



Diffusion of Hospital Information System – Case Study of SRM Hospitals

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Accepted on: 17-02-2015; Finalized on: 31-03-2015.

ABSTRACT

Use of Information Technology for production and operations has become a necessity in all the organizations, but even more so in life critical services like health sector. The introduction of an overall hospital management system that helps in management of the hospital functions is very important for efficient use of the resources for the benefit of all stakeholders. In this study the factors that impact the adoption of IT systems were collected and the extent to which these factors were impacting the adoption of Hospital Information System was evaluated in a large private hospital. The study used a structured questionnaire administered to various employees in the hospital and analyzed the gathered data using statistical tools. The result of the study found that while some of the factors were significant, some factors like Trial-ability and Relative advantage were more important than others.

Keywords: Diffusion of Innovation, User Acceptance, Hospital Management Information Systems, Electronic Medical Records

INTRODUCTION

Organizations across various industries both in manufacturing and in services have found that use of Information Technology Systems (IT) add to their top line and bottom line growth. The underlying conditions that enable such an impact of IT systems are equally true in case of the health care industry, and hospitals in particular. Studies^{1,2} have proven that use of IT systems can improve healthcare efficiency and quality.

However, we see that diffusion of IT systems in health care has been very modest, and even more so in the case of the healthcare industry in India^{3,4}. This is not to say that health care professionals are technology averse. Medical field has been a swift adopter of new technologies, as for example it took just six months since the invention of X-rays by Roentgen for the first clinical x-ray photography of human organs to appear.

As IT system usage has been found to have alleviated the industry's persistent problems such as patient safety issues, medical errors and escalating costs, a study on its diffusion is a crucial issue to be studied further^{5,6}. Further not much research has taken place in such a crucial area of our nation's effort for affordable health for all.

Thus this study has chosen to study the diffusion of innovation of IT systems in the hospitals with a focus on the Hospital Information Systems as the innovation.

Literature Review

Hospital Information System is an automated document and information management system for hospitals. Hospital Information system aids managers in hospital administration for making informed decisions on a timely manner, but can be extended to aid decision making for

other associated professionals like doctors and nurses in accessing patients records and help in diagnosing and administer care as well⁷. But at the same time, it is a well known phenomenon that even in industries where the usage of IT systems is a well established and accepted practice, the implementation of IT systems have a high rate of failure, as much as 80% as well⁸.

Hence it becomes important that we focus our attention on the factors that enable success in implementation of IT systems in hospitals so as to ensure success of such high cost IT systems. Various theories with emphasis on different methodologies of implementation of IT systems have been postulated. Some of the theories which are very popular have their focus on the acceptance of technology by the users that may lead to better usage and hence success of implementation. The Technology Acceptance models (TAM) and the updated models of the same theme proposed by Davis⁹, Venkatesh and Davis¹⁰ provide such a theory.

DeLone and McLean¹¹ have proposed IT system success based on a set of success indicators. Ferret¹² have proposed success of IT measures using project success factors like timeliness and quality of end results.

We also find a few health sector specific studies in this area. For example Tabibi¹³ have proposed a structural equation based model, using the TAM variables and industry specific factors.

Angst¹⁴ have proposed a Social Contagion model to study the process of diffusion of adoption of electronic medical records in USA. Miller and Tucker¹⁵ have used the network model to study diffusion of IT among hospitals. Cain and Mittman¹⁶ have proposed a set of ten factors specific to health care for diffusion of innovations.



METHODOLOGY

We decided to use the ten dimensions that enable diffusion of innovation as proposed by Cain and Mittman¹⁶ to study and evaluate the diffusion of the IT system usage among the employees of a large private hospital in Chennai so as to evaluate the usefulness of these ten dimensions. The study was planned as a cross sectional study of the employees in a short period and as a descriptive study of the diffusion process of the system implementation.

A structured questionnaire based on the ten dimensions was prepared and after testing was administered to the hospital staff at all levels using stratified random sampling of the employees. The gathered responses were tested using statistical techniques including Chi-Square and Multiple Regression methods. The study was carried out in 2014.

RESULTS

The dimensions enabling diffusion of IT system within a health care system are as follows:

1. Relative advantage – which can be explained as the relative potential by value or benefit associated with adoption of an innovation as compared to the existing practice. Better the relative advantage of the IT system more will be the penetration.
2. Trial-ability – refers to the user's ability to try out the innovation without commitment and large investment. If the IT system is perceived to have a 'no loss' trial-ability, the diffusion will be better.
3. Observability- refers to the visibility of the outcomes of innovation use to the potential users of the innovation. If the success of IT system is visible to the employees, the system usage and hence the realization of advantage to employees and the organization can be achieved.
4. Communication channels – refer to the various modes through which the opinion leaders and others can communicate about the innovation within or outside the organization. If more number of methods of communication exist, both in formal and informal modes, the ease of communication about the new system is better, and hence its use.
5. Homophilous groups – These are groups of people with similar characteristics and may depend on the individual members' personality etc. More the amount of similarity between the early adopters and the laggards, the spread of usage will be better.
6. Pace of Innovation/reinvention – refers to the modifications the innovation undergoes during the process of diffusion. If the number of changes are too big before the IT system usage has spread to most of the employees, the system might appear to be unstable/unreliable to the users and hence impede spread of innovation.

7. Clarity of Norms, roles and networks – The formal organization work flow must incorporate the innovation and fit in to the roles of all the players in its adoption. If the organization has not defined the roles and responsibilities of all stakeholders in the adoption of innovation, the rate of adoption will suffer.
8. Opinion Leaders – are those whose opinions are respected or listened to by others and who are influenced positively by the capabilities of the innovation. If either the influential opinion leaders are absent or not convinced about the IT system, the adoption will suffer.
9. Compatibility of the innovation with the existing systems and technologies. If the organization's existing systems like patient handling work flow are not possible to be aligned with the new IT system, the adoption will suffer.
10. Infrastructure – the IT system, being a computing intensive operation must have the required hardware and software to function and also be available to all potential users.

Using the data gathered on these as variables and the perception of success in implementation of the IT system, a multivariate regression analysis yielded the following results.

Both Relative Advantage and Trial-ability dimensions were found to have high significance ($p < 0.01$). Norms, Compatibility and Infrastructure availability dimensions and to some extent Observability were found to have a good amount of significance ($p < 0.05$), where as Communication Channels, Homophilous groups, Pace of Innovation and Opinion Leadership were found to have not much of significance. The adjusted R^2 was 0.72 indicating a good fit for the model to the data gathered.

The Beta value of Trial-ability was found to be the biggest indicating that the spread of the IT system usage will be better if the stakeholders will have an assurance to try out the system along with the existing system with minimal extra effort. However the Beta value of relative advantage also was higher than that of the other significant variables. The test of multi-collinearity also was performed and we could see that the variables were not having any significant multi-collinearity, thus strengthening our research model.

The initial null hypotheses formed assuming an equal impact of all the 10 factors on the IT System Implementation success in the hospital studied were thus rejected as we found significant difference among these also using the Chi-Square test of significance.

Suggestions for IT System Implementation in Hospitals

Based on the findings above, we observed that the employees get convinced about the ability of the innovation to replace the existing system, if they get an



opportunity to try the new system while they also get to continue with the existing system at no or very low cost, the employees will be better oriented to receive the new technology. However particular attention needs to be paid to the element of 'cost' to the individual. Many times the cost is in the form of additional effort and time on the part of employee.

Though the organization might recognize the additional effort once the system is successfully absorbed in the organization, the employees' concern of 'What Is In It for Me' needs to be addressed too. An idea that needs to be considered is compensating the employee for the loss of the productive time in operating in new and old system simultaneously either monetarily or by providing additional help.

A rough estimation of the relative costs of a failure of the new system while implementing reveals that it is probably cost effective if the employee is monetarily compensated with a fixed time period of trial and acceptance as compared to the cost of failure of implementation or providing additional personnel.

At the same time the hospital management must diagnose the relative advantage gained through the use and highlight the early gains in usage of the IT system to the entire work force. This also aids in increasing the observability factor for the rest of the organization so as to speed up diffusion of innovation.

CONCLUSION

The management of diffusion of innovation such as IT systems in hospitals needs to be planned in a strategic manner. The management must make its objective in pursuing the innovation clear and evaluate the cost benefits of alternative modes of implementing. Since people play a major role in making the innovation adoption a success, the various ways by which they need to be encouraged in making the new innovation a success needs to be studied and the best strategy to be adopted until we reach success.

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Source of Support: Nil, Conflict of Interest: None.

