the innovation begins to lose its foreign character to the organization. On the one hand, if the innovation does not exactly fit the organization's situation, it is reinvented so as to accommodate the organization's needs and structure more closely. Sometimes, a new organization unit is created with responsibility for the innovation.

Stage 4- Clarifying: The innovation is gradually put into wider use within the organization, and as this happens, the new idea becomes clearer to the organization's members. Also, stable arrangements are made for the innovation as the innovation is becoming embedded into the organization.

Stage 5- Routinizing: At this stage, the innovation has become incorporated into the regular activities of the organization. The possibility exists for the innovation to become discontinued during this stage in the process.

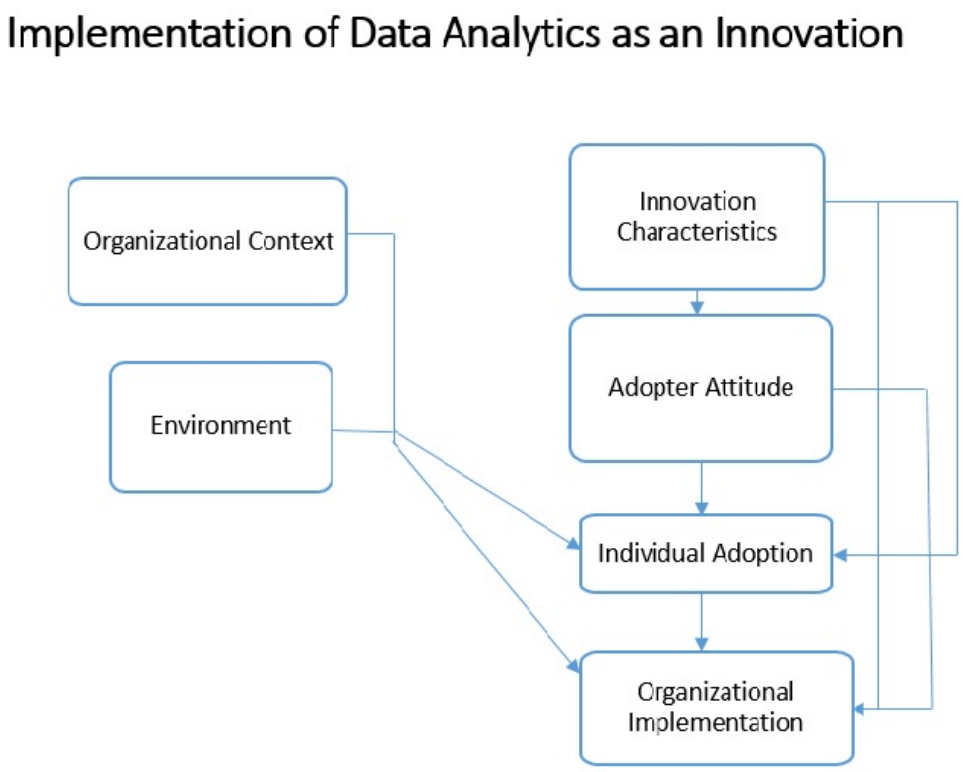
The above five stages usually occur in the order presented, but this need not happen. That is the activity at one stage is substantially accomplished, at least implicitly, the next stage cannot begin. Conversely, it is possible that one or more of the stages in the innovation process might be skipped (Rogers, 2003).

IV. Proposed Conceptual Framework

Foss, et al. (2014), propose the following conceptual framework implementing data analytics as an organizational innovation (figure 1) within higher education. Rogers (2003) identified that the implementation of innovations is influenced both by the process an

organization uses to redefine and adapt the innovation to fit its context by the support structure it provides to encourage individual adoption and the integration of the innovation into regular ongoing activities. Greenhalgh, et al. (2004) concluded thru meta-analysis innovation research in health care organizations that the combination of the innovation, the intended adopter(s), and a particular context determines successful implementation.

Figure 1:



Foss, et al. (2014) propose four major components are related to the extent of individual adoption and organizational implementation of a particular innovation. The four components proposed are as follows:

1. **Organizational Context**: Includes five variables that previous research indicates may influence adoption and organizational implementation.
2. **Collaboration**: Shared responsibility for redefinition and implementation between senior leaders and faculty and staff.
    - Authenticity: the "fit" between the innovation and the organization.
    - Institutional support: clear communication from organizational leaders that adoption of the innovation is important to the organization, including direct advocacy, reward, recognition, and financial support for ongoing implementation.
    - Training: professional development and education directed toward adoption and use of the innovation within the organization.
    - Integrated use: purposeful integration of on innovation into existing organizational systems that provides opportunities for the innovation to spread across the system.
3. **External Environment**: The external environment can influence which innovation can be legitimately introduced to the organization and influence, how, when, and at what level they will be implemented (DiMaggio & Powell, 1983; Meyer et al., 2008).
4. **Innovation Characteristics**: The acquired characteristics of the innovation itself:
    - Functionality: the extent to which an innovation solves a problem and is perceived to have value.
    - Usability: the ease with which a potential adopter can incorporate the innovation into their common practice or daily use.
5. **Adopter Attitude:** Perceived value of the potential adopter.

- Usefulness: the extent adopters believes the innovation improves their ability to complete their duties.
- Legitimacy: the extent adopters believe the innovation is a good "fit" for the organization and consistent with their professional values and practices.

V. Conclusion

Indubitably, data analytics may be an organizational innovation that can be diffused within higher education. As institutions consider utilizing different "tools" to aid them in improving student retention and graduation rates, it is imperative to consider: organizational context, external environment, innovation characteristics, and adopter attitude. These four components can be critical to the implementation process for an organizational innovation such as the use of data analytics within higher education.

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