CAVEATS OF INFORMATION TECHNOLOGY IN HEALTH INFORMATICS

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Abstract- In this paper we examine the influencers and key factors that either impede or augment the implementation and change management process during deployment of health care IT Systems. The goal is to examine and analyze the existing state of information regarding implementation process of health care IT systems and management of change during the rollout. Our findings suggest that influencing change management factors can be classified under two major dimensions i.e. social and technical. While acknowledging due importance of technical factors, we argue that social factors playmore vital role for successful implementation of IT systems. The study reveals that if change managers are able to capitalizethese success factors and address these problem areas in the rollout plan,they can successfully drive an efficientHI implementation process.

Index Terms- Health informatics (HI), Caveats, change management, human-technology relationship.

I. INTRODUCTION

The adoption of (Information Technology) IT systems in health care sectors is seen globally as an effective methodto improve health care services and proficiently meeting widening health care demands [**1**].The adoption rates of IT systems are exponentially increasing in health care sectors across the world [**2**] Still, change management is considered to be a vital challenge while introducing and implementing new IT systems in health care sectors.
Furthermore, specific issues and actors [stakeholders] that shape health care environments deserve attention and consistent guidance [**3**]. From a change management perspective, the main job of the project manager is "to get the unwilling [users] to do the impossible for the ungrateful" [**4**].The challenge becomes even greater when the change management team is required to collaborate on such common operational undertakings for which the culture and capabilities are not essentially shared and have extreme time-constraints [**5,6,7**].
Change management plans and implementation process of these [IT] systems in complex medical environments would value from understandings of the contingent properties of human-technology relationship [**8**]. Though, studies have discussed the importance of change management and the factors that can affect change management process in any organization but little is known about the influencing factors for change management during implementation of 'IT systems' in 'health care sectors'. Hence, this study is driven by the following research question (RQ): *What are the positive and negative factors that affect the change management process during rollout of health care IT systems?*
We discuss the literature on"implementing IT systems in health care sectors" and identify the limitations in the existing literature, followed by the methodology adopted for this research. Subsequently, the research findings are presented and their implications are discussed. Finally, the study concludes by suggesting some research avenues for future.

II. COMPLEXITIES OFHI

Health Informatics (HI) is the integrated discipline of Information Technology (IT) and medical science into public health care practice and related research fields. Existing literature suggests that the health sector often lags behind other developing sectors in terms of the adoption of advanced IT systems.

A. Perceptions and Caveats

The fact with IT projects is that the perceived and anticipated benefits of the planned and expected change in health care systems are not deterministic [**9**]. However, 'social factors' have either been ignored or underestimated while employing implementation methodologies; considering such systems being only technical in nature [**10**].It has been argued that health care IT solutions actually add more intricacies with increased number of processes inter-relationship and higher rate of information [**11**]. These inherent complexities of health care IT systems mean, the integration of existing complicated medical processes with new IT system, which can have profound unpredictable consequences [**12**].

B. Change Management

When resistance is seen as natural then it can be seen as a preliminary step to adaption [13].The literature identifies communication in health care individuals as often "informal, disorganized and variable" [**14**].Even if health care IT systems are carefully planned and cautiously designed, they cannot successfully be implemented in the organization if major systemusers resist[**15**].

C. Organizational Culture and Behaviour

Resistance in change management process also comes in the form of cultural differences. A tough ask for organizations in today's IT world is to design and adopt a volatile culture and effective management style, for capitalizing opportunities and dealing with confronted challenges of changing IT environments. Unlike developed countries, a complexity of developing countries is the challenge of dealing with skeptical users who neither have the basic IT skills nor interest [**18**]. In such cases modified business process re-engineering be designed to suit the particular organizational environment and culture [**19**].

Culture is a "collective programming of the mind" that distinguishes not only societiesbut also industries and organizations [**16**]. Communal behavior can be assessed under the umbrella of Hofstede five major dimensions of culture i.e Power Distance (PD), Uncertainty Avoidance (UA), Masculinity& Feminity, Time Orientation and Individualism (IND). Societies with higher degree of PD, UA and IND present more resistance [**17**].

D. Approaches and Influence Tactics

Suitability of any implementation approach mainly depends on particular environment of anyhealth care organization.However, the method of implementation and rollout of [IT] systems can make the difference to success or failure.Few important factors which needs to be considered for the selection of implementation approaches are; domain knowledge of medical staff, flux of patients and daily workload, and the amount of resources available for implementation process. Based on these attributes, health care IT organizations involve one of the four implementation approaches[**20**] as shown in Fig 1.

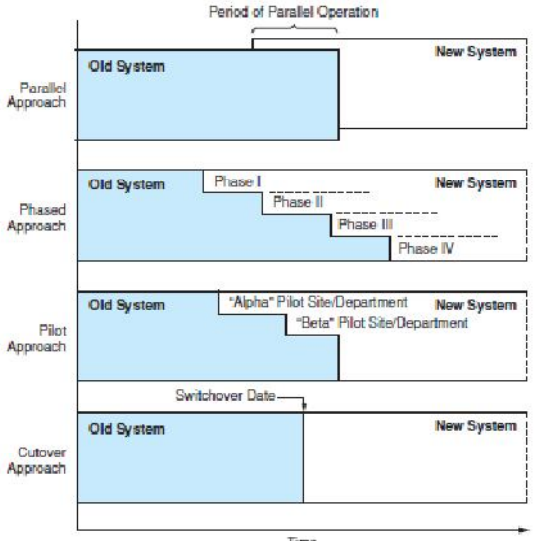


Fig 1: Implementation Approaches

III. RESEARCH METHODOLOGY

While studies focus on implementation of e-health records and multiple IT systems, little is known about the critical factors affecting the behaviors and attitudes towards adoption of new IT systems [**21**]. Despite these facts, stakeholders' coordination has not been the subject of extensive study in the Information Systems literature [**22**]. Furthermore, little is discussed about critical success factors and support required for effective change management while implementing IT systems in Health Care Out Patient Departments (OPDs). A gap can therefore be seen in determining the factors affecting change management process and implementing health care IT systems.

In this study the research methodology has been categorized in three steps. Firstly,the literature about problems in rollout of health care IT systems was studied. The aim was to investigate the factors that influence the process of change management while implementing new IT systems in health care sectors. Subsequently, multiple health care users were selected for the case study and data was collected from the users of healthcare IT systems. A qualitative research methodology was adopted to capture the statistics through acase study of multiple OPDs from a developing country. 67users had participated from multiple OPDswith an average day flux of 1200 patients. The objective was to obtain influencers from clinics of functional health care IT systems.Selection of questions was aimed to use the questionnaire as an instrument for plugging in information gaps, establish user perceptions on acceptance of new healthcare IT systems and to quantify the expectations and concerns of different categories of users. Finally, a comparative empirical analysis of the literature and case studywas done to identify critical success factors and impediments of implementationprocess for health care IT systems.

IV. FINDINGS

A. Case Study Background

Two main factors were consideredwhile selecting these health care organizations; one that these organizations have transformed from manual paper based systems [processes] to IT systems, and second that implementation IT systems were only restricted to OPDs as first phase of their implementation plan. The selection criteria of the users were based on their involvement in the implementation process and roll out of IT systems in their health care departments. Based on the findings from the case study, different views and experiences of [IT] system users were noted which has affected the change management and implementation process of these[IT] systems. These experiences can be segmented and discussed under the following headings:

B. Role of Culture Dynamics

1) Effect of Training Environments

The case study reveals that participants [medical staff] were given initial basic training on the system

in well-equipped training rooms. It was noted that practical handling in supervised environments encouraged the participants to use the new [IT] system. For example,one of our participants[clinician doctor] said, *"If we would not have been guided in such supervised environments, nobody [clinicians] would have spent [their] own time to understand the system"*.

2) Transformation Process and Approach

Despite fixing the specific dates well in advance, on the final day of rollout, the participants expressed their frustration as the patients were not ready for the new [IT] system. As one of the participants [medical administrator] said, "despite *repeated instructions, our patients were not ready [incomplete credentials for registration] once we shifted to computer system which created lots of complications"*

While selecting the implementation approach, management chose few sample departments and simulated complete [medical] process. For example,one of the participants [medical nurse] said, *"We were happy as they selected few departments [Pilot approach of Implementation] as lead for the [IT] system, which were better equipped and [IT] skilled; as community we are comfortable to follow"*.

3) Working with New [IT] System

It was noted that, while using live [IT] system users faced problems from peers and colleagues who were unwilling to use the new system. For example, one participant [clinician doctor] said," I *felt there were people within department; who never used the system and not let the system to set in; may be [they] had self-interests!"*. It was found that initially participants were reluctant to use the new [IT] system and had shown fear of being unfamiliar with the equipment or were not having enough motivation. For example, one of our participants [specialist doctor] said, *"[our] staff is not feeling comfortable to use new [IT] system, they hesitate to handle the system as it may get damage*". One of the participants [head of department] said, *"It is not possible for the entire department to completely shift over to different [IT] system while handling patients"*.

C. Effective Leadership During Change

1) Change Management Plan

In addition to training sessions, management team members implemented the plan in a phased program with existing system in parallel for which our participants remained comfortable. For example, one of the participants [paramedic] said,*"When asked for help and assistance I have liked the way their team lead used to generate discussions and listen to our fears and reservations"*. One of the users [nurse] of [IT] systems said, *"They [management team] have divided the implementation process in various phases, which became easy for us to understand and parallel continuation of already existing system made the journey comfortable*". For example, one of the participants [clinician doctor] said, [The] *Rollout phase was tough but their [Change Management Team] patience and consistency in responding to our frequent and sometimes strange [for the team] queries, had given me confidence to adopt the new system"*.

In one of the health care organizations, the change management [implementation] team planned for a particular rollout methodology and participants [users] were also trained and prepared for the same methodology but then implemented different implementation methodology for which neither users nor the organization were ready.For example, one of the participants [medical administrator] said, *"We were promised and trained for phased rollout program [implementation approaches] but actually they started the [IT] system in all departments in one day [cut over approach] which was not part of the plan, which I think was the main reason for disliking the system as none of our department staff nor the patient community was use-to of this abrupt style"*. *O*ne of our participants [nurse] said, "*System has been enforced on us where as [I think] if we were given due time to readjust ourselves in understanding the system, it would have been a treat to happily use the system"*. A comment from Hospital management [admin Officer], *"It would have been better if the [implementation] team had involved us during development of the IT system then we were more comfortable in understanding and using this [IT] application*".

2)Change Agents and Middle Layer Management

The change manager during initial rollout phase provided close support to users in their clinics as was committed during initial training sessions. For example, one of the participants [clinician doctor] said, "*Their [change management] team leader committed us [users] to provide hand holding support in our clinics. I appreciate that he honored his words so we also religiously worked for [IT] system success"*.

While implementing the new [IT] system, participants expressed difficulty in getting clear and in time instructions, whenever they needed clarifications on system queries. For example, one of our participants [clinician doctor] said, *"After giving training once, we used to be given instructions through our department heads as part of implementation plan. Conversely there should have been a middle layer or support mechanisms to guide us through that [implementation] plan"*.

D. Users' Perspective

1) System Rollout and Over Stretched Users

Before the rollout phase of new [IT] system, the change management team involved all heads of departments and medical administrators in planning phase of implementation. For example, one of the[consultant/specialist doctor] participant said, "*We were comfortable with the [change management] team and were supportive in their implementation*

process, as they involved us while making their [system] implementation plan and plugged in our routine commitments before finalizing the rollout plan".During the implementation phase, the users found it taxing because they had to treat the same number of patients and to perform all their routine tasks in addition to handling the new [IT] system. Moreover, participants found it difficult to integrate the patients in the new [IT] system especially patients with no IT background. For example,one of our participants [specialist doctor] said."w*e have to spend lot of time understanding the new system. Then half of the time I spent explaining this system to my patients at the cost of my business hours. Important things get delayed and we are struck up"*. Another participant [medical administrator] said, *"They [management team] told us it would take few weeks to shift to the new [IT] system but due to software [application] problems it took [3] months in transformation process. We were over taxed and lost interest in the system"*.

Participants experienced system breakdowns during initial stages and expressed difficulty in performance. For example, one participant[clinician doctor] said, *"extensive disruptions [frequent breakdowns of Networks, slow response of application] during this phase, which we can't afford while dealing with patients"*.Another participant [senior nurse] said, "*during this [implementation] phase we were to learn new systems [additional work] deal with same number of patients and perform all our routine duties, but no one bothers! I never asked for this system so why should I go through this suffering"*.

2) Guidance and Support

In addition to formal system training, participants expressed the requirement of multiple levels of guidance and support depending on existing level of expertise [system knowledge] of the users. For example, one of the participants [medical administrator] said, "w*e have multiple age groups of professionals; it was comparatively easier to introduce the system to younger doctors but was very taxing to train senior consultants.Should have given intensive training or more support while using the [IT] system"*.

Few of the participants experienced lack of initial training, For example one participant [nurse] said, "*during initial stage, support like handholding training was found missing in roll out process in our hospital"*. *W*hereas a participant from other health care organization expressed satisfaction on the support provided by the team which helped them to optimize the use of the new [IT system]"*Comprehensive system training made us confident with new application and enabled us to exploit all its features. Pre-education of doctors and patients made the implementation flow even smoother"*.

3) Interdependency of Business Processes

Our participants expressed their frustration in using the new [IT] system since despite their efforts they could not complete the cycle of the medical process through the [IT] system, till all specialists and staff in the chain completed their actions. For example, one participant [clinician doctor] said, *"It was very discouraging when senior consultants don't respond to your [referred] patients through [IT] system and patients come back; complaining of not being treated; spoils our credibility and patients' confidence. Should be some [accountability] procedure [for consultants]".Head of filter clinics said, "worst part of this [rollout] process was spending extra time with every new patient to make them understand the departmental flow [in paper free environment] for their particular diagnosis"*.

E. Strength of IT System

1) IT System Infrastructure and Application Features

It was observed that a weak technical infrastructure and limited application features added to the problems of users [medical staff]. Participants felt that repeated interruptions and uncertain [IT] system behavior caused a negative impact and reluctance of participants in using the system. For example, one participant [nurse] said, "*frequent network breakdowns and slow application response has shattered my confidence in this [IT] system"*.

Participants from few departments found problems using new [IT] application as, many of their [specialty] medicines were not available in the [system] data base and application features had restricted their job performance, for example one of the participants [specialist doctor] said, "*restricted choice of medicines through [IT] the application has forced me to go for alternate medicines"*. One of the senior participants [specialist doctor] makes his point in the case,"*New [IT] system is no good for me as I need more features, which this system is not providing and then I am asked for compromises or wait for the improved version"*. It was noted that participants from a specific department were comfortable in using the new [IT] system as [IT] system's features were meeting all their process needs.Participants expressed difficulty in working with new interface [GUI] which was quite different from their existing [paper] formats so they struggled in understanding and familiarizing themselves withnew design. For example, one of our participants [senior consultant] said, *"It is difficult for the doctors to adopt a new design [application interface] of [patient] consultation form which is totally different from our previously used old formats"*.

V. DISCUSSION

Based on the analysis of collected data and study of the literature, four main dimensions associated with successful implementation processes of health care IT systems were identified. Deeper analysis of users'

data [case study] reveals that social factors are more critical for successful implementation of health care IT systems as compared to technical factors. There are number of risks which expose implementation process of health care IT systems and present challenges for change managers.

Fig 2 illustrates that most of the insulating factors are part of "social category" (*shown in brown color*)while a limited number form part of "Technical Category" (shown in green color).Positive and negative factors which influence the implementation process, have been divided under following themes: -

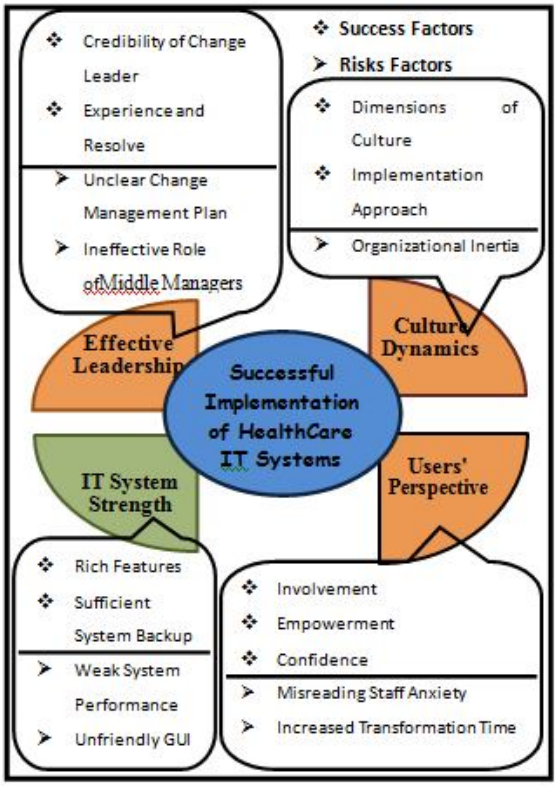


Fig 2: Factors Affecting Implementation Process

A. Role of Culture Dynamics

Effective change management is considered an essential contributing factor for the success of IT implementation in health care sectors. However, type of support, training and assistance needed at various stages of implementation process, depends on organizational culture. Moreover, appropriate selection of 'Implementation methodologies' also plays a vital role in successful implementation and acceptance of health care IT systems. However, risk probability of these [implementation] methodologies would vary, depending on the type of community you are addressing and the culture you are dealing with. When dealing with culture dynamics of organization, the findings reveal that (illustrated in Fig 2) there are two main success factors (Implementation Approach and Dimension of Culture) and one negative factor (Organizational Inertia) which affect the implementation process of the IT systems.

1) Implementation Approach

The case study also reveals that selection and success of implementation approaches largely depends on "organizational culture" and "level of uncertainty avoidance" of that community where the IT systems being deployed. Therefore, change managers need to carefully plan health care process of change management, in line with "power distance", "uncertainty avoidance", "masculinity & feminity", "time orientation" and "individualism"[**17**] for selecting appropriate implementation approach which is most suited to the organizational environment and accepted by user community. For example the participants were happy once a pilot approach was adopted for implementation, as this suited the community that presumably had a lower threshold of 'uncertainty avoidance'. If implementation process is adopted in accordance with cultural context of organization it may yield positive results and broader acceptance by the users. Therefore, IT systems that challenge an existing organizational culture, test their prevailing norms and attempt to homogenize multinational best practices become risky to succeed.

2)Dimensions of Culture

Organizational communities react to change differently, so one can never underestimate users' resistance as it is a factor which varies with the dimensions of the culture. Findings from the case study also showed that despite repeated announcements the patient community was not ready on the day of rolling out of new [IT] system and they [change managers] had to follow a gradual change approach in the organization. In such scenarios 'rationale persuasion tactics' never work and the recommended influence tactics for the change managers would be 'hard influence tactics' (adapted from [**23**]. Additionally, it was also found that participants were happy and comfortably accepted the supervised and guided training since it was part of their organizational culture.

3) Organizational Inertia

The study suggests that change management teams should take into account and discern the difference between resistance due to misunderstandings and parochial (local or departmental) interests as part of organizational behavior. It is imperative that change managers also be cognizant of how others perceive the system. Participants from the case study reported that few of the users neither wanted to use the [IT] system nor allow others do it. Moreover, staff was reluctant to handle the new hardware due to the organizational inertia or fear of unknown, which in both cases needs to be addressed out rightly by the change managers. Since, a negative attitude or comments from colleagues may exert a substantial adverse effect on the community as a whole. Moreover, it was observed that as a natural inertia, users found it difficult and were reluctant to completely shift from existing [manual] system to new [IT] system.

B. Effective Leadership during Change Process

The leadership style and approach followed by change agents [managers] also has a vital impact on rollout process. Findings reveal that leadership encompasses (illustrated in Fig 2) two success factors (Credibility of Change Agents & Experience and Resolve) and two negative factors (Unclear Change Management Plan & Ineffective Role of Middle Managers) which affect the implementation process of IT systems.

1) Credibility of Change Agents

A well reputed and respected change agent [manager] to lead change management initiatives is more likely to be followed and accepted by the organization. Change must be led [through change managers], for which the rationale and approach to the change be communicated to all the stakeholders. Managers often forget the time they spend in getting this [requirement of new system] problem and the number of angles they had explored in understanding and believing the need for change. Findings suggest that to be an effective[change] manager, due hearing must be given to the users' routine commitments and their genuine reservations about the rollout process must be addressed. This would not only smooth the process of change but will also get the support from the users.

2) Experience and Resolve

Frequent formal and informal interactive sessions of change managers with the users, will attract users' attention and also enhance their [users] confidence in the new [IT] system. Change managers should make consistent efforts to ensure that the new destination [IT system] and process [change management] to arrive to the targeted goal must not conflict their [users] cultural beliefs. Therefore, change managers must shape up their approach by segmenting long complicated procedures into small realistic & achievable goals. Findings revealed that participants felt comfortable with the interactive sessions with the management team and confidently followed the system as they [team] had divided the implementation plan into various understandable phases.

Furthermore, it is also observed that management teams who are driving the change must anticipate, with their experience the short term disruptions during the initial phases of implementation and make proactive arrangements to assist and guide users during those difficult stages. The rollout phase is a critical stage of implementation for both 'users' and 'change leaders'; as on the one side users are passing through their most uncomfortable [transformation] phase i.e. 'shakeout period' and on the other side, change leaders are confronted with maximum resistance from users and deducing that change momentum has fallen down. Three of the participants lost interest innew [IT] system due to the initial disruptions and frequent interruptions, which they did not expect and for which users were not prepared.

3)Unclear Change Management Plan

Change managers must re-model their mind maps according to the organizational culture where they are unfolding their rollout plan.In many situations, change leaders and managers can do better if they revise their mental model and conform their change management plansin accordance with the change process that is taking place in the organization.For example the participants were happy to use the [IT] system if enough time was given by the management to readjust themselves [medical staff]. Moreover, the change agents must be consistent and clear in their change management plan and should have concise performance measuring criteria. The participants were uncomfortable for adopting a different implementation approach by the change management team, as the [change management] team planned and trained them [users] for one implementation approach whereas followed another [cut over approach] which was neither accepted by the department nor users.

4)Ineffective Role of Middle Managers

Senior management expects users to understand and believe in the idea of change after few interactions with new [IT] system and therefore users should convincingly follow the instructions from senior management. It has been observed that users were not comfortable with the system unless they could be convinced about the value of the new system. Therefore, it is suggested that middle managers [drivers] should play their role effectively by interacting with users and giving them [users] due time to understand the process of change. Moreover, these change] managers must inspire entities to take ownership of the change efforts by creating visual pictures of old and new systems and subsequently boost motivation within users to drive the change. Findings of the case study also identify the importance of capitalizing the role of middle managers as change champions. Since they have their fingers on the pulse of operations they can therefore conceive, suggest and set in motion new ideas that top managers may not have thought of. For example, the participants expressed the requirement of middle layer to guide them and correctly interoperate the top management instructions for them [users].

C. Users' Perspective

Health care users' [clinicians] contribution inhospitals IT systems and use of electronic medical records is reported to have a significantly low. In healthcare environments, system users are considered to be the most vital entity for success or failure of the system. It is deduced from the findings that users' perspective can have three main success factors; Involvement, Empowerment and Confidence; and three negative factors, Misreading Staff Anxiety, Increased Transformation Time and Adverse Doctor-Patient Relationship which affects the implementation process. Each of these are discussed below:-

1) Involvement and Empowerment

Even when the organization is willing to engage in a project, individuals' [users] disinterests can impede

the process, as users are busy, stressed or may fear becoming less instrumental with the new outcome. Our findings suggest that, users [clinicians]must be involved in decision making process of implementation and rollout plans; this creates interest of the user in adopting the IT system and accepts the system with minimum resistance. Rollout of health care IT systems can only get off the ground when appropriately conceived and supported by both change leaders and future key users [medical staff].

The implementation processes of health care IT [systems] theory is usually the preconceived impression of purely technical in nature. Therefore, methodologies adopted for the implementation of IT systems are executed with the conjecture that change will be accepted by people without or with little resistance. Whereas, one of the vital principles of change management process is maximum empowerment of the people [users], involved in the process of change; which is accomplished through participation in the improvement process, identifying problem, finding solutions and involvement in decision-making process (adapted from [**24**]. Therefore, an all-encompassing framework for organizational transformation with an effective top down structure for the change management process is crucial to transform the users' opinion into a coherent steering force**.**

2) User Confidence

Asking users what they believe is required for system success, and providing them the missing links facilitates the [IT] system acceptance by the users. Users must be informed about the change process from the outset, to plug in their domain knowledge and increase their confidence on the system.Similarly, it is suggested that change managers should divert substantial efforts and resources [dedicated helpers] to address the skeptical users of the system as health care [IT] systems are interlinked and performance success is scaled with the slowest 'user group' in the chain. For example findings from the case study reveals that variant efforts were required to train different type of users depending on the attributes of age, attitude and their [IT] awareness level.Therefore, skeptical users and those with lesser interest in the system should be closely monitored and supported, right from the outset of the implementation process.

3)Misreading Staff [user] Anxiety

Users spend their business time, efforts and resources for the new [IT] system and pass through a pressure of learning and understanding this [IT] system; if their efforts and contributions are not timely appreciated then users get frustrated, lose interest in the system and momentum of implementation process breaks down.Breakdowns in the change process occur due to the perceived discrepancies between the ongoing process of organizational change and pre-conceived change managers' mental models of the rollout process. Managers typically counter such breakdowns & gaps by re-engineering the organizational processes & guiding people, so they conform to their conceived model of change.It was observed that users are apprehensive of the new [IT] system, have fear of [unknown] implementation process and need acknowledgement and support from change managers.

4) Adverse Patient-Doctor Relationship

Transformation from manual system to new [IT] system is always taxing as stakeholders are passing through a shakeout period. Findings suggest that increased transformation times; distract users' attention and looses support for the system. Therefore, the implementation process should be made easy and simple by creating shorter milestones for users to have frequent achievements to celebrate.

Due to interlinked medical processes, the[IT] system cannot be fully and successfully functional until all users in the chain of healthcare processesutilize the system at the same pace and frequency. The findings reveal that initial phase of the [IT] system may disturb the clinician-patient relationship. This can have multiple reasons, like system failure, lack of knowledge for thenew [IT] system or may be low threshold for the acceptance of change.Therefore, it is strongly suggested that change managers must include this factor in their support plan to proactivelymonitor and provide assistance to the users in such scenarios.

D. Strength of NewIT System

Efforts must be focused on designing and developing a system that is responsive to people's needs. System's features must encompass by re-engineering all existing organizational processes and contribute in efficiency of existent methods in terms of time and efforts. As literature also establish that seventy percent of the systems either fail or do not provide end-user satisfaction(Anderson 2000).Findings from the study suggest that both functional and non-functional factors contribute to health care IT systems' success. However, there can be two main success factors (rich system features & sufficient system backup) which can contribute to smooth implementation and acceptance of the system; and two negative factors (weak system performance & unfriendly GUI design) which can adversely affect acceptance of the system and impede the rollout process.

1) Application Features and System Backup

The study reveals that the strength and efficiency of the new [IT] system affects users' interest and further acceptance of the new [IT] system.Moreover, sufficient application features accommodating user requirements and enhancing work efficiency would increase the users' comfort level and acceptance.

The type and strength ofIT infrastructurehas vital effect on acceptance of new [IT] system by its key users.Therefore, it is suggested from the case study that IT infrastructure design must be enabled with suitable backup data and network arrangements with efficient data extracting techniques for wider

acceptance by users. Conversely, users lose interest in system due to frequent system breakdowns and slow output of [IT] application.

2) GUI Design and System Performance

New GUI screens and the changed format of user interface also add to the user problems and eventually cause delays in accepting the [IT] system by the users [medical staff]. The study suggests that the Graphical User Interface (GUI) of the new system should also be designed similar to already existing [manual] formats so as to keep the users in their comfort zone.

Low end servers with similar specs of edge switches and user end client hardware can never produce an optimum and efficient outcome even with extremely efficient software applications. It was observed that due to delayed processing of system queries users lose their confidence on the system; and [IT] system loses its credibility.

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