ASEE 2014 Zone I Conference, April 3-5, 2014, University of Bridgeport, Bridgpeort, CT, USA.

Improvement in the Performance of Design-Science Research in Information Systems

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***Abstract*— The two paradigms, behavioral science and design science hold a vital importance in the IS research. These are composed of people, organizational structures, technologies, and work systems. The purpose of the research is to explore the two paradigms, behavioral science and design science, of the Information Systems in terms of people, organizations and technologies. In addition to that, the performance of this research will be evaluated using a certain framework on reference based on the methods observed from the literature. In order to distinguish between system building and design research, certain guidelines addressing evaluation, contributions, rigor and the research process are considered. This would develop depictions of IS problems, processes and solutions that clarify the available knowledge. The outcomes of this research could be used by the Information System professionals engaged in design, analysis and evaluation of the artifacts. A part of outcomes can be used to make future problem solving design better and more useful. This research is going to show results that would actually help the investigators in understanding the learning methodologies of information system design which would involve the understanding and improvement in the two paradigms highlighted throughout this research.**

Keywords— IS Designs; Behavioral Science; Design Science.

I. INTRODUCTION

Information Systems have been one of the highest growing technologies in the last few decades. The most significant purpose of these systems is to empower the organizational development in terms of people processes. The two paradigms, behavioral science and design science hold a vital importance in the IS research. These are composed of people, organizational structures, technologies, and work systems (1,5,15-16). It is very important for the researchers to explore the potential of "further knowledge that aids in the productive application of information technology to human organizations and their management" and to effectively spread the "knowledge concerning both the management of information technology and the use of information technology for managerial and organizational purposes" (18). Currently, there is a growing literature on Information System research design (6-10). Based on the literature, the IS research is a core subject (12) call the IT artifact the "core subject matter" of the IS field.

A large number of readers might think and try to figure out the idea and insight from the existing theories within the domain. In order to resolve that issue, the research was primarily intended to review, summarize the theoretical information, and provides a better understanding of the existing material. This material comprised of a relevant review, comprehensive narrative and straightforward models. According to the authors of the paper "*Annals* summarize previously established studies and concepts, pinpoint potential problems (such as factual errors), and inspire new discussions and directions for further research activity" (11). This not only shows the importance of these synthesis and motivation towards the understanding of the information, but also explores the potential of new ways of the centric research.

The research involves *significantly challenging or clarifying existing theory or concepts*. The papers that provide similar contribution show certain relevance and consistency with the theories but are not acknowledged for one reason or the other. Even though these theories have great potential to bring change in the existing business industry but the knowledge does not reach the actual audience. Harrison and Klein (8) suggested that diversity is not a unitary concept but is composed of three distinct types to not only gain a better appreciation of the mixed findings from the previous research but also to make meaningful advances in our theoretical understanding of diversity and related phenomena. The authors reviewed the existing theories of the centric research and developed insights from it. Two major points were encouraged for the betterment of the existing research and understanding. By using these, current centric research can be taken to the next level.

The types of behavior in humans and the way they process systems and information has its unique value in research while providing specific problem-solving strategies to any problem. In the literature, the researchers have set out possible deficiencies in processing social information like encoding information, interpreting situations, adopting goals, producing strategies, and evaluating responses. In the same context of evaluating behaviors, (13) considered physiological factors and emotions to contribute to the assessment of the process. The steps and models of social information processing and aggressive behavior were researched.

The author found and concluded that certain developmental factors like physiological and emotional may cause a deviation in the cognitive memory structure that, in turn, may be reflected as deficiencies and aggressive biases in cognitive information-processing patterns that increase the likelihood of employing aggressive problem-solving strategies manifesting in aggressive behavior. The positive aspects of the research methods involving behavioral science were to take into account many factors that can influence a certain type of behavior in human. On the contrary, the negative aspect was to not consider other important facts that are unknown like mental level factor, environment factors, parenting and so on. These factors could have revealed in-depth conclusions about the study (13). In this study, going through the variety of guidelines mentioned in the following sections of the paper, make sense to understand the relationship between behavior and design.

II. RESEARCH METHOD

Research method is an important factor when defining the process of the study. A study can follow one or more research methods. The combination of multiple methods is in relevance to the two paradigms under consideration in this research. In the research, the methodology revolves around providing a better understanding for the researchers and readers by specifying guidelines and reflecting upon them within the scope of research. The opted method also incorporates the interpretive paradigm in which rich description and details of each factor are established.

The process of the design is defined by the sequence of actions that go along the design and implementation. The results from the design are referred to as artifacts by Walls et al. (17). Those results could be used to get feedback information which would be used as inputs for the new designs. The reiteration of the results could make the hypothetical models better. The researchers also identified four artifacts as the feedback processes as models, constructs, instantiations and methods. These were identified in order to fulfill the problems posed at the beginning of the research. The constructs are important factors in providing the language for the definitions of the problems and the proposed solutions.

The details on the methods for this paper would be to not only make a detailed hypothesis followed by identified processes, but also to evaluate the artifacts based on the processes. Once that is done, the artifacts will be used as the reverse utility for the betterment of the research method. The statistical analysis on the variables gives an important insight to what combination of variables worked well enough for the research. These variables not only reflect the feasibility of the research, but also give out valuable information on the best practices within the proposed design for a particular problem.

III. DESIGN GUIDELINES

Design science and design activities play hand in hand. While a research process as a whole, it is a problem solving process as well. In order to do that effectively, certain design guidelines are necessary for an innovative artifact. The purpose of the establishment of the guidelines is to contribute to the work of researchers to properly understand and visualize the requirements of design-science research. For each specific project, it is important to know when and where these guidelines are used and how are these beneficial in the research process (10). While some researchers develop information systems that meet the management requirements, others methods where the management issues remain inclusive within the design. In early methods, researchers used waterfall approach in which they defined and validated the requirements ahead of time before initiating the design and hence the implementation (14). Later, researchers used the prototype approach where they proposed certain tool based methods for application development and programming. In the years to come, further methods were used for proposal with efficient framework and enabled the designers to produce effective information systems (17). They use a certain set of practices for the particular knowledge process in consideration. Through that, the iteration of the feedback information can be used for further processes in order to finalize the design and implementation of that. Two important ways, the Case Study method and the Survey method were given subsequent importance in this research. The case study approach seeks to understand the problem being investigated. It provides the opportunity to ask penetrating questions and to capture the richness of organizational behavior, but the conclusions drawn may be specific to the particular organizations studied and may not be generalizable.

On the other hand, the survey approach seeks to discover relationships that are common across organizations and hence to provide generalizable statements about the object of study. However, often the survey approach provides only a "snapshot" of the situation at a certain point in time, yielding little information on the underlying meaning of the data. The research method and design have been of a vital importance because the different ways have been discussed with its pros and cons from a research perspective. Based on the conclusions, a good choice of methodology for any research can be made.

A. performance of Design Science

Performance of the design-science research in Information Systems is largely based upon understanding the linkages among Availability of Scientific Information, Sufficient exposure to the data source and Proper Design Implementation (DI). These variables are innovations that define the ideas, practices, technical capabilities, and products through which the analysis, design, implementation, and use of information systems can be effectively and efficiently accomplished. The factors highlighted in the section below give an insight to the dependency of the variables as well as how those are tweaked towards the achievement of the goal.

B. Figures

The model was designed in order to accomplish the defined goal given certain independent variables which have either positive or negative effect on the goal. The relationship of

these elements would have a significant effect on the overall success of the research. Hence the performance of the design-science research in Information Systems will be improved.

Based on the model, there have been two most important aspects that we pondered upon while conducting the design-science and behavioral science research. A human goes through mental and behavioral changes. At each step, even though information may have been gained unless it is demonstrated by behavioral changes it might be argued that learning has not properly occurred at one particular time. Having established a definition for research purposes, the measurement of behavior and information research with acceptable degrees of validity and reliability is vital. That is especially difficult for basic methodology traits such as effective design, accurate validation, and proper execution of the problem complicates the search for overall contributions. The result often is obtained as a statistical construct that estimates the amount of variation in the results from the design and other factors as variables.

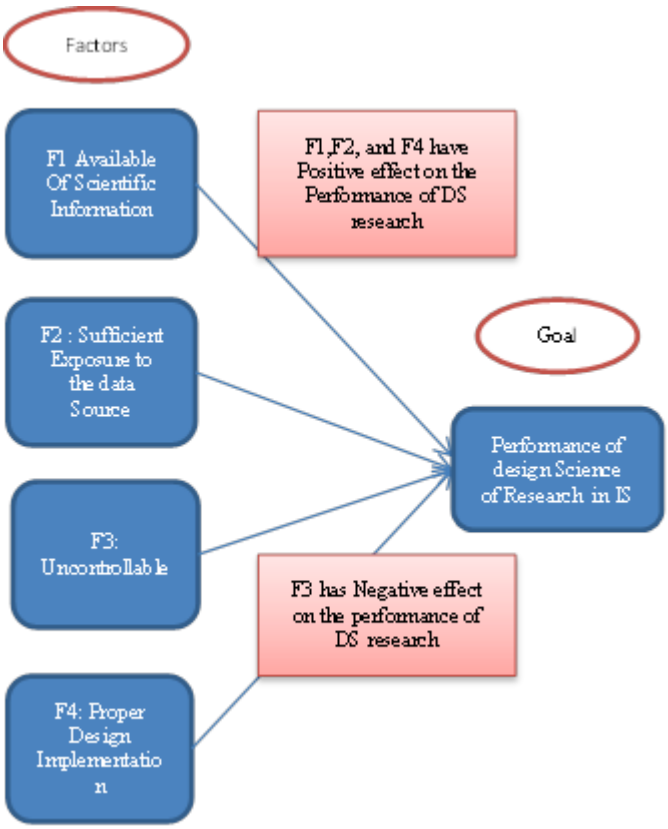

Fig.1 Model Layout - Improved performance of Design-Science research in Information

In Figure 2 shows the level tier of the model designed and discussed in the paper

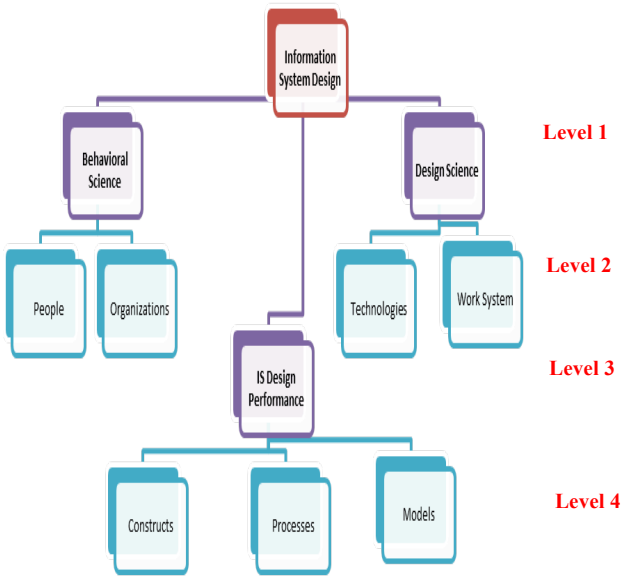

Fig. 2. Information System Design Model showing four levels of the design

In figure 2, the four levels of the Information System Design are illustrated through the hierarchy. The figure takes into account not only the two paradigms of the design, but also the design framework and the iterative methods used in the research. The model depicts the constraints at each level of the design. In the first level, the two paradigms behavioral science and the design science are considered. In the second level of the design, the behavioral science consists of people and organizations while the design science paradigm consists of technology and work system as significant constraints. These constraints are based on the category that those paradigms reflect and the fact that they are related to the model in consideration. In the third level, the information system design framework exists which is a part of the design with those two-level constraints included. This reflects the overall framework of the research and possesses its own levels. In level four, the three factors are the constraints, processes and models. These are a necessary part of the framework and could have further sub-factors based on the objective of the model. In our model, the most important objective is to find new insight to how these things can be improved and itemized and hence that level goes back as an input for the main design model and the framework. This iterative criterion makes sure that there is always a feedback used towards the input and hence making it better iteratively.

CONCLUSION

The research was carried out to explore the two paradigms, behavioral science and design science, of the Information Systems which are composed of people, organization structures, technologies and work systems. The behavioral science paradigm develop and verify explanations related to human behavior while the design-science paradigm creates innovative artifacts that have potential to push the organizational envelope. The types of behavior in humans and the way they process systems and information has its unique value in research while providing specific problem-solving strategies to any problem. The artifacts are used to get feedback information which would be used as inputs for the new designs. The reiteration of the results could make the hypothetical models better. In the methods following the iterations, the design sequence as well as the feedback information is considered as the two elements in the research process. The outcomes of this research can be used by the Information System professional engaged in design, analysis and evaluation of the artifacts. The significance of this research in the industry is of high importance. This research is going to show results that would actually help the investigators in understanding the learning methodologies of information system design which would involve the understanding and improvement in the two paradigms highlighted throughout this research. The research guidelines would open doors for similar researches to base their studies on certain techniques that would empower the design science.

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