TVC MODEL: AUTOMATIC USER SATISFACTION LEVEL MEASUREMENT OF INFORMATION SYSTEM

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Abstract - User satisfaction or satisfaction is the most important of any information system. Feedback can estimate user satisfaction level of information system management. High level of user satisfaction or acceptance indicates the higher success of any information system. Again, user satisfaction or acceptance level can help management to upgrade service time to time. In this paper, we introduced a TVC (time, cost, and visits) model to calculate user satisfaction level automatically. This TVC model can also help the management whether the service is an innovation or not. Moreover we have concluded by a hypothesis this TVC model to user satisfaction/ acceptance.

Keywords - TVC, User Satisfaction, Time, Visits, Cost.

I. INTRODUCTION

Realization in organizations, in Information Technology (IT) has mainly focused on implementation segment of IT innovation. Previously from beginning of IT implementation development IT acceptance was used. In IT innovation, for improving organizational users basic challenges are using to modification individual behavior. Also, considering a success in IT innovation when members' of executive has accepted and using IT novelty then the cluster of novelty gets benefits [1]. Scholars mentioned that, circle of scholarly grieved the fewer care to IT application segment, seeing that if we have matched with IT acceptance phase of IT novelty. In qualitative studies approach used IT implementation. Also we can say that the main motivation of joint difficulties are not only IT innovation disaster but also mainly for IT implementation miscarriage. For leading some resistance by organizational members, we can use well known method of IT that is initiatives in some organizations. The conflict may happen at organizational, group and individual level. For managing and improving the IT innovation process, actually perceptive of IT implementation conflict could help organizations, moreover, find ways to moderate them. Main key of an organizational success is usually consider as a inventive. We can see from researchers that measuring the implementation of effectiveness has done in IT innovation [2][3]. All these experiments are tested the common innovation efficiency in industries, business and organizational circumstances before IT implementation researches. Success of IT innovation has known as a critical ways. Normally, organizations could increase, modify, adopt and implement the innovations. IT innovation is a main key of changing work in environments of an organization. We can see that many organizations cannot be succeeding to understand the estimated benefits of IT innovations that can be implemented. During development of implementation, deficient in IT implementation steps is that many organizations dispose of a few adopted IT innovations. Furthermore, the organizations will not gain probable profits of flourishing skill innovation, interruption of working systems and negative influences on business image and damage of integrity.

From some studies we can see that implementation of innovations focus on IT implementation in advanced in every circumstance in developing countries. The main aim of this research work is to develop a theoretical user satisfaction model (TVC Model) of Information System Management in any organization. In directly and indirectly the top management of the organization will be supported by this study and make decision to upgrade the system or services. For successful efficiency of IT implementation, it should be comprised in the given study model. We organized literature review, TVC model, and conclusion in section II, III and IV respectively.

II. LITERATURE REVIEW

We have studied some existing user satisfaction model of information system management. Some of them is described blew:

A. Innovation Implementation

Previous works illustrated that researcher proposed their own explanation about an innovation. In [5] author express innovation as a concept, habitude or substance which recognized as modern by the civil society members. Usually more emphasis is given on

habitude or technology. Authors in [1][4] express innovation as a habitude or technology which an institution may introduce for the first time or already using them. In this research, idea of IT (IT) modernization might be adduce the type of IT modernization that an institute want to use and recommend IT modernization. Subsequently, an organization which use IT modernization will be benefited and accomplish ambitious dominance.

B. Klein, Conn and Sorra's Model

In [1] and [2] researcher emphasis how innovation can be implemented in the organization. Author in [1] offered an effective scheme in this research work. Researcher have introduced implementation framework based on the previous research work. This framework based on different types of institutional innovation performance reveal to implementation performance. This model also severely depends on high official management support, financial support, rules, habitude and environment. The proposed [1] model was tested on 39 institutional case from 33 construction companies in USA.

C. Innovation Implementation Model, Sawang

After six year the model proposed in [1], many researchers work on to enhance the model. Author in [3] proposed an extended model based on two factors financial and human resource. Original framework was only focus on financial capability. Moreover, the author also adds an another matric called incoming innovation acceptance approach. The author [3] tested the implementation performance model on Thailand and Australian portion. The outcome of the test reveal that, proposed model performs well in terms of effectiveness and accuracy. Studies of implementation performance shows that, availability of human and financial source control implementation performance . Moreover, human capability is one of the key factors in implementation stage.

D. Mesurement Model of IT Implementation

In the research work of [6], authors tried to show a model of unconventional measurement of IT execution efficiency on the basis of two theoretical form of innovation performance. Consisting of five constructs or variables in the existing measurement model which has connection among of them. In directly and indirectly connection, the main key of measurements in this research work [6] is calculating the connection among the top administration shore up and IT execution effectiveness. Furthermore, indirect connection between economical funds accessibility and IT execution efficiency should be calculated in the intangible model. Authors [6] used a structural form and relationship in the middle of variables. The idea and meaning of variables is described next. Financial Resource Availability (FRA) shows the organizations that can provide high superiority and purposely available computer softwareand hardware, technical instruction, user sustenance services, trial with new technology as well as practicing for large economic costs. Top Management Support (TMS) shows the organizations that can provide high superiority and purposely available computer accessories, technical instruction, user sustenance services, trial with new technology as well as practicing for large economic costs.. The policy of Implementation and practices shows the policy what can support IT innovation implementation like assistant program, communication, instruction. Teaching for employees to use the innovation such as we can say about the quality and amount of available training. The technical assistance condition to innovation users depends on necessary basis, the available rewards like honor, promotions for IT innovation utilize. In the organization Implementation Climate (IC) shows the users' important perception of IT innovation implementation. Using of an adopted IT innovation in IT Implementation Efficiency (ITME) shows the value and reliability of the members of organization.

III. TVC MODEL

A. Importance of TVC

TVC (time, number of visits, and cost) is not only an importance matrix of management in any organization, but also very effective of end users or customers satisfaction measurement. It is also very effective to citizen services of any state. TVC measures time, number of visits and cost needed for any services. If we compare TVC before and after implementation of information system of any service, we can compare the effectiveness or satisfaction of customers. Let an example to discuss effectiveness or satisfaction of a citizen who wants to complete birth registration and get certificate of his child in Bangladesh.After implementing the information system (online), the organization should keep track TVC matrices for all citizen and compare after implementing and before implementing the service online and if seems that TVC is higher than threshold, then management will understand the negative feedback of customer or citizen and needs to revise the policies and implementation factors of the services. Otherwise organization will understand that users or customers or citizen are giving positive feedback and satisfied to the system or services.

B. ProposedTVC Model with user feedback

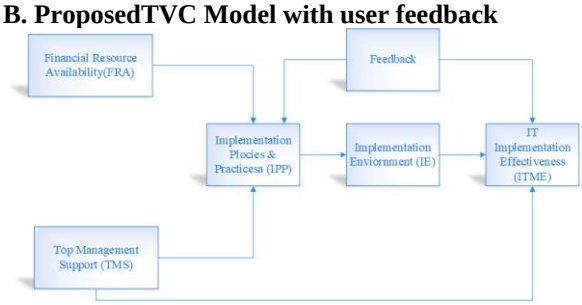


Figure1. Updated Measurement Model of IT Implementation

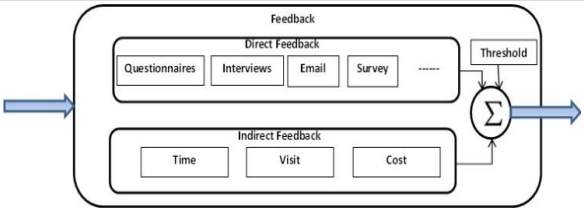


Figure 2. User feedback (TVC Model)

Fig. 1 shows proposed model for viewing customer satisfaction. We have added a feedback method with measurement model of IT implementation [6]. In this model, we introduced feedback method. Information system will get feedback from ITME and apply some process to verify user satisfaction. After determining the satisfaction level of users, it will send to IPP to take necessary action. We have introduced two feedback method i,e, direct and indirect feedback. Direct feedback is as traditional system. We have include time, number visits and cost matrices in indirect feedback. These three matric is so useful to determine user satisfaction level for the information system and need not user interaction directly. So we call this model as TVC model. Details of the feedback method of proposed model is described next.

Fig. 2 shows various feedbacks with TVC model. Getting information from customer or user of the information system about effectiveness of the system is referred as user feedback. Analyzing user feedback, management can take valuable decision to improve the performance of the system. It may be negative, positive, Informal or formal feedback. If users or customers satisfied to the system, they usually give positive feedback about the system. If they are not satisfied, then they may give negative feedback. Customers or users feedback help management to upgrade the system, improve customer satisfaction, pay attention to customers, best customer involvement, boosts customer relationships, inform to additional customer and overall business growth. Customer or user feedback can help business in many ways such as, adaptation proportion optimization, customer / users oriented Product, extend database etc. Customer feedback can leading to an upgraded product or sservice.

In our proposed work, we used two type of user feedback.

a) Direct feedback
b) Indirect feedback

(a) Direct feedback: This type of feedback is directly connected to customers. Direct feedback can be collected in many ways such as questionnaires, interviews, email, surveys, phone calls, observation, social media or printed forms. This technique is traditional process. Users or customers are directly connected to these methods. It needs huge time and cost to collect information.

(b) Indirect Feedback: Users or customers will not directly connect to this type of feedback. This is an automatic process. Management will get important information from this feedback without any cost or time. Fig. 2shows the process of indirect feedback. Three main parameters Time, number of Visits, and Cost (TVC) involve in this method. We have denoted TVC model of this method which has been discussed in four steps blew:

Step 1: Management has to keep records about customer visits to the organization, time duration for visits and processing of services, and cost to visits to process and others before deploying the system. If the organization has no records regarding these (time,visits, and cost), then management should make a tentative record that one customer needs TVC to perform one service. Then management will develop a database TVC for all services of the organization. We called it PreTVC database.

Step 2: Management will keep a watchful eye after deployment of the system. Management has to keep record how much users / customers getting services through online. Management also should establish a standard threshold about deliver services through online. Keep record of TVC save the delivered services of the customer.

Step 3: ComparePostTVC with PreTVC. If these comparison shows better then threshold, then management assumes positive feedback i,e, information system is performing well and customers are satisfied about services delivery of the organization. If the comparison shows higher than threshold, then management assumes negative feedback i,e, customers are not satisfied to the service delivery of the organization and needed to update the service delivery system.

Step 4: Analyze all data from direct feedback from user and take into consideration. Also consider indirect feedback form Step 3 and combine these two feedbacks and update the system as required.

C. Mathematical Model

Let before implementingthe information system (online).

$$TVC_{Before} = \alpha X T_B + \beta X V_B + \gamma X C_B \quad (1)$$

Where, $T_B = \sum_{i=1}^{m} T_i$, $V_B = \sum_{i=1}^{n} V_i$ and $C_B = \sum_{i=1}^{0} C_i$

Before implementing information system (online), T_B is the total time, T_i is time needed to perform a portion of the service. V_B is number of visits, V_i is number of visits needed to perform a portion of the service, and C_B is to total cost, C_i is the cost needed to perform a portion of the service. $\boldsymbol{\alpha}$, β and γ are adjusting factor and these three values will be set according to importance of specific matrices. For example, if cost is very important then needed time, then γ has to set higher than $\boldsymbol{\alpha}$.

After implementing the information system (online),

$$TVC_{After} = \alpha X T_A + \beta X V_A + \gamma X C_A \quad (2)$$

Where, $T_A = \sum_{i=1}^{m} T_i$,$V_A = \sum_{i=1}^{n} V_i$ and $C_A = \sum_{i=1}^{0} C_i$

After implementing information system (online), T_A is the total time, T_i is time needed to perform a portion of the service. V_A is number of visits, V_i is number of visits needed to perform a portion of the service, and C_A is total cost, C_i is the cost needed to perform a portion of the service. α, β and γ are adjusting factor and these three values will be set according to importance of specific matrices. For example, if cost is very important then needed time, then γ has to set higher than α.

Threshold of information system (online),
$TVC_{Th} = \alpha XT_T + \beta X V_T + \gamma XC_T$ (3)

Where, $T_T = \sum_{i=1}^{m} T_i$, $V_T = \sum_{i=1}^{n} V_i$ and $C_T = \sum_{i=1}^{0} C_i$

Target to achieve success of information system, T_T is the total time, T_i is time needed to perform a portion of the service. V_T is number of visits, V_i is number of visits needed to perform a portion of the service, and C_T is total cost, C_i is the cost needed to perform a portion of the service. α, β and γ are adjusting factor and these three values will be set according to importance of specific matrices. For example, if cost is very important then needed time, then γ has to set higher than α.

Now, after implementing the system or services, management will keep record (all TVC). Compute average value of TVC_{After} .If average $TVC_{After} \leq TVC_{Th}$ then management assume positive feedback of users. Also assume customers are happy with the system and average saving value = TVC_{Before} - TVC_{After} . Otherwise management assume negative feedback of users. Also assume customers are not happy with the system andupgradation of information system is needed.Average upgradation value needs =TVC_{After} - TVC_{Th}.

D. Algorithm

1. Set TVC_{Before} , TVC_{After} and TVC_{Th}as equation 1, 2 and 3 respectively.
2. If $TVC_{After} \leq TVC_{Th}$ then
a. Assume positive feedback of customers. Customers are happy.
b. Success level = TVC_{Before} - TVC_{After}
3. Else
a. Assume negative feedback from the customers. Customers are not happy to the service and need to update information system (online)
b. Needed update level = TVC_{After} - TVC_{Th}
4. End

E. Example

Calculation TVC_{Before} before implementing information system (online):

For birth registration of a child of a citizen (village farmer):

1. He needs to go district corresponding birth and death registration office.
2. Let distance from his living place to corresponding office is 50 KMs.
3. Time needed to travel 100Kms (up and down) is T_1=4 hours.
4. Time needed at office (to fill up necessary document) is T_2=1 hour.
5. One day needed to fill up necessary document and one day needed to collect the certificate.
6. One another day needed (optional) to confirm whether the certificate is prepared or not.
7. Total 3 days and with 4*3 or 12 hours needed T_B=3days.
8. Travel cost for 100*3 or C_1+C_2 = 300Km is Tk-1500
9. Indirect cost: This citizen needs 3 day to travel. If this 3 day were not needed to travel, he may work or job other task and he may income some revenue in these days. So total revenue income loss C_3 = 500*3 or Tk-1500 (tentative)
10. Fees needed for the certificate let C_4 = Tk-50.
11. Total Cost (Tk) $C_B=C_1+C_2+C_3+C_4$ = 1500+1500+50 or 3050.
12. Total Time needed is T_B=3days = 3*24*60 = 1440 minutes.
13. Total visits needed is One for going to office, one to ensure about preparation of the certificate and one to collect the certificate, total V_B=3.
14. α = 1, β=2 andγ=20as we assume the citizen is village farmer and money is more important to him.
15. So $TVC_{Before} = \alpha XT_B + \beta X V_B + \gamma XC_B$ = 1*1440 + 20 * 3 + 2*3050 = 7600

After implementing information system TVC_{After} (online)

1. The citizen will apply birth certificate of his child (by online) T_1=0, V_1=0, C_1=0.
2. Need not any travel to corresponding office (time is zero). T_2=0, V_2=0.
3. No travelling cost is needed, C_1=0, C_2=0;
4. Only registration fee is applicable (C_3=Tk-50)
5. No visits is required (number of visits = 0) as certificate can get through email, V_2=0.
6. So $TVC_{After} = \alpha XT_A + \beta X V_A + \gamma XC_A = 1 * 0 + 20 * 0 + 2 * 50 = 100$

TVC_{Th} Calculation (online) set by organization

1. Let T_T=20 minutes
2. C_T = 100
3. V_T=1
4. So $TVC_{Th} = \alpha XT_T + \beta X V_T + \gamma XC_T = 1 * 20 + 20 * 1 + 2 * 100 = 240$

For this calculation, we see that

$$TVC_{After} \leq TVC_{Th}$$

So we can say that, this system gives us positive feedback and customers are happy. The system or service is running well. We set target TVC_{Th}=240, before implementing information system, average

TVC_{Before} was 7600, after implementing information system (online) $TVC_{After} = 100$. So target to implement information system for this service is fulfilled and customers are satisfied. We have abled to save average TVC_{Before} - TVC_{After} = 7600-100=7500. So management can happy to this service. Management will update TVC_{Th} time to time for better service than previous.

F. Hypothesis

TVC (time, number of visits, and cost) is negatively related to users / customers satisfaction.

IV. CONCLUSION

We have developed a TVC model in an easy way. This model can be used to determine any new added services are innovation or not. Again, this model can help the organization to estimate user acceptance or satisfaction level of any services. Management can take necessary action to upgrade the services according to the user satisfaction level. Management also can update threshold satisfaction level time to time to give better service to customers.

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