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A CASE DISCUSSION ON JUSTIFICATION OF E-PDS: A MULTI CRITERIA DECISION APPROACH

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INTRODUCTION

Indian economy is being projected to attain 60% of the US economy in size by 2025. The introduction of IT in business has changed the business scenario which created the question of survival of the organizations without IT. Government came up with e-PDS which is a technology enable service, helps in both quantitative and qualitative assessment of the system. E-PDS helps the Government in faster delivery of goods and services, reduction in cost and increase in customer awareness and satisfaction. It facilitates the procurement, allotment, inventory control, accounting services and tracking product delivery which reduces the fraud and leakages in PDS. Despite the developments, this IT investment is not fruitful as a high rate of illiteracy and poverty in rural committees, where unreliability of electricity supply and frequency of power cut deprives them from e-PDS system. IT investment is not benefited for the rural area as the number of computer literate is less as compare to the urban areas. Now it is a challenge for the Government to justify the investment as it is a part of the public money that they are spending. Increasing the investment in PDS for value creation, does not reveal the accurate value measured out of this investment. There are some advantages of ICT investment like, increase efficiency, developing quality, better control, transparency in information, competitive advantage, increase revenue, increase integrity, minimizing the risk and wastage, centralized data storage, customer satisfaction, value creation, better decision, where as there are some disadvantages like difficult to calculate the return on investment, in appropriate evaluation techniques etc.

Key word: IT justification, ROI, MCDM, e-PDS,AHP

LITERATURE SURVEY

The ICT investment evaluation became a ongoing debate for the academics and researchers to highlight the impact of ICT on organizations. As ICT return is intangible based on social dimensions, it is quite difficult to calculate the cost and benefit of the investment. ICT cost is more than ICT benefit, Marrison and Bernt, (1990). ICT investment is not giving monetary return always. ICT implementation is important as it improve the efficiency of the system. The main purpose of implementing the ICT in the organization to enjoy the competitive advantage, (Hu and Plant, 2001). The benefit of ICT can be for an individual, organization, economic and social, (Bannister 2005, Piccoli and Ives 2005). ICT used as a weapon which facilitates positive change in the organization (Gregor et al, 2006). ICT became more attractive in the business scenario of 21st century, (Agarwal and Lucas 2005). Willcocks and Lester (1999b) highlighted the risk of ICT investment in terms of cost, size, complexity, cultural and political aspects. Many authors have projected the effect of ICT failure and consequences, (Kwon and Watts 2006, Remenys et al 2004, Willcocks and Lester 1999b, Reich and Benbasat 2000). Some researchers found that, the firms have substantial returns from IT investment, (Brynjolfsson and Hitt 1993, 1995 and Lichtenberg 1995). Chen.Y, Joe.Z., (2004), used Data Envelopment Analysis (DEA) model to evaluate the productivity impact of IT investment. The IT investment evaluation is always considering the technical and economical aspects where as human and social aspects are not considered (Hirschheim & Smithson 1988). Cronholm and Goldkuhl (2003) highlighted the six generic types of evaluation consisting three strategies of “how to evaluate” and two strategies of “what to evaluate”. IT Business Value Analysis (BVA) toolbox is very much helpful to the IT management to get solutions for different issues as it

gives less emphasis on intangible valuation models and more emphasis on traditional financial valuation models, (Marta 2007). IT investments can be a failure in giving benefits where amount spent on time, effort, technology and opportunity proved to be waste. (Fortune & Peters, 2005). In past few decades, number of research activities have been done to evaluate the Information System (IS) success based on information value, system usage, user satisfaction and service quality, but the IS success model developed by DeLone & McLean (1992), considered to be a major contribution in this research area. IS evaluation is often referred as IS assessment, IT appraisal, IT justification, IT measurement, Nagm (2006). Enrique Silva (2003) suggested both the qualitative and quantitative benefits by using two models like Business Process Modeling and Simulation (BPM & BPS) and Dynamic Information Workflow Model (DIWM). Gunasekaran et al. (2001) suggested that, the ROI is not an appropriate model to justify the IT investment decisions as it ignores the intangible benefits of IT investment which are playing a vital role in developing the organizational effectiveness. He proposed one conceptual model by evaluating the benefits of strategic, tactic, operational, tangible (financial & non-financial) and intangible considerations. Remenyi et al. (1997), proposed one approach called Active Benefit Realization (ABR) for maximizing the value of IT investment by managing the information systems development process effectively and efficiently.

METHODOLOGY

In presence of number of evaluation methodologies, no single method is accepted universally and proved satisfactory. The methods are accepted on the basis of different circumstances, Ward (2003). Many evaluation techniques are used in the literature like fundamental measures, composite approaches or meta approaches, financial techniques, multi-criteria methods, strategic analysis methods and probabilistic methods, Yaseen, Sheikh, (2006).it is difficult to calculate the intangible benefits of ICT investment but it can only be done by questionnaire to understand the impact on organization, Hillam and Edwards, (2001). Berghout and Renkema (2001) developed 65 methods to evaluate the ICT return. Farbey et al, (1999a) highlighted the matrices to match the evaluation technique with the project characteristics. The financial method includes, Return on Investment (ROI), Payback method (PB), discounted cash flow method, Net Present Value (NPV), Internal Rate of Return (IRR) and Profitability Index (PI), but all these methods have their own limitations.

Multi Criteria Decision Making (MCDM)

In current business situation, it is a challenge for each and every organization to provide qualitative products and services with low cost, less product development cycle and less delivery time, as it is required to take many critical decisions to win the competitive advantage in the said era. The researchers have developed many decision making methods to handle the decisions at tactical and strategic level, (Madan, Ranganath 2014). Multi Criteria Decision Making (MCDM) approach is the well known method to find the best appropriate decision out of number of alternatives and which is classified as Multi-objective Decision Making (MODM) and Multi-attribute decision making (MADM). Various MCDM methods have been developed during the research like Weighted Sum model (WSM), Weighted Product Model (WPM), Analytical Hierarchy Process (AHP), Revised AHP model, ELECTRE method, TOPSYS method etc. A fuzzy AHP has been developed widely due to complexity of traditional AHP. Chang (1996), highlighted the fuzzy AHP using triangular fuzzy number for pair wise comparison of fuzzy AHP. Number of authors used the fuzzy AHP techniques of MCDM approach to take decision in different fields like Cheng (1997) proposed to evaluate naval tactical missile system, Deng (1999) proposed to handle qualitative multi-criteria analysis problems, Lee et al (1999) proposed stochastic optimization to achieve global consistency, Cheng et al (1999) proposed for evaluating weapon systems, Chan et al (2000b) proposed for increasing productivity by reducing lead time, Cao (2000) proposed to consider the tolerance deviation, Kuo et al (2002) proposed to locate a convenience store, Cengizkahraman et al (2003) proposed to compare the catering service companies, Yang and Hung (2007) proposed to solve plant layout design, Wang and Lee (2007) proposed to find positive-ideal and negative-ideal solutions, Chen and Tsao (2008) proposed for distance measurement, Cebeci and Kahraman proposed Geometric mean method to find fuzzy weights, Mikhailov (2004) proposed fuzzy Preference

Programming Method (PPM), Buckley (1985) proposed Lambda-max method, Weck et al (19970 proposed to evaluate different production cycle. Chan et al (2000a) proposed an algorithm to quantify the tangible and intangible attributes and benefits in fuzzy AHP. To justify the e-PDS investment we have used the AHP model based on available data.

Analytic Hierarchy Process (AHP)

AHP model helps the decision maker to decide the best flexible possible decisions by ranking the alternatives by using large number of criteria available where both qualitative and quantitative aspects are being considered and amongst all, the well known Saaty (1980) highlighted the analytical hierarchy process using the mathematical models to decide complex decisions. In the earliest days, the AHP used in triangular fuzzy numbers for pair wise comparison in weighted decision alternatives, (Laarhoven and Pedrycz 1983), systematic and comprehensive approach to decision making, Saaty (1990).The criterion used influences the decision making process with equal weightage or varies on the basis of criterions (Yahya & kingsman 1999). AHP approach is benefited in terms of simplicity (Liu and Hai 2005). It is widely used in cases like evaluation and selection (Maggie and Tummala 2001). According to Chen-Tung et al. (2006), the AHP approach helps to measure the performance of the suppliers to take future decisions on suppliers. The AHP approach is also used to measure intangible factors (Ajitabh pateriya, Devendra singh verma 2013). The AHP model is used under Multi Criteria Decision making process mostly used in complex decisions (Hudymacova et al). AHP model has been modified time to time like computing, pair wise comparison, normalizing and weighting for making better decisions. Number of authors has worked on AHP model by using number of factors (shown in Table-1)

Table: -1 Authors worked on AHP model

	The most important criteria	Authors
1	Quality	Li et al. (1997); Yahya and Kingsman (1999); Tam andTummala (2001); Yu and Jing (2004); Liu and Hai (2005); Weber et al. (1991); Zhang et al. (2003); Ghodsypour and O'Brien (1998), Dickson (1966)
2	Cost	Tam and Tummala (2001); Yu and Jing (2004); Amid et al. (2006); Li et al. (1997); Weber et al. (1991); Zhang et al. (2003); Ghodsypour and O'brien(1998), Dickson (1966).
3	Delivery	Yu and Jing (2004); Liu and Hai (2005); Yahya and Kingsman (1999); Dickson (1966); Weber et al. (1991)
4	Trust	Yu and Jing (2004)
5	Responsiveness	Yahya an Kingsman (1999); Li et al. (1997); Liu and Hai (2005)
6	Financial	Zhang et al. (2003); Liu and hai (2005; Dickson (1966); Weber et al. (1991)
7	Management and Organisation	Zhang et al.(2003); Yahya and Kingsman (1999);Weber et al. (1991); Liu and Hai (2005); Dickson(1966)
8	Discipline	Liu and Hai (2005); Yahya and Kingsman (1999)
9	Facility and Capacity	Zhang et al. (2003); Weber et al. (1991); Liu and Hai (2005); Yahya and Kigsman (1999); Dickson(1966)
10	Performance history	Weber et al. (1991); Zhang et al. (2003); Dickson (1966)
11	Environmental Performance	Handfield et al. (2002)
12	Technical capability	Tam and Tummala (2001); Liu and Hai (2005); Chen-Tung et al. (2006); Amid et al. (2006); Dickson (1966); Weber et al. (1991); Zhang et al. (2003)
13	Warranty	Zhang et al. (2003);Dickson (1966);

(Sources: Alehashem, Sheikholeslam, Emamian, Akhavan, 2013)

The steps followed in AHP

1. Decide the decision criteria on the basis of objectives and importance (i.e., criteria and sub-criteria based on the goal).
2. Give weightage to the criteria and sub-criteria on the basis of their importance by pair wise comparison and rate the factors.
3. Develop the decision matrix.

CASE INTRODUCTION

In this paper, an attempt has been taken to justify the IT investment in PDS process. The Government implemented the e-PDS to minimize the cost and to maximize the customer satisfaction. Top give transparency and justice to the consumers of the PDS, the Government introduced the ICT application which also minimizes the loss by minimizing the corruption in the system by maintaining a proper tracking record of each and every activities of the PDS process. The efficiency has been increased by providing information and educating the society in maintaining transparency in e-PDS process. To somehow, the process is being developed but now it is the time to justify the investment on e-PDS as the Government is accountable to the public as public money is utilized to improve the e-PDS process and also to highlight the advantages and disadvantages of such investments.

ANALYSIS

To justify the e-PDS investment, we have taken 4 options like Traditional system, improved system, Partial e-PDs and e-PDS so that we can easily compare these options and justify the e-PDS investment. The Traditional PDS reported with number of drawbacks and then to rectify the drawbacks, there are number of schemes developed to improve the system. For more improvement, the Government partially implemented the e-PDS and for better controlling and monitoring they implemented e-PDS fully, which gives rise to transparency, ready response, ease out the transactions, better decision making process and customer satisfaction. To calculate the Return on Investment (ROI), we have to consider both the investment and the return. The process investment includes the cost, time and effort, where as the return in terms of easy transaction, Ready response, transparency, better decision and customer satisfaction. The cost incurred to implement the technology in the process and the time and effort invested to make it successful. As we have taken qualitative feedback from the authorities (Appendix-I), it is suitable to use AHP model and so on used expert choice 11.5 software for our calculation. There are four options taken to compare the investment and return, i.e. traditional system, process improved, partial e-PDS implementation and e-PDS (shown in Table-2)

Table: -2 Comparison between PDS systems

	Investment .333	Time .118	Effort .268	Cost .614		
Traditional System	.556	.535	.581	.547		
Improved System	.257	.270	.233	.265		
Partial e-PDS implementation	.118	.120	.118	.118		
e-PDS	.069	.075	.068	.070		
Total	1	1	1	1		
	Return .667	Easy transaction .097	Ready response .086	Transparency .243	Better Decision .177	Customer Satisfaction .397
Traditional System	.073	.068	.069	.068	.087	.072
Improved system	.135	.134	.134	.121	.129	.155
Partial e-PDS implementation	.283	.268	.268	.316	.252	.275
e-PDS	.509	.530	.529	.495	.532	.498

Total	1	1	1	1	1	1

(Source: Survey data and Author's calculation)

CONCLUSION

The implementation of IT investment in PDS can be proved better in terms of return as it increases the overall effectiveness of e-PDS and helps in achieving the objectives fixed by the Government, but it is quite difficult to calculate the benefits in terms of quantitative as number of traditional methods has been developed during the research in this field which takes into account the intangible factors giving the qualitative benefits. The above analysis highlighted the matter that the cost is important as compare to time and effort when we consider the investment part. When we consider the return part, the customer satisfaction is most important as compare to easy transaction, ready response, transparency and better decision. It is also suggested that, e-PDS is a better option in terms of return where as Traditional system is a better option where we concentrate on investment aspect, as it decreases the time and cost.

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