

Managing Change: A Model for Organisational Readiness to Adopt Pharmacy Information Systems

(Mengurus Perubahan: Model Kesediaan Organisasi terhadap Penerapan Sistem Maklumat Farmasi)

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ABSTRACT

Although research in organisational readiness is growing, there are still gaps in the context of adopting pharmacy information systems. Evaluating factors that affect organisational readiness to adopt pharmacy information systems might help the health sector to be more successful and avoid negative impacts or losses due to its failure. This paper discussed a proposed model for organisational readiness to adopt pharmacy information systems and factors that affect organisational readiness. A qualitative case study was conducted using interviews, document analysis and observations. This study identified four main categories of factors that influence the organisational readiness to adopt information systems, such as (1) change valence that contributes towards improving the commitment to change, (2) organisational ability that contributes to change efficacy, (3) contextual factors and (4) implementation methods that affect both, commitment to change and efficacy. The study's findings supported and extended the theory of organisational readiness for change and expanded its use in the context of adopting pharmacy information systems. This study also provides the basis for evaluating organisational readiness on a wider domain such as adopting information systems.

Keywords: Change management; organisational readiness; information systems; pharmacy information systems; evaluation

ABSTRAK

Meskipun kajian bidang kesediaan organisasi semakin berkembang, masih terdapat jurang dalam konteks penerapan sistem maklumat farmasi. Penilaian faktor yang mempengaruhi kesediaan organisasi terhadap penerapan sistem maklumat farmasi dapat membantu sektor kesihatan untuk meningkatkan kejayaan serta mengelak implikasi negatif dan kerugian akibat kegagalannya. Kertas ini membincangkan cadangan model kesediaan organisasi terhadap penerapan sistem maklumat farmasi serta faktor yang mempengaruhi kesediaan organisasi. Kajian kes kualitatif dilaksanakan melalui temu bual, analisis dokumen dan pemerhatian. Empat kategori utama faktor yang mempengaruhi kesediaan organisasi terhadap penerapan sistem maklumat dikenal pasti: (1) valens perubahan yang menyumbang kepada peningkatan komitmen perubahan, (2) keupayaan organisasi menyumbang kepada keberkesanan perubahan, (3) faktor kontekstual dan (4) kaedah pelaksanaan yang memberi kesan kepada komitmen dan keberkesanan perubahan. Hasil kajian ini menyokong dan mengembangkan teori kesediaan organisasi untuk perubahan dan meluaskan penggunaannya dalam konteks penerapan sistem maklumat farmasi. Kajian ini juga menyediakan asas kepada penilaian kesediaan organisasi terhadap penerapan sistem maklumat dalam domain yang lebih luas.

Kata kunci: Pengurusan perubahan; kesediaan organisasi; sistem maklumat; sistem maklumat farmasi; penilaian

INTRODUCTION

Emerging technology plays an important role in the healthcare sector. The application of information systems (IS) in healthcare that encompasses various activities leads to a healthcare system that is highly dependent on health information systems (HIS). Complex HIS implementation increases the risk of failure, which inadvertently affects cost and delivery of healthcare, including the quality of care. Change management leading to HIS adoption can guide the management of organisational readiness and subsequently increase the system's success.

Although studies in organisational readiness are increasing (Shea et al. 2014; Yusif et al. 2017), their evaluation aspects are difficult to measure and incomprehensive. Complex systems require extremely thorough assessment methods and high skills to enhance its effectiveness (Andargoli et al. 2017). Established evaluation tools and models are limited, even for common constructs (Yusif et al. 2017). In the pharmacy information systems (PIS) context, limited knowledge on relevant factors results in the lack of emphasis on the organisational aspect and subsequently, a low level of organisational readiness in adopting PIS. Low levels of organisational

readiness can increase the risk of IS failure. Therefore, this paper discussed an evaluation study on organisational readiness to adopt a PIS.

THEORETICAL BACKGROUND

ORGANISATIONAL READINESS IN THE ADOPTION OF INFORMATION SYSTEMS

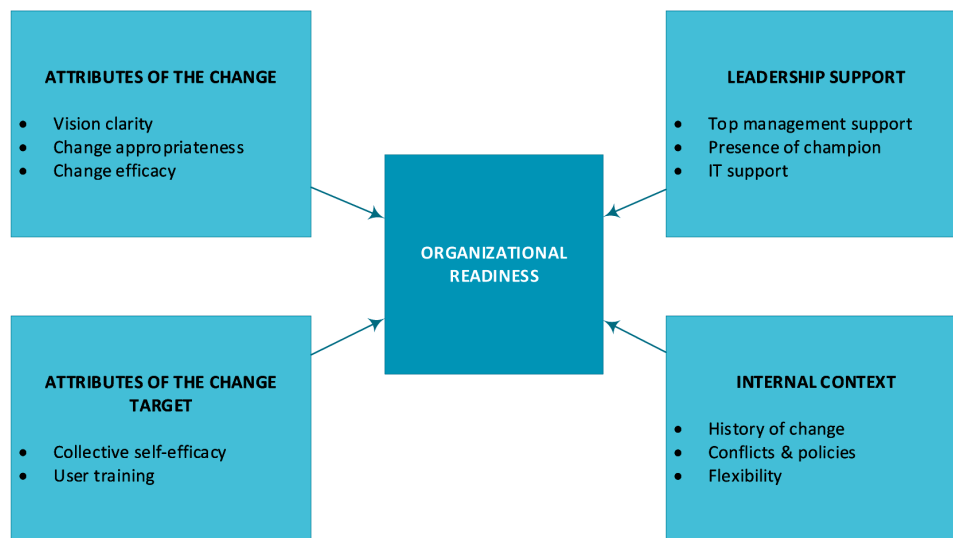
Most definitions on organisational readiness are related to psychological and human behaviour aspects. According to Shea et al. (2014), organisational readiness is a state where organisational members are mentally and physically ready to implement changes. In general, organisational readiness to adopt IS can be defined as the commitment and organisational ability regarding thoughts and actions associated with the adoption of IS in organisations. The implementation of IS requires detailed and continuous planning in change management to ensure the successful accomplishment of the system's objective (Li et al. 2012; Zheng et al. 2009). Organisational factors and a complex IS implementation process results in unpredictable project outcomes (Wyatt 2003) and frequent failure in adopting planned changes (Timings et al. 2016). Problems in organizations especially involving complex processes can prevent positive changes and need to be addressed continuously (Billsten et al. 2018). This explains why many studies focus on the organisational readiness aspect during the formative evaluation of IS, which is to facilitate planning and determining targets from the early stages (Wyatt 2003).

Preliminary knowledge from the evaluation of organisational readiness provides an opportunity for the organisation to plan properly, particularly in change management activities (Khoja et al. 2007; Li et al. 2012). Evaluation of organisational readiness is recommended at the inception of HIS planning (Li et al. 2012) to enable the organisation to take corrective and preventive measures to facilitate IS implementation successfully and avoid unrealistic target setting and inappropriate implementation strategies (Zheng et al. 2009). IS implementation generally involved high investment in terms of cost, time, and manpower. However, benefits are only realised after the system is widely adopted; hence, IS adoption is crucial and needs to be prioritised (Coerderoy et al. 2014; Oliveira et al. 2011). IS adoption is defined as a decision and action taken to fully accept and use IS (Michel-Verkerke & Spil 2013).

Organisational Readiness Construct A number of methods can be used to determine the organisational readiness construct, which could be generally classified according to two approaches, namely psychological and structural (Shahrasbi & Paré 2014), as featured in Table 1. The psychology approach views organisational readiness from the psychological and behavioural aspects (Jennett et al. 2003; Shea, Jacobs et al. 2014; Weiner 2009). According to this approach, organisational readiness is achieved through commitment by organisational members and their views on organisational capability to implement HIS. Other factors, known as contextual factors, provide an indirect effect on readiness through organisational commitment and capability to change. Structural approach

TABLE 1. Components related to organisational readiness based on the evaluation by psychological and structural approaches

Approach	Measure	Study examples
Psychological readiness	Organisational members' commitment Perception on organisational capability	Oostendorp et al. 2015; Shea et al. 2014; Weiner 2009
Structural readiness	Change requirement readiness Involvement readiness Technological readiness Social readiness social Basic readiness Involvement readiness Structural readiness Unreadiness Change attributes Leader support Organisational context Change target attributes Adapting capability Effective communication Individual commitment Support towards change Organisational culture and policy Leadership	Coleman & Coleman 2013; Sun & Qu 2014 Jennett et al. 2003 Paré et al. 2011; Yusof & Aziz 2015 Pfortmiller et al. 2011 Zheng et al. 2009



Source: Yusof & Aziz (2015)

FIGURE 1. Framework of Organizational Readiness in IS adoption

emphasises more on contextual factors that influence organisational readiness by looking at it from the fit of change with other components that can be generally classified as human, organisational and technological (Paré et al. 2011; Yusof & Aziz 2015; Zheng et al. 2009).

ORGANISATIONAL READINESS FRAMEWORK AND MODEL

Organisational readiness frameworks proposed by Paré et al. (2011) and Yusof and Aziz (2015) consist of a number of parameters that were classified into four categories, namely change attributes, leadership support, internal context and attributes of the change target that focuses on factors related to IS implementation, individuals and

organisations (Figure 1). The role of factors that were evaluated based on a number of readiness parameters related to IS implementation differed according to the implementation phase and they were specific to IS and organisation type. Moreover, dependency on time results in the challenge to apply models that monitor the level of readiness to accept the change process. This results in the challenge to apply the models in a general evaluation study on organisational readiness to implement IS.

Lippit Model Zheng et al. (2009) adapted the Lippit Model (Figure 3) when evaluating organisational readiness to implement IS. Zheng suggested that organisations

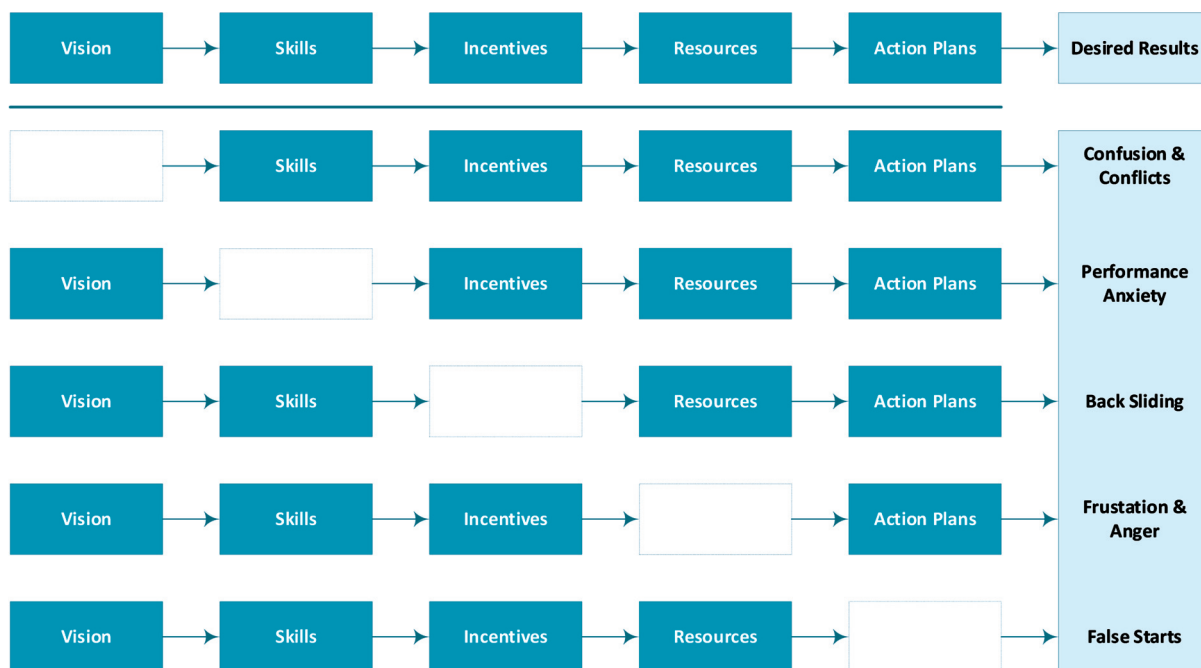


FIGURE 2. Lippit Model (Zheng et al. 2009)

should possess five aspects to ensure the successful implementation of IS, namely vision, skills, incentives, resources, and action plans. Weaknesses in any of these aspects would result in numerous problems such as confusion, worry, resistance, frustration and mistakes in the early stages. Adaptation of the Lippit model for evaluating the level of organisational readiness enables early identification and mitigation of potential problems that could occur during and at the post implementation phases.

THEORY RELATED TO ORGANISATIONAL READINESS

Activity Theory Coleman & Coleman (2013) and Sun & Qu (2014) applied *Activity Theory* (Figure 3) to evaluate organisational readiness levels towards changes in IS implementation. Activity Theory views IS implementation from a wider perspective by involving other components, such as individuals, organisations, technology and implementation of change. The wider coverage enables a more holistic evaluation at both, individual and social levels. Social evaluation examines the impact from

multiple aspects of implementing changes. However, evaluation measures of this model are not clear.

The organisational readiness theory for change (Weiner 2009) defines organisational readiness as a common psychological condition among organisational members who are committed to implement changes and optimistic about the organisation’s capability to implement changes (Figure 4). Commitment towards change is defined as a mutual determination by various organisational parties to implement change. This commitment is influenced by the extent to which organisational members appreciate the desired changes. This mutual appreciation, known as change valence, is the main determinant of the commitment to change.

The effectiveness of change is defined as the organisational members’ view on the organisation’s capability to successfully implement changes (Armenakis & Harris 2009; Weiner 2009). The effectiveness of change is determined by the organisational members’ assessment of the balance between three determinant factors, namely

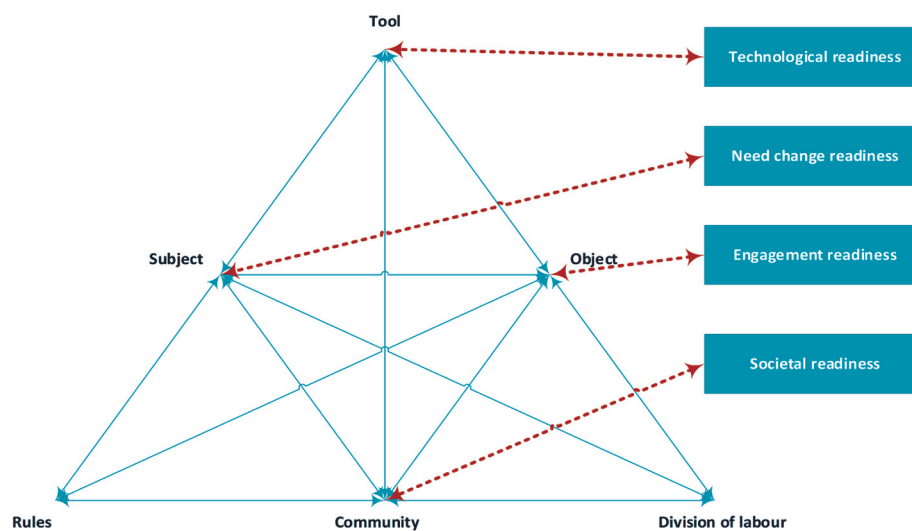


FIGURE 3. Constructs for evaluation of e-Health Readiness based on Activity Theory (Coleman & Coleman 2013)

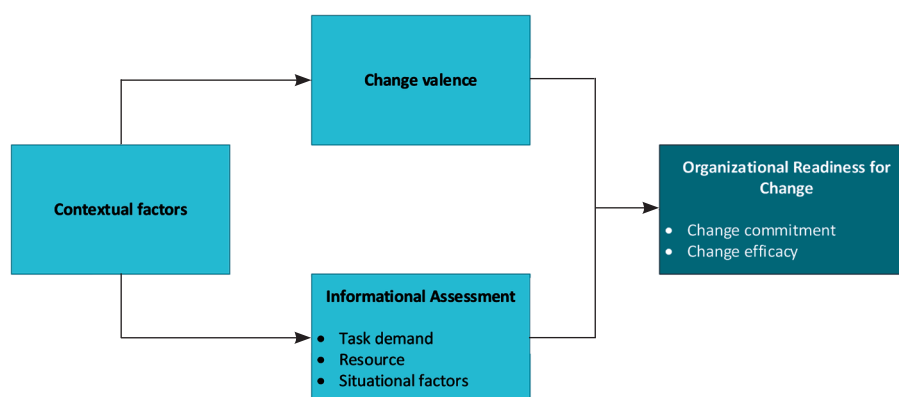


FIGURE 4. Theory of organizational readiness for change (Weiner 2009)

task demands when implementing change, availability of resources, and the current situation or environment such as duration of change implementation (Weiner 2009). A positive evaluation of these three factors could increase confidence among organisational members on implementing successful change that could subsequently increase the effectiveness of change.

CONCEPTUAL MODEL

A comparison between the conceptual models are summarised in Table 2. Several important components were also involved in organisational readiness towards change, such as purpose of change, appropriateness of change, change valence or appreciation towards changes, leadership roles and organisational context.

Purpose of change refers to an organisational belief towards the need to change based on the gap between the weaknesses in the current situation and achievable potentials through planned changes (Armenakis & Harris 2009). Information related to the purpose of change disseminated through effective communication could increase organisational readiness to accept and implement changes (Evans et al. 2014; Jennett et al. 2003).

Appropriateness of change is defined as the perceived appropriateness of planned changes to overcome identified organisational gaps or problems (Armenakis & Harris 2009). The belief in the appropriateness of change for overcoming identified problems could increase readiness and commitment among organisational members to implement changes (Paré et al. 2011).

TABLE 2. Previous studies on organisational readiness components

	Organisational readiness theory for change (Oostendorp et al. 2015; Shea, Jacobs et al. 2014; Weiner 2009)	Organisational readiness framework (Paré et al. 2011; Yusof & Aziz 2015)	Activity theory (Coleman & Coleman 2013; Sun & Qu 2014)	Lippit Model (Zheng et al. 2009)
Change valence	Change valence		Social readiness Involvement readiness	
Purpose of change		Vision clarity	Readiness for change purpose	Vision
Appropriateness of Change		Appropriateness of Change		System appropriateness
Leadership role	Leadership & social role	Leadership support Champion role		Effective leadership
Change capability	Change capability	Change effectiveness Collective self-effectiveness	Technology readiness	Resource & skill
Task demand	Task requirement	IT support		Action plan incentive
Contextual factor	Contextual factor	Internal context Change history Conflict Flexibility		Culture and policy

Change valence refers to appreciation of organisational members based on perceived benefits of changes from an organisational or individual perspective (Armenakis & Harris 2009). According to Holt et al. (2007), organisational and individual valence are among the most influential factors of change readiness. Weiner (2009) argued that appreciation culminates due to the positive view on the purpose and appropriateness of change as well as social influence, particularly from the top management level. Change valence is arguably the main determinant of commitment to change.

Leadership role is an important aspect that influences organisational factors and increases organisational capability to implement complex changes, including HIS (Zheng et al. 2009). Support and commitment from top management and change agents are needed to ensure sufficient resource allocations as well as providing infrastructure required for attaining successful implementation of change (Armenakis & Harris 2009; Paré et al. 2011).

This study's proposed model was developed based on the theory of organisational readiness for change (Figure 5). Organisational readiness was assessed based on two

core components, namely commitment to change and effectiveness of change. Commitment to change is defined as the organisation's determination to adopt IS, which is reflected through the way of thinking, while effectiveness of change refers to the organisation's capability to adopt IS effectively, reflected through capability from a structural aspect. This is strongly related to organisational readiness, which is defined as the commitment and organisational capability to change mentally and physically.

Commitment to change is determined by change valence; i.e. organisational appreciation towards the adoption of IS. In this study's model, change valence was influenced by four factors, namely purpose of change (Armenakis & Harris 2009), appropriateness of change (Armenakis & Harris 2009; Paré et al. 2011; Yusof & Aziz 2015; Zheng et al. 2009), organisational members

acceptance (Michel-Verkerke & Spil 2013) and leadership role (Armenakis & Harris 2009; Paré et al. 2011; Weiner 2009; Zheng et al. 2009). Effectiveness of change is determined by organisational capability, including team size and sufficient resources, task demand (using available resources) and environmental factors such as duration (Armenakis & Harris 2009; Oostendorp et al. 2015; Paré et al. 2011; Yusof & Aziz 2015).

According to Timmings et al. (2016), contextual factors can have either a positive or negative effect on the implementation of change. These factors affect organisational readiness through its effect on the commitment to change and effectiveness components. Examples include policy, culture, flexibility, past experience. and organisational structure.

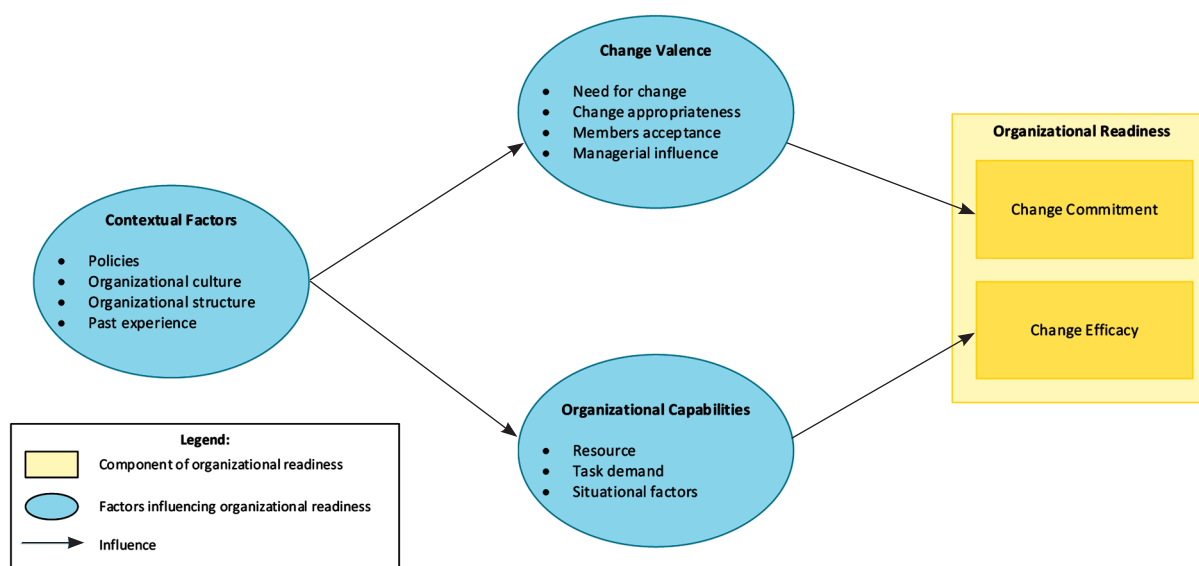


FIGURE 5. The initial model of organizational readiness to adopt IS

METHODS

This qualitative case study employed a purposive sampling to evaluate PIS in a Pharmacy Service Department (PSD) at a Malaysian hospital. Data were collected over two months from March to May 2016 using interviews, direct observations and document analysis. Semi structured, face-to-face and one-on-one interviews involving nine informants lasted approximately one hour per session. Informants were involved in PIS implementation and selected from multiple categories (Table 3). Three of the informants were owners of system modules and responsible for designing system requirements, two informants were system users and the rest were project management team members and technical committee members. The interview's agenda was sent to the informants prior to the interview session for their reference. Interviews were recorded and transcribed. Interview transcriptions were given to the informants for verification purposes. Data

were analysed and reflected upon each interview session and used as input to modify the interview agenda for the next session.

Documents were chosen from six project files related to PIS involving 323 documents dated over 28 months from November 2013 to March 2016. Only 74 documents consisting of 472 pages were examined based on their relevancy to the study's objectives from socio-technical aspects. For example, inter-organisational communication among vendors, staff, stakeholders and committee appointments. *Semi-participatory observations* were also conducted on related events such as meetings and daily work practices. Data were maintained in a comprehensive database involving field notes, interview transcripts, and audio recordings.

Data were analysed manually using the instructed content analysis technique. Field notes were examined by identifying the main elements that were reduced, and marked using the open coding technique (Burnard et al.

TABLE 3. List of informants

Informant (N = 9)	Position	Work Experience (year)	Role
Informant 1	Pharmacy officer	8	Module owner
Informant 2	Pharmacy officer	9	Module owner
Informant 3	Pharmacy officer	10	User
Informant 4	IT officer	15	Project management team
Informant 5	Pharmacy officer	11	User
Informant 6	Pharmacy officer	8	Module owner
Informant 7	Pharmacy officer	7	Project management team
Informant 8	Pharmacy officer	15	Project technical committee
Informant 9	Pharmacy officer	30	Project technical committee

Notes: Module owner: prepare the requirements for module specification;
 User: Appointed module user
 Project Management team: appointed project management team;
 Project technical committee: Appointed members from relevant section representatives.

2008). These elements were categorised based on the identified codes. Uncategorized data were reanalysed to determine whether they needed to be categorised under a new code or as a sub-category under the existing code. This category was further refined by comparing it with overlapping or similar codes.

The study’s credibility was ensured by triangulating data from multiple informants and other modes of data collection. Trustworthiness was further increased by building rapport with the organisation and informants, emphasising information transparency given by informant, careful data examination and verification. Informants had participated voluntarily and disclosed information to build trust and were afforded flexibility during the interview to ensure valid informant opinions were excluded from external bias.

RESULTS

PSD implemented activities in three pharmacy units, namely enforcement, practice and development, as well as policy and management. PSD was also responsible for coordinating activities at external organisations under different administrations, which included nationwide state PSDs, health office, hospitals, and public clinics. This resulted in a complex organisational structure. The PIS consisted of five main modules that included activities implemented in two of the three pharmacy units. Part of the modules were redeveloped from the existing systems. PSD also had a history of failure in previous IS projects. The Forensic Lab module involved a number of activities, including delivery, handling, monitoring, endorsement of analysis certificates, and sample reports of lab analysis related to intelligence and operation activities in the Pharmacy Enforcement Unit. The licensing module involved processing activities for monitoring, issuing licenses, and permits handled by national pharmacy enforcement branches. The checking module involved

checking activities on premises that distribute, sell, process, and consume drugs, products, and controlled substances. The module also interacted with the licensing module, where information from the checking process are needed for approving licenses and permits in the licensing module. The Drug List Module involved activities that managed the drug list such as adding, cancelling, and drug reclassification. The Drug Pricing module activities were handled by the Drug Price Unit. The Practice and Development unit consists of several main sub-modules such as pricing, drug price evaluation, cost pricing, insurance, and fees. This study identified twelve factors that influenced organisational readiness to adopt IS. They were classified into four categories, namely change valence, organisational capability, contextual factors and implementation method.

CHANGE VALENCE

The purpose for change is motivated by the need to improve work processes that are facing problems such as inefficiency, high workload and the need to improve work quality and productivity. Inefficient processes in the sample screening of the forensic lab resulted in increased workload, whilst complex and inefficient drug classification and drug price checking resulted in waste of time, manpower, and resources. Long turnaround time for drug license processing, integrity improvement through error reduction during analysis in the forensic lab and drug pricing data as well as technology advancement, lends pressure on PSD to increase work quality and productivity.

Appropriateness of change is viewed from a task-PIS fit perspective in terms of task clarity, standardization and modification flexibility that aligns with the system and facilitates transformation from current to new methods during PIS adoption. According to Informant 4, designing a proper process through a standard operating procedure (SOP) and process reengineering eases the integration of the

process with PIS. Informant 1 argued that a flexible policy enables a more significant improvement and optimization of the process through PIS implementation.

Acceptance of PIS adoption depends on the PSD members' views on potential benefits compared to challenges in adopting the system. PIS benefits were evaluated based on its impact on the organisation and clients. Perceived PIS potential for improving work performance and easing the work process influences PSD members to highly appreciate the system and "trigger the commitment to successfully implement PIS" (Informant 4). "A structured process eases its implementation" (Informant 3), while a flexible online process "enables prompt action on critical cases" (Informant 5).

Informant 2 believed that PIS facilitated clients when applying for drug licence through faster, easier and user-friendly service. In addition, benefits were forthcoming from improved integrity and productivity (that included license processing and speedy generation of drug price report), as well as error or risk reduction when analysing forensic lab samples. Perceived challenges based on gaps in knowledge, skill, and communication among suppliers, system development teams and users also influenced system acceptance. Active user involvement in PIS development requires users to "understand wider work processes beyond routine tasks" (Informant 6), in addition to difficulties in documenting user requirement specification due to communication gaps when interacting with the system's vendor.

Social influence from leaders and peers also affects PSD's commitment to PIS adoption. According to Informant 4, leadership support through enforcement and advocating PIS use, allocating resources, and making decisions when handling issues increased organisational commitment and acceptance of PIS. Experienced co-workers act as reference sources (during discussions between user and vendor); they also skilfully deliver information that was easily understood by the user. Moreover, members involved in pre-implementation activities had also indirectly assisted in promoting the system, which included disseminating the current status of system implementation. Peer influence also resulted in a negative impact, where "negative individual perception had negatively affected other individuals" (Informant 6) and this "could lead to system abandonment should there be a failure in correcting the perception" (Informant 4). This situation led to leadership intervention to increase system acceptance.

ORGANISATIONAL CAPABILITIES

Resource availability in terms of human, infrastructure, knowledge and skills affects the PSD's capability to adopt PIS. The number of project management team members was inadequate for fulfilling task demands, which resulted in the failure to play a more efficient role in pre-implementation activities, including "failure to

guide and commit appropriate actions for handling all issues" (Informant 3). Providing appropriate infrastructure and technology enabled "ease of system access and subsequently increased PIS use" (Informant 2). Knowledge and skills in the work process allowed PSD to generate detailed user requirement specifications whilst IS related knowledge enhanced PSD capabilities when handling problems. Knowledgeable and skilful individuals were seen as critical assets for PIS implementation, while continuous training could "facilitate system use and increase system acceptance" (Informant 1).

Task demand, coupled with routine tasks during PIS development, increased staff workload and subsequently limited the staff's active involvement in pre-implementation activities. Furthermore, short system development duration also increased daily workload. Informant 6 felt that extremely short training duration resulted in difficulties to develop the system properly.

Contextual factors. "PIS was implemented according to existing policy" (Informant 5) to ensure it complied with current policy. However, Informant 2 argued that a more flexible policy could improve work process and produce more significant output through better methods. Moreover, according to Informant 8, new policy enforcement, such as mandatory IS use, also increased PSD readiness to adopt PIS.

Work culture. The use of technology during routine work at the Forensic Laboratory Unit increased user acceptance as well as reduced the negative perception on PIS adoption. Complex organisational structure in PSD and external organisations resulted in a communication gap as well as an unclear instruction mechanism that affected information dissemination, such as the system's objective that resulted in misunderstandings and affected user appreciation of PIS.

Past experience enabled PSD to plan and manage change in a proper manner. Experience in applying technology helped to increase staff members' buy-in. Past experience was used as a benchmark - PIS failure to compete with the positive aspects of previous systems raised doubts about vendor credibility. PIS users viewed system development as more challenging due to the big difference in PIS users' role compared to previous project developments. Past failures in system implementation resulted in negative views on PIS's potential to succeed as well as pressure on PSD, causing the organisation to strictly adhere to the implementation schedule, which subsequently hindered detailed specifications of users' requirements that could affect PIS acceptance.

IMPLEMENTATION METHOD

Members' active involvement at the outset of the system allowed users to familiarise themselves and subsequently

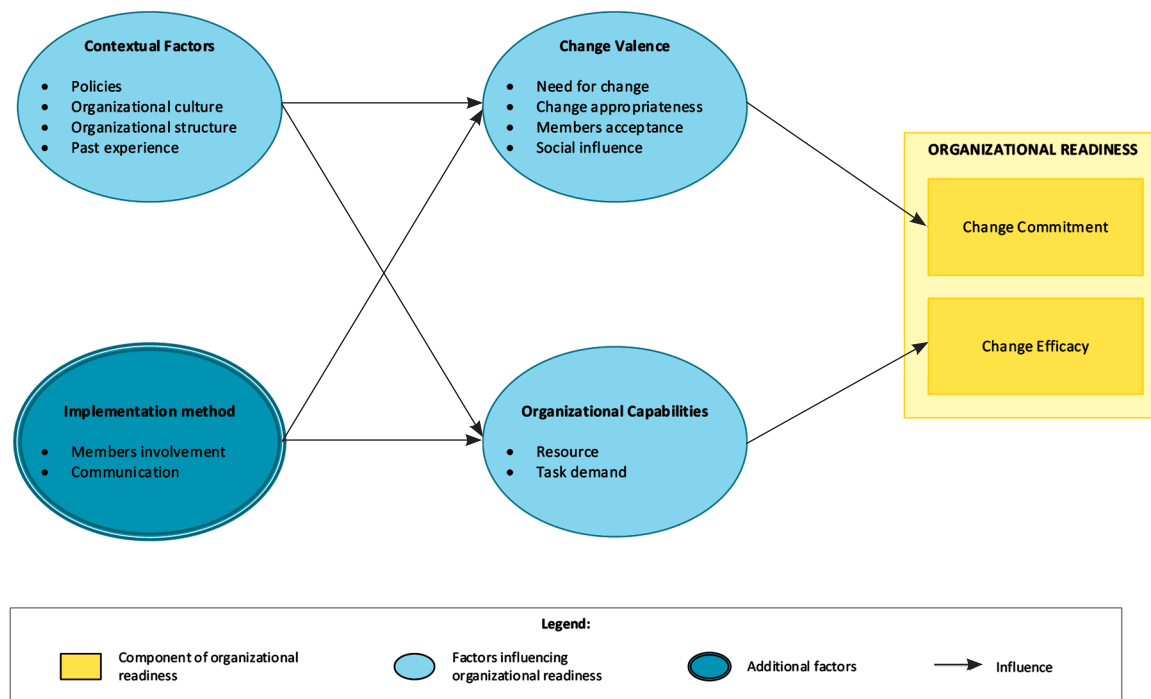


FIGURE 6. Refined proposed model for organizational readiness to adopt IS

increase PIS acceptance. Continuous communication during members’ active involvement could also “increase members’ confidence in a successful system” (Informant 1) that positively affects PSD’s commitment. Increased workload and difficulties faced by involved members during implementation activities could, however, negatively affect user appreciation. Failure to involve members adequately hampered early identification of incomplete process requirement. This resulted in major changes to the work process that caused disappointment among the members involved.

Employing inefficient communication methods during the implementation of PIS hindered both, vendor and user, from understanding the users’ requirements and express complete and clear requirements, respectively. This subsequently resulted in inaccurate development of the system’s functions. The consequences of poor information dissemination methods include misunderstanding, confusion, missing and inaccurate information that contributed to the failure to involve all relevant stakeholders when discussing problematic modules.

DEVELOPMENT OF PROPOSED MODEL

The refined model was updated according to three aspects, as illustrated in Figure 6. First, the leadership role in change valence was replaced with social influence to include peer influence, where knowledge sharing, experience and the members’ perception influenced appreciation of IS. Second, the environmental factor in organisational capability was removed since it was included in contextual factors and implementation method. Third, the members’ involvement factor and

communication efficacy were added in the implementation method component. Members’ active involvement and effective communication method enabled messages related to the adoption of the system to be disseminated clearly and enhance change valence and commitment, in addition to increasing organisational capability through increased manpower and effectiveness of work implementation through effective communication.

DISCUSSION

Most adoption factors for PIS are generic in nature and relevant to all types of IS. The factors include system usefulness, fulfilment of user requirements, training, service provider quality, empathy, security assurance, technical support, responsiveness, system use: duration and user experience, user satisfaction of specific functions, decision making and communication (Yusof et al. 2008a; Yusof 2015; Nordin & Deros 2017). However, a number of PIS adoption factors are very specific to the pharmacy domain in terms of unit structure, process, and standards. These factors are related to: 1) pharmacy process such as process flow (Nanji et al. 2009); 2) pharmacy unit: structure, culture, pharmacy unit routine (Andersen 2002); required workflow adaptation (Nanji et al. 2009); 3), specific function of medication management process, links to medication related information, monitoring and patient education (El Mahalli 2016); 4), technical requirement and information to support plan, standards, policy and law for medication (Isfahani 2013); data input mechanism and report format in accordance to international medication standards (Azizi 2011).

This study identified four main factor categories that influenced organisational readiness to IS: 1) change valence that contributes to increased commitment to change; 2) organisational capability that attributed to effectiveness of change; 3) contextual factors and 4) the implementation method that affects commitment and effectiveness of change. All factors need to be considered to ensure a high level of organisational readiness to adopt IS and subsequently IS success. Change valence can be increased by focusing on requirements and appropriateness of change such as clear dissemination of vision and objective for system implementation (Paré et al. 2011; Yusof & Aziz 2015) as well as training activities and demonstration during awareness promotion campaigns concerning IS implementation (Jennett et al. 2003). The effectiveness of the strategy was observed from the PIS's capability to improve work processes in terms of timesaving and smooth implementation, increased productivity through reduced errors and flexibility of online access. This perceived trust has increased commitment among organisational members and subsequently increased organisational readiness to adopt IS (Paré et al. 2011).

Work process-system fit was also identified and supported by Bhattacharjee and Hikmet (2007), who found that organisational members only appreciate IS benefits if the system fits the current work process. This study observed that acceptance of PIS adoption could be increased through the members' active involvement, training, support from a more experienced party, and possessing experience in technology use. According to Culler et al. (2009) and Evans et al. (2014), members' involvement during the pre-implementation phase could increase acceptance by organisational members as well as reduce the risk of resistance towards IS adoption. This is because organisational members can familiarise themselves with the system through active engagement during the implementation process. Organisational members can give opinions on any potential issue that can be mitigated earlier. This enables them to understand decision making and appreciate efforts contributed during the implementation and subsequently increase the desire and commitment to ensure successful PIS adoption.

Effective training can increase organisational members' skills in using IS to complete their task. This facilitates organisational members during the transition process, which from the current work process to using PIS, and indirectly reduce resistance risk, such as the reluctance to change old working methods. This study also identified social influence by leaders and peers on organisational commitment when adopting PIS. Being the most important social factor (Coeurderoy et al. 2014), leaders play an important role in advocating IS use, allocating manpower and time, making decisions regarding potential issues to ensure sufficient resource allocation (Armenakis & Harris 2009; Paré et al. 2011) and accelerate the adoption (Bawack & Kamdjoug 2018) as well as motivating organisational members to adopt IS (Coeurderoy et al. 2014).

The influence of more experienced peers in increasing acceptance among organisational members (Coeurderoy et al. 2014; Culler et al. 2009; Yusof 2015) was observed during promotional activities and voluntary dissemination of PIS related information. These influential members also played an effective role as mediators during training sessions and discussions between users and vendors. The role was informal and voluntary as no individual was officially appointed or assigned as a champion.

This study also identified peer influence on the negative perception of other individuals. The negative perception stemmed from resistance towards change that was triggered by the current working system and scepticism about potential PIS adoption (Hammar et al. 2015; Hartzema et al. 2007). The leader's role in enforcing system use that involves implementation of the system and training, can overcome this problem (Culler et al. 2009; Evans et al. 2014).

The organisation's capability to implement changes determines the effectiveness of change, where a high level of change effectiveness allows the organisation to be prepared physically for adopting IS. Organisational capability is determined based on the balance between the availability of resources and task demands when adopting IS (Weiner 2009). In order to increase organisational capability, leaders should play their role in allocating sufficient resources to support task demand (Cresswell et al. 2013; Nordin 2012; Yusof 2015). In addition, comprehensive planning of the job scope and implementation schedule also affects organisational capability.

Contextual factors such as policy, work culture, organisational structure and past experience varies across organisations. Although these factors influence commitment and effectiveness of change, these factors are difficult to change. Nevertheless, knowledge and awareness of these factors are crucial when preparing the organisation to take precautions in controlling the risk of negative effects culminating from these factors. Therefore, the organisation needs to focus on increasing change valence and organisational capability, as well as appropriate implementation methods that include members' involvement and effective communication.

PSD readiness to adopt PIS is implemented in two phases: pre- and post implementation. For the pre-implementation level, PSD commitment to change was very high, where members were committed to implementing the system. Despite low levels of manpower of the project management team, the project was still managed properly. According to Chaudoir et al. (2013), the IS implementation method also affects the implementation of technology in the healthcare system, including various resistance and risks as well as the duration of the implementation. Member's involvement and communication effectiveness also influences organisational readiness to adopt PIS. Although this study excluded these factors in the proposed model, these factors were discussed in a number of studies that associated the effects of implementation methods on commitment to change and effectiveness of change.

Organisational members' involvement in activities involved in system implementation influenced organisational readiness to adopt IS. According to Armenakis and Harris (2009), members' active involvement in the planning and decision-making processes could increase appreciation and the effectiveness of IS adoption. In addition to providing manpower for increasing organisational capability, early involvement of organisational members at the pre-implementation phase enabled users to familiarise themselves with the system and subsequently encourage acceptance of the system. This is because the active involvement of members allows them to receive the system's benefits as well as limitations that influence the acceptance of the system (Jennett et al. 2003). Ongoing communication during active involvement also increases the members' confidence in forging success that positively affects organisational commitment (Coleman & Coleman 2013). However, the involvement of organisational members could also yield negative effects in terms of heavy workload and challenges when implementing the system that could lead to system resistance.

An effective communication method is crucial for ensuring the successful adoption of IS. Coeurderoy et al. (2014) recommended early communication efforts, particularly regarding the benefits of the system in order to ease IS adoption. Activities related to PIS in this study, including promotion and awareness campaigns, were not emphasised by the management team. Ineffective communication, particularly related to objectives and the potential to adopt the system, resulted in low commitment among organisational members (Evans et al. 2014).

An ineffective communication method involving users, vendors and project management could affect information dissemination. Organisations should employ effective communication methods to increase the potential of a successful adoption of PIS (Shahrabi & Paré 2014; Yusof et al. 2008b). PSD emphasises less on activities related to message dissemination related to the requirement and appropriateness of change at the organisational level. Active member involvement at the pre-implementation level enabled message dissemination and communication, yielding a high appreciation for PIS among involved members. Available resources, including staff and technology infrastructure, were adequate for supporting the requirements for PIS adoption. However, limited manpower in the project management team affected pre PIS implementation activities. In order to increase the readiness level for PIS adoption, PSD needs to promote the system by disseminating information about the system and conduct practical training by involving a larger user group. Identifying champions and building a support group to become change agents could also increase organisational commitment through social influence. High member involvement, an effective communication method and medium, as well as frequent information dissemination could enhance members' understanding of the system's potential benefits and subsequently increase organisational readiness and commitment to adopt PIS.

The post-implementation level was more critical, whereby the failure of PSD to emphasize the dissemination of information related to the system, training, and wider campaigning efforts beyond users involved in the pre-implementation phase could affect organisational commitment to adopt PIS. Even with sufficient resources, poor commitment to change resulting from lack of system acceptance reflects a low level of organisational readiness, which subsequently leads to the abandonment of PIS and ultimately, its failure.

CONCLUSION

Organisational readiness to adopt IS is determined by the commitment to change, (the extent of the organisation's commitment) and the effectiveness of change – (the extent to which the organisation is able to adopt IS effectively). This study identified 12 factors that influenced organisational readiness to adopt PIS. The factors were classified into four categories, namely (1) change valence that contributes to increased commitment to change, (2) organisational capability that contributes to effective change, (3) contextual factors, and (4) implementation methods that influence commitment to change and effective change.

This study contributed by supporting and expanding the theory for organisational readiness for change through the identification of specific factors for each component besides the proposed additional components for implementation methods that include members' involvement and effective communication. The identified factors proposed model could also be used as a guide to enhance organisational readiness as well as a basis for developing an evaluation for any IS type.

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REFERENCES

- Andargoli, A.E., Scheepers, H., Rajendran, D. & Sohal, A. 2017. Health information systems evaluation frameworks: A systematic review. *International Journal of Medical Informatics* 97: 195-209.
- Andersen, S.E. 2002 Implementing a new drug record system: A qualitative study of difficulties perceived by physicians and nurses. *Quality Safety in Health Care* 11: 19-24.
- Armenakis, A.A. & Harris, S.G. 2009. Reflections: Our journey in organizational change research and practice. *Journal of Change Management* 9(2): 127-142.
- Azizi, A. 2011. A study of medical record in teaching hospitals affiliated to Iran, Tehran and Shahid Beheshti Universities based on standards of the American Physicians College. *Simorgh* 17(7): 323-29.

- Bawack, R. E. & Kala Kamdjoug, J.R. 2018. Adequacy of UTAUT in clinician adoption of health information systems in developing countries: The case of Cameroon. *International Journal of Medical Informatics* 109: 15-22.
- Bhattacharjee, A. & Hikmet, N. 2007. Physicians' resistance toward healthcare information technology: A theoretical model and empirical test. *European Journal of Information Systems* 16(6): 725-737. doi:10.1057/palgrave.ejis.3000717
- Billsten, J., Fridell, M., Holmberg, R. & Ivarsson, A. 2018. Organizational Readiness for Change (ORC) test used in the implementation of assessment instruments and treatment methods in a Swedish National study. *Journal of Substance Abuse Treatment* 84: 9-16. doi:10.1016/j.jsat.2017.10.004
- Burnard, P., Gill, P., Stewart, K., Treasure, E. & Chadwick, B. 2008. Analysing and presenting qualitative data. *Br Dent J* 204(8): 429-432. doi:10.1038/sj.bdj.2008.292
- Coeurderoy, R. B., Guilmot, N. & Vas, A. 2014. Explaining factors affecting technological change adoption: A survival analysis of an information system implementation. *Management Decision* 52(6): 1082-1100. doi:10.1108/MD-10-2013-0540
- Coleman, A. & Coleman, M.F. 2013. Activity theory framework: A basis for E-Health readiness assessment in health institutions. *Journal of Communication* 4(2): 95-100.
- El Mahalli, A., El-Khafif, S.H. & Yamani, W. 2016. Assessment of pharmacy information system performance in three hospitals in Eastern Province, Saudi Arabia. *Perspective in Healthcare Information Management* 13(Winter): 1b.
- Evans, W.K., Ashbury, F.D., Hogue, G. L., Smith, A. & Pun, J. 2014. Implementing a regional oncology information system: Approach and lessons learned. *Current Oncology (Toronto, Ont.)* 21(5): 224-33. doi:10.3747/co.21.1923
- Holt, D.T., Armenakis, A.A., Feild, H.S. & Harris, S.G. 2007. Readiness for organizational change: The systematic development of a scale. *The Journal of Applied Behavioral Science* 43(2): 232-255. doi:10.1177/0021886306295295
- Isfahani, S.S., Mirzaeian, R. & Habibi, M. 2013. Assessment of pharmacy information system performance in selected hospitals in Isfahan City During 2011. *Jundishapur Journal of Pharmaceutical Products* 8(1): 3-9.
- Jennett, P., Jackson, A., Healy, T., Ho, K., Kazanjian, A., Woollard, R., Haydt, S. & Bates, J. 2003. A study of a rural community's readiness for telehealth. *Journal of Telemedicine and Telecare* 9(5): 259-263. doi:10.1258/135763303769211265
- Khoja, S., Scott, R.E., Casebeer, A.L., Mohsin, M., Ishaq, A.F.M. & Gilani, S. 2007. e-Health Readiness assessment tools for healthcare institutions in developing countries. *Telemedicine and e-Health* 13(4): 425-432. doi:10.1089/tmj.2006.0064
- Li, J., Ray, P., Seale, H. & MacIntyre, R. 2012. An E-Health readiness assessment framework for public health services-Pandemic perspective. *2012 45th Hawaii International Conference on System Sciences* 2800-2809. doi:10.1109/HICSS.2012.95
- Michel-Verkerke, M.B. & Spil, T.A.M. 2013. The use IT-adoption-model to predict and evaluate adoption of information and communication technology in healthcare. *Methods of information in medicine* 52(6): 475-483. doi:10.3414/ME12-01-0107
- Nanji, K.C., Cina, J., Patel, N., Churchill, W., Gandhi, T.K. & Poon, E.G. 2009. Overcoming barriers to the implementation of a pharmacy bar code scanning system for medication dispensing: A case study. *Journal of the American Medical Informatics Association* 16(5): 645-650.
- Nordin, N., Md Deros, B., Wahab, D.A. & Mohd, M.N. 2012. A framework for organisational change management in lean manufacturing implementation. *International Journal of Services and Operations Management* 12(1): 101-117.
- Nordin, N. & Deros, B.M. 2017. Organisational change framework for lean manufacturing implementation. *International Journal of Supply Chain Management* 6(3): 309-320.
- Oliveira, T., Martins, M.F. & Lisboa, U.N.De. 2011. Literature review of information technology adoption models at firm level. *Electronic Journal of Information Systems Evaluation* 14(1): 110-121.
- Oostendorp, L.J., Durand, M.-A., Lloyd, A. & Elwyn, G. 2015. Measuring organisational readiness for patient engagement (MORE): An international online Delphi consensus study. *BMC Health Services Research* 15: 1-13. doi:10.1186/s12913-015-0717-3
- Paré, G., Sicotte, C., Poba-Nzaou, P. & Balouzakis, G. 2011. Clinicians' perceptions of organizational readiness for change in the context of clinical information system projects: Insights from two cross-sectional surveys. *Implementation Science* 6(1): 15. doi:10.1186/1748-5908-6-15
- Pfortmiller, D.T., Mustain, J.M., Lowry, L.W. & Wilhoit, K.W. 2011. Preparing for organizational change. *CIN: Computers, Informatics, Nursing* 29(4): 230-236. doi:10.1097/NCN.0b013e3181f9dc8b
- Shahrasbi, N. & Paré, G. 2014. Rethinking the concept of organizational readiness: What can IS researchers learn from the change management field? *20th Americas Conference on Information Systems, AMCIS 2014*, 1-16.
- Shea, C.M., Jacobs, S.R., Esserman, D.A., Bruce, K. & Weiner, B.J. 2014. Organizational readiness for implementing change: A psychometric assessment of a new measure. *Implementation Science: IS* 9(1): 7. doi:10.1186/1748-5908-9-7
- Shea, C.M., Reiter, K.L., Weaver, M.A., McIntyre, M., Mose, J., Thornhill, J., Malone, R. & Weiner, B.J. 2014. Stage 1 of the meaningful use incentive program for electronic health records: A study of readiness for change in ambulatory practice settings in one integrated delivery system. *BMC Medical Informatics and Decision Making* 14(1): 119. doi:10.1186/s12911-014-0119-1
- Sun, J. & Qu, Z. 2014. Understanding health information technology adoption: A synthesis of literature from an activity perspective. *Information Systems Frontiers* 17(5): 1177-1190. doi:10.1007/s10796-014-9497-2
- Timmings, C., Khan, S., Moore, J.E., Marquez, C., Pyka, K. & Straus, S.E. 2016. Ready, set, change! Development and usability testing of an online readiness for change decision support tool for healthcare organizations. *BMC medical informatics and decision making* 16(1): 24. doi:10.1186/s12911-016-0262-y
- Weiner, B.J. 2009. A theory of organizational readiness for change. *Implementation Science* 4(1): 67. doi:10.1186/1748-5908-4-67
- Wyatt, J. 2003. When and how to evaluate health information systems? *International Journal of Medical Informatics* 69(2-3): 251-259. doi:10.1016/S1386-5056(02)00108-9

- Yusif, S., Hafeez-Baig, A. & Soar, J. 2017. e-Health readiness assessment factors and measuring tool: A systematic review. *International Journal of Medical Informatics* 107: 56-64.
- Yusof, M.M., Papazeripoulo, A., Paul, R.J. & Stergioulas, L. 2008a. Investigating evaluation framework for Health Information Systems. *International Journal of Medical Informatics* 77(6): 377-385.
- Yusof, M.M., Kuljis, J., Papazeripoulou, A. & Stergioulas, L. 2008b. An evaluation framework for Health Information Systems: Incorporating human, organizational and technology-fit factors (HOT-fit). *International Journal of Medical Informatics* 77(6): 386-398.
- Yusof, M.M. & Aziz, K.A. 2015. Evaluation of organizational readiness in information systems adoption : A case study. *Asia-Pacific Journal of Information Technology and Multimedia* 4(2): 69-86.
- Yusof, M.M. 2015. A case study evaluation of a Critical Care Information System adoption using the socio-technical and fit approach. *International Journal of Medical Informatics* 84(7): 486-499.
- Zheng, K., McGrath, D., Hamilton, A., Tanner, C., White, M. & Pohl, J.M. 2009. Assessing organisational readiness for adopting an electronic health record systems: A case study in ambulatory practices. *Journal of Decision Systems. Special Issue: Organisational Self-Assessment For IT Innovation Adoption* 18(1): 117-140. doi:10.3166/jds.18.117-140

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