Testing the Links from Fit to Effective Use to Impact: A Digital Hospital Case

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Short Paper

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Abstract

The global health sector is undergoing rapid digital transformation. Because such transformations often fail to meet expectations, researchers have begun studying the full chain from implementation to outcomes to learn what improvements are needed. Recent studies suggest that it is especially important to learn what 'effective use' of new systems involve, because effective use is the lynchpin between a system and its benefits. A key challenge, however, is operationalizing effective use. In this paper, we compare two approaches: theory-driven, operationalizing effective use using the 'theory of effective use', and context-driven, operationalizing it in terms of the workarounds users devise to achieve their goals. We compare these approaches using survey data from a multi-hospital digital transformation. The results support the theory-driven approach, while offering useful insights on workarounds.

Keywords: Effective use, workarounds, fit, health information systems, survey

Introduction

Healthcare is rapidly transforming with governments worldwide incentivizing the use of health information systems (Eden et al. 2019a). While these systems offer many benefits, unintended and negative outcomes often occur (Zheng et al. 2016). Such outcomes have led researchers to seek better insights into the IT-to-outcome chain. One accepted way to do so is to focus on the *fit* of a technology and its *use* (Devaraj and Kohli 2003; Goodhue and Thompson 1995). However, recent studies stress that 'use' is not enough; the use must be *effective* (Eden et al. 2018b; Shachak et al. 2019).

The challenge is learning what effective use involves and how to achieve it. Healthcare studies have begun examining this through: 1) inductive case studies (Burton-Jones and Volkoff 2017; Savoli et al. 2019); and 2) statistical analysis of electronic medical record data associated with the US Government's 'Meaningful Use' regulations (Lin et al. 2019). To complement such work, we report our attempt, as part of a mixed-methods study, to use a survey approach to understand the links from fit to effective use to outcomes.

Effective use refers to "using a system in a way that helps attain the goals of using the system" (Burton-Jones and Grange 2013, p. 633). Thus, measuring it requires operationalizing "*a way that helps attain the goals*." How can this "way" be identified? We compare two approaches: theory-driven and context-driven.

The theory-driven approach involves operationalizing effective use via the dimensions in the 'theory of effective use' (Burton-Jones and Grange 2013). Thus, a theory-driven approach involves testing if these dimensions apply to users of electronic medical records (EMRs). Conversely, the context-driven approach operationalizes effective use based on users' perspectives of what constitutes effective use in their given context. From a context-driven view, effective use of EMRs can be operationalized as 'workarounds'. While the concept of workarounds may seem counterintuitive to effective use, both center on the use of a system to attain a goal. Considering workarounds as a form of effective use fits Alter's (2014) definition of a workaround as a "goal-driven adaptation …to overcome, bypass or minimize the impact of obstacles …perceived as preventing a desired level of efficiency, effectiveness or other organizational or personal goals". The one commonality amongst diverse professional cohorts in healthcare organizations is that effective work is the delivery of high quality patient care. As such, workarounds are considered a normal part of clinical work (Halbesleben et al. 2008).

Comparing these approaches is helpful for both research and practice. For research, this provides a good opportunity to test the usefulness of the 'theory of effective use' (Burton-Jones and Grange 2013) vis-à-vis workarounds. Although widely-cited, this theory has not been tested in great detail. For practice, it will be helpful for health service leaders to know how to measure how effectively their EMRs are used. Surveys offer a complement to in-depth case studies and objective system logs but to our knowledge, there are no validated survey measures of effective use for the healthcare/EMR context.

Definitions and Hypotheses

In this section, we define our constructs and specify their relationships. We defined effective use above and proposed two operationalizations: 1) theory-driven effective use; and 2) context-driven workarounds.

Based on the 'theory of effective use', effective use consists of three dimensions: 1) *Transparent interaction*: "The extent to which a user is accessing the system's representations unimpeded by its surface and physical structures;" 2) *Representational fidelity*: "The extent to which a user is obtaining representations from the system that faithfully reflect the domain being represented[1];" and 3) *Informed action*: "The extent to which a user acts upon the faithful representations he or she obtains from the system to improve his or her state" (Burton-Jones and Grange 2013, p. 642). These dimensions stem from representation theory (Burton-Jones and Grange 2013), which asserts that any information system consists of three structures (Wand and Weber 1995, pp. 205-206):

- Physical: "Manifests the nature and form of the technology used to implement the system", such as workstations-on-wheels, printers, and wireless devices.
- Surface: "Manifests the way the system appears to its users", such as the user interfaces through which individuals read or enter data and navigate the system.
- Deep: "Manifests the meaning of the real world system the information system is intended to model", such as the representation of the patient journey through the healthcare system, and the functionality required to support the patient journey.

In contrast, the context-driven perspective relies on users identifying what effective use involves for them, locally, to achieve their goal. This was informed by our qualitative work (Eden et al. 2018a; Eden et al. 2019b) of which this study is a part, in which users told us how they worked around their EMR to provide good care. This is not unexpected because "health IT itself can undermine the central mission of the clinician: serving patients" (Koppel et al. 2015, p. 219) and workarounds can be "clever methods for getting done what the system does not let you do easily" (Halbesleben et al. 2008, p. 3).

In investigating the IT-to-outcome chain, we also examine the constructs of fit, individual benefits, and net benefits. *Fit* is the degree of alignment between a system and the organization in terms of role fit (roles of the hospital as embedded in the system), control fit (controls of the hospital as embedded in the system) and cultural fit (the hospital's culture as embedded in the system) (Strong and Volkoff 2010). *Individual benefits* is "the extent to which the IS has influenced the capabilities and effectiveness, …of key users" (Gable et al. 2008, p. 389). In the context of EMRs, we view *net benefits* as an individual's

[1] We extend representational fidelity to include the fidelity of representations an individual *inputs* into a system and a system *outputs* to the individual.

perception of how the IS contributes overall (Petter et al. 2008) including to patients, staff, and the hospital. While fit and net benefits can be conceived at the organizational level, we examine them at the individual level recognizing that systems are constituted in use (Orlikowski 2000) and therefore multiple perspectives of how the system fits and benefits the hospital exist at the individual level.

To study fit, we drew on Strong and Volkoff's (2010, p. 750) model of fit, specifically: role fit, control fit, and culture fit, which "emerge from the way a set of deep, surface, and physical structures are designed". While the effects of these misfits on effective use has not been studied in detail, initial research suggests a link. For instance, while Weeger et al. (2013) did not measure effective use itself, their work suggests misfits in roles, controls, and culture impair effective use in hospital clinics. Likewise, Van den Hooff and Hafkamp (2017) found when role misfits are present, nurses work around their EMR. The underlying mechanisms for both links are similar. That is, when users see their systems fit their work, they should be more *able* and more *motivated* to engage effectively with system structures. Therefore, we hypothesize:

- H1: The perception of fit positively influences effective use
- H2: The perception of fit is inversely related to workarounds

Systems must be used effectively (Burton-Jones and Grange 2013), for benefits to be obtained. Given effective use is defined in terms of achieving desired goals (Burton-Jones and Grange 2013), it is self-evident to propose a positive link from effective use to outcomes. Proposing a positive link from effective use to *individual benefits* follows the theory of effective use. While that theory did not speak to net benefits, subsequent work has shown how effective use (defined similarly) can offer benefits at multiple levels (Burton-Jones and Volkoff 2017; Eden et al. 2018a; Raymond et al. 2015). Hence, we hypothesize:

- H3: Effective use is positively related to individual benefits
- H4: Effective use is positively related to net benefits

Workarounds in healthcare reflect the standard way to overcome task constraints (Koppel et al. 2015). As such, they should improve individual outcomes, such as efficiency (Flanagan et al. 2013). Hence, we hypothesize that workarounds positively influence individual benefits[2]. The downside is workarounds can negatively impact others (Eden et al. 2018a). For instance, clinicians copy-and-paste notes without updating to improve their efficiency but this can cause inaccuracies and make it difficult for others to find information, impeding future care (Flanagan et al. 2013). Zheng et al. (2016) similarly found workarounds minimize impediments for the focal user but lead to unintended harms to patients. Thus, we hypothesize:

- H5: Workarounds is positively related to individual benefits
- H6: Workarounds is inversely related to net benefits

Methods

We undertook a field study (Edmondson and McManus 2007) of the digital transformation of hospitals in an Australian state. The transformation was underpinned by a new EMR integrated with computerized provider order entry, ePrescribing, and clinical decision support, referred to as the *ieMR* (integrated electronic medical record). The ieMR enabled the entire patient journey to be supported, recorded, and accessible at all the State's hospitals. We collected data from five hospitals that have, in total, over 300,000 emergency admissions, 200,000 inpatient and 750,000 outpatient appointments annually.

Due to the intermediate state of effective use research, we collected qualitative and quantitative data (per Edmondson and McManus 2007). The qualitative data (Eden et al. 2018a; Eden et al. 2019b) indicated both theory-driven and context-driven perspective of effective use are prevalent in the hospitals. The interview data also identified the importance of fit for how the ieMR was used. The qualitative findings informed the design of the quantitative data collection, which is the focus of this paper.

For the quantitative study, we developed a survey instrument (Appendix 1). Both fit and effective use are multidimensional, whereas the other constructs are unidimensional. Multidimensional constructs can be

[2] A negative reciprocal link may exist, as users may engage in more workarounds if a system hinders their outcomes. If the positive and negative relationships are equally strong, we may see no apparent effect.

latent (higher order construct results in variation to its dimensions) or aggregate (the dimensions precede and form the higher order construct) (Barki et al. 2007). Following the theory of effective use, effective use is an aggregate construct formed by its dimensions, each of which are reflectively measured. Thus, it is a first order reflective – second order formative construct (Wright et al. 2012). Fit is a first order reflective – second order reflective construct, as its dimensions – role, control, and culture fit[3] - emerge from latent structures (Strong and Volkoff 2010) and are distinct, interdependent, and covarying (Wright et al. 2012). Following Strong and Volkoff (2010), we measured fit in terms of misfit, i.e., items were negatively framed and reversed prior to analysis. We took steps to improve measurement validity, e.g., adapting items from prior literature where possible, drawing on our qualitative data (MacKenzie et al. 2011), and obtaining feedback from our participants (Haynes et al. 1995). All items were measured on a 7-point Likert Scale.

The survey was distributed in the shakedown phase of the ieMR's lifecycle (Markus and Tanis 2000) to all staff at the hospitals who use the ieMR: doctors, nurses, allied health professionals, administrative, and executives. Both physical and electronic surveys were distributed and a small monetary incentive was offered to each hospital's research foundation to maximize participation (VanGeest et al. 2007).

Results

We used IBM SPSS (v. 25) to prepare the data for analysis. Where possible, missing data was replaced using expectation-maximisation imputation (Little and Rubin 1989). We used listwise deletion when cases had more than 50% missing data (per Hair 2006). Table 1 provides the sample statistics.

Table 1. Sample Descriptive Statistics*

	Hospital A	Hospital B	Hospital C	Hospital D	Hospital E	Total
N	130	277	135	97	314	953
Gender**						
•Female (n)	114; 87.7%	244; 88.1%	116; 85.9%	76; 78.4%	254; 81.2%	804; 84.4%
•Male (n)	16; 12.3%	33; 11.9%	19; 14.1%	19; 19.6%	59, 18.8%	146; 15.3%
Avg. Age (years)	35 - 44	35 - 44	45 – 54	35 - 44	35 - 44	35 – 44
Avg. Experience (years)	5 - 9	5 - 9	5 – 9	5 - 9	3 - 4	5 – 9
Profession:**						
•Admin (n)	26; 20.0%	27; 9.7%	15; 11.1%	7; 7.2%	61; 19.4%	136; 14.3%
•Allied Health (n)	9; 6.9%	32; 11.6%	20; 14.8%	18; 18.6%	49; 15.6%	128; 13.4%
•Doctors (n)	14; 10.8%	20; 7.2%	12; 8.9%	10; 10.3%	61; 19.5%	117; 12.3%
•Nurses (n)	75; 57.7%	174; 62.8%	80; 59.3%	54; 55.7%	122; 38.9%	505; 53%
•Other (n)	4; 3.1%	23; 8.3%	7; 5.2%	7; 7.2%	17; 5.4%	58; 6.1%

*Due to missing data, the sum of demographics does not always equate to the total participants.

**The high proportion of females and nurses is expected as 75% of the workforce is comprised of females and more than 45% of the staff are nurses and 13% are doctors.

To assess the hypotheses, we performed structural equation modeling using mPlus (v. 8.2). First, we performed confirmatory factor analysis to assess the structure of reflectively measured constructs (both first order and second order). As effective use is second-order formative, it was excluded from the factor analysis as the dimensions are not expected to covary (Wright et al. 2012)[4]. The measurement model

[3] While Strong and Volkoff (2010) identified six types of misfit, we only include role fit, cultural fit, and control fit in our analysis due to their much greater salience during our qualitative data collection.

[4] Consistent with Barki et al. (2007), it was examined in the structural equation model using a multiple indicators, multiple causes (MIMIC) approach (Diamantopoulos and Winklhofer 2001).

displayed reasonable fit (CFI = 0.961; TLI: 0.951; RMSEA: 0.051; SRMR: 0.034[5]), all items loaded on their respective constructs and measurement validity established, i.e., indicator reliability (standardized outer weights > 0.70), internal consistency (composite reliability of each construct > 0.70), convergent validity (average variance extracted > 0.50), and discriminant validity (Fornell and Larcker (1981) criterion analysis). See Appendix 2 for correlation matrix.

We next tested the structural model. The results (Figure 1) demonstrated reasonable fit. Absolute and incremental fit indices met required threshold[5] (CFI = 0.967; TLI: 0.963; RMSEA: 0.049; SRMR: 0.035). A MIMIC approach was used to model effective use, regressed on four dimensions, with a global indicator, and two outcome variables. All dimensions of effective use were significant. Overall, the results support H1-H4 verifying the usefulness of the theory-driven perspective. The results for the context-driven perspective of workarounds were meagre and mixed. There was no apparent effects of workarounds on individual benefits (refuting H5) and only a small effect of workarounds on net benefits (H6).

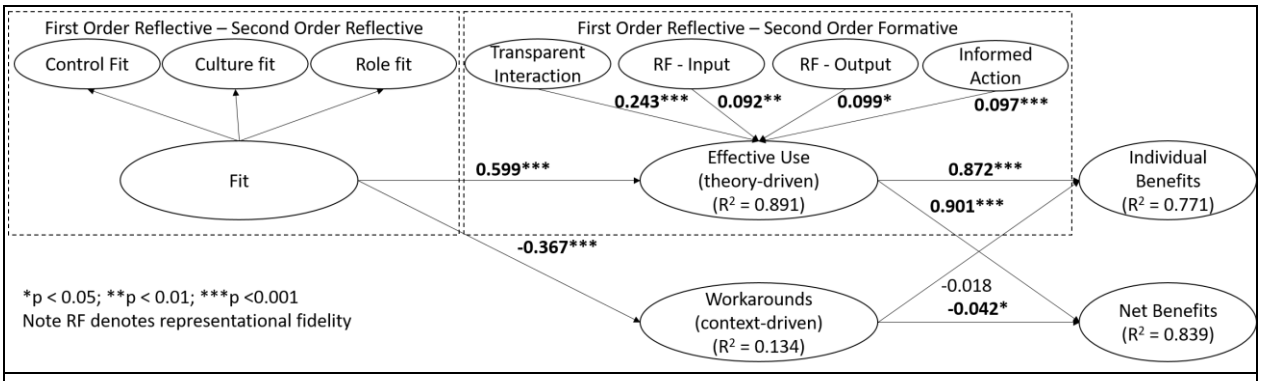

Figure 1. Results of Model Testing

We conducted two further tests to explore the results (results not shown to conserve space). First, we decomposed fit and effective use into their dimensions to test if dimension-level relationships were present. We found control fit and culture fit were the most influential: control fit the most influential on transparent interaction and culture fit the most influential on informed action and workarounds.

Second, we tested for mediation and moderation. Specifically, we examined if fit affected impacts *directly* in addition to, or instead of, affecting benefits through the *mediator* of effective use. We found fit did have a direct effect on both individual and net benefits in addition to an indirect effect through effective use, but it did not have an indirect effect through workarounds. Finally, we conducted a moderated mediation test (Preacher et al. 2007) to examine the possibility that fit might play a dual role with workarounds – triggering them (mediated effect) and affecting their usefulness (i.e., they are more useful when fit is low). We found that the moderation effect was indeed significant, lending support to this dual effect of fit.

Discussion

This research explored the links between fit, two views on effective use (theory and context-driven), and perceptions of benefits. We obtained three main findings with implications for research and practice.

First, the results highlight the value of achieving fit between a hospital and its EMR system because when greater fit is attained, the dimensions of effective use specified in the theory of effective use increase and workarounds decrease. Fit also appears to play multiple roles: improving outcomes directly, improving them indirectly (through effective use as a mediator), and by affecting the usefulness of workarounds. Overall, our results support Strong and Volkoff's (2010) theory of fit for the EMR context.

Second, we found the theory-driven perspective of effective use had a strong relationship with both individual and net benefits. Of the effective use dimensions, transparent interaction was the most salient

[5] While the χ^2 test of model fit indicates poor measurement model fit (χ^2 = 2030.458, DF: 590, p <0.000) and structural model fit (χ^2 = 1652.941, DF: 503, p <0.000), this is expected give n the large sample size (Hair 2006). All other fit statistics were in an appropriate range.

(β=0.243, p <0.001). From a research perspective, the salience of transparent interaction may, in part, be due to the survey occurring in the shakedown phase when staff are learning how to navigate the system (Markus and Tanis 2000). Researchers will need to test effective use over time to see if dimensions have different impacts at different times. In the meantime, the practical implication is that health services will get a bigger return on their training in the shakedown phase if they focus on improving users' ability to interact with the system rather than focusing on deeper skills related to data and its use.

Third, the *context driven* perspective of effective use, focusing on workarounds, had no apparent relationship with individual benefits and only a very small relationship with net benefits. The meagre effects can be interpreted in several ways. One possibility is feedback loops.[6] That is, negative outcomes may trigger users to engage in workarounds to improve those outcomes, leading to no apparent effect in cross-sectional data. While this is plausible for individual benefits, it is less so for net benefits. This is because we predicted workarounds would impair net benefits. Thus, if feedback was strong, we would see a *strong* negative link between workarounds and net benefits, but the effect was weak. Thus, we offer two further possibilities that research should test. One is that workarounds might, actually, be inconsequential. This may be the case if users mainly work around constraints at the 'edges' of their work. That is, perhaps most users follow the rules when performing central tasks but vary in whether they use workarounds in ancillary tasks. If that is the case, then variation in workarounds would simply not matter very much. An alternative possibility is that the meagre effects are due to workarounds having both positive *and* negative effects that cancel each other out. For instance, users might know a workaround such as cutting-and-pasting notes helps them in some ways but hurts them in others. They may engage in it not because it is a clear solution, but because it is the only solution they see. Future research should test which of these possibilities is the case. It may even be the case that workarounds help users discover how to use an EMR better over time. For now, the implication for research is that researchers should not rely on workarounds as a good indicator of effective use; a theory-driven perspective is more reliable for now. The implication for practice is that it would be safest to leave workarounds alone (neither encouraging nor discouraging them) until these possibilities are tested.

Conclusion

In sum, we identified how a system's fit with a hospital affects how it is used, which in turn influences benefits. Given the mixed findings associated with health IT, our results can provide health services with comfort that fit, effective use, and benefits can be attained. We also provide health services with *specific* dimensions of fit and effective use they can focus on to improve outcomes. Our results suggest they cannot rely on users themselves determining what effective use involves via workarounds. Rather, our results reinforce the value of *theory* in suggesting dimensions to focus on, meanwhile revealing the need to study workarounds in more detail. Given the dimensions of fit and effective use studied here stem from representation theory, our work also affirms the usefulness of this theory for research in this area.

Appendix

Appendix 1. Measurement Scales and Reliabilities for the First-Order Reflectively-Measured Constructs

Construct[7]*	Measures**	Descriptive Statistics
Control Fit[A]	Compared to the controls that should be in place in our hospital, the controls implemented in the ieMR are a poor fit	Mean: 4.24 St. Dev: 1.53 Range: 1-7
	Compared to the controls that should be in place in our hospital, the controls implemented in the ieMR are suboptimal	

[6] Several models of use and outcomes propose feedback loops but research has yet to test such effects in detail (Delone and McLean 2003; Goodhue and Thompson 1995; Burton-Jones and Grange 2013).

[7] While not shown here, we used header text before each set of items to ensure participants understood their meaning, e.g., the header text for *Net Benefits* stated that it referred to outcomes for the organization from implementing and using the ieMR. Similar clarifications were used for each construct.

	Compared to the controls that should be in place in our hospital, the controls implemented in the ieMR are inappropriate	
Cultural Fit[A]	The ieMR does not fit the values and norms of our hospital.	Mean: 4.66 St. Dev:1.48 Range: 1-7
	The ieMR clashes with our hospital's culture.	
	The ieMR does not fit the way our hospital does things.	
Role Fit[A]	The roles in the ieMR are inconsistent with our current roles.	Mean: 4.08 St. Dev: 1.44 Range: 1-7
	The job scope of staff in the ieMR does not fit our actual job scope.	
	The design of the ieMR does not support our roles.	
Transparent Interaction[B]	When using the ieMR, the physical structures (e.g. hardware, devices) and presentation structures (e.g. screens, menus, forms) allow me to record and obtain data with ease.	Mean: 4.00 St. Dev: 1.75 Range:1-7
	When using the ieMR, I can easily enter and access what I need without being impeded by the physical structures (e.g. hardware, devices) and presentation structures (e.g. screens, menus, forms).	
	When using the ieMR, I can interact seamlessly with the data I need, without being constrained by the physical structures (e.g. hardware, devices) and presentation structures (e.g. screens, menus, forms).	
RF Input[B]	When using the ieMR, I **record** accurate data into the system	Mean: 5.31 St. Dev:1.30 Range:1-7
	When using the ieMR, I **record** timely data into the system	
	When using the ieMR, I **record** complete data into the system	
RF Output[B]	When using the ieMR, the data I **obtain** from the system is accurate	Mean: 4.88 St. Dev: 1.39 Range: 1-7
	When using the ieMR, the data I **obtain** from the system is timely	
	When using the ieMR, the data I **obtain** from the system is complete	
Informed Action[B]	When I obtain data from the ieMR, I look for the relevant pieces that I can act upon to improve my work	Mean: 5.30 St. Dev: 1.14 Range:1-7
	When I obtain data from the ieMR, I seek ways to leverage good pieces of information for my job.	
	When I obtain data from the ieMR, I use key parts of it to identify problems, find solutions and/or take corrective action in my work.	
Workarounds[C]	When I use the ieMR, I do what I think will help patients, even if that means working around parts of the system that I have been instructed to use.	Mean: 3.92 St. Dev:1.61 Range:1-7
	When I use the ieMR, I do what I believe is in the patient's best interests, even if that means completely ignoring some aspects of the system that I have been instructed to use.	
	I often overlook some parts of the ieMR that I have been instructed to use, so that the assistance provided to the patients can be more efficient.	
Individual benefits[D]	The ieMR enhances my effectiveness in my job.	Mean: 3.91 St. Dev:1.81 Range:1-7
	The ieMR increases my productivity.	
	The ieMR increases the reliability/safety of my actions.	
Net Benefits[D]	The ieMR benefits patient care/safety.	Mean: 4.57 St. Dev:1.75 Range:1-7
	The ieMR benefits efficiency of care.	
	The ieMR benefits staff like me.	
	The ieMR benefits the [Hospital name]	
*Measures adapted from: A: concepts in interview data and Strong and Volkoff (2010) (scales reversed); B: Burton-Jones and Grange (2013); C: interview data; D: Gable et al. (2008). **All items had an indicator reliability greater than 0.70. All constructs demonstrated composite reliability greater than 0.80, and AVE of greater than 0.80.		

Appendix 2. Correlation Matrix*												
	RFit	CFit	CuFit	Fit	WA	IB	NB	TI	RFI	RFO	IA	EU
RFit	1.000											
CFit	0.696	1.000										
CuFit	0.680	0.748	1.000									
Fit	0.795	0.875	0.855	1.000								
WA	-.292	-.321	-.314	-.367	1.000							
IB	0.632	0.695	0.680	0.795	-.307	1.000						
NB	0.660	0.726	0.710	0.830	-.340	0.933	1.000					
TI	0.598	0.658	0.643	0.752	-.276	0.721	0.752	1.000				
RFI	0.422	0.465	0.454	0.531	-.195	0.547	0.570	0.503	1.000			
RFO	0.581	0.639	0.625	0.730	-.268	0.695	0.724	0.710	0.679	1.000		
IA	0.331	0.364	0.356	0.416	-.153	0.461	0.480	0.425	0.462	0.505	1.000	
EU	0.718	0.790	0.773	0.903	-.331	0.878	0.915	0.821	0.623	0.791	0.525	1.000
*RFit: Role Fit; CFit: Control Fit; CuFit: Culture Fit; WA: Workarounds; IB: Individual Benefits; NB: Net Benefits; TI: Transparent Interaction; RFI: Representational Fidelity Input; RFO: Representational Fidelity Output; IA: Informed Action; EU: Effective Use												

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References

Alter, S. 2014. "Theory of workarounds," *Communications of the AIS* (34), pp. 1041-1066.

Barki, H., Titah, R., and Boffo, C. 2007. "Information system use–related activity: An expanded behavioral conceptualization of individual-level information system use," *Information Systems Research* (18:2), pp. 173-192.

Burton-Jones, A., and Grange, C. 2013. "From use to effective use: A representation theory perspective," *Information Systems Research* (24:3), pp. 632-658.

Burton-Jones, A., and Volkoff, O. 2017. "How can we develop contextualized theories of effective use? A demonstration in the context of community-care electronic health records," *Information Systems Research* (28:3), pp. 468-489.

Devaraj, S., and Kohli, R. 2003. "Performance impacts of information technology: Is actual usage the missing link?," *Management Science* (49:3), pp. 273-289.

Diamantopoulos, A., and Winklhofer, H. M. 2001. "Index construction with formative indicators: An alternative to scale development," *Journal of Marketing Research* (38:2), pp. 269-277.

Eden, R., Akhlaghpour, S., Spee, P., Staib, A., Sullivan, C., and Burton-Jones, A. 2018a. "Unpacking the complexity of consistency: Insights from a grounded theory study of the effective use of electronic medical records," *Proceedings of the 51st Hawaii International Conference on System Sciences*.

Eden, R., Burton-Jones, A., Casey, V., and Draheim, M. 2019a. "Digital transformation requires workforce transformation," *MIS Quarterly Executive* (18:1), p. 4.

Eden, R., Burton-Jones, A., Grant, J., Collins, R., Staib, A., and Sullivan, C. 2019b. "Digitising an Australian university hospital: Qualitative analysis of staff-reported impacts," *Australian Health Review* (Forthcoming).

Eden, R., Burton-Jones, A., Scott, I., Staib, A., and Sullivan, C. 2018b. "Effects of eHealth on hospital practice: synthesis of the current literature," *Australian Health Review* (42:5), pp. 568-578.

Edmondson, A. C., and McManus, S. E. 2007. "Methodological fit in management field research," *Academy of Management Review* (32:4), pp. 1246-1264.

Flanagan, M. E., Saleem, J. J., Millitello, L. G., Russ, A. L., and Doebbeling, B. N. 2013. "Paper- and computer-based workarounds to electronic health record use at three benchmark institutions," *Journal of the American Medical Informatics Association* (20:1), pp. 59-66.

Fornell, C., and Larcker, D. F. 1981. "Structural equation models with unobservable variables and measurement error: Algebra and statistics." Los Angeles, CA: SAGE Publications.

Gable, G. G., Sedera, D., and Chan, T. 2008. "Re-conceptualizing information system success: The IS-impact measurement model," *Journal of the Association for Information Systems* (9:7), p. 18.

Goodhue, D. L., and Thompson, R. L. 1995. "Task-technology fit and individual performance," *MIS quarterly* (19:2), pp. 213-236.

Hair, J. F. 2006. *Multivariate data analysis*. Pearson Education India.

Halbesleben, J. R., Wakefield, D. S., and Wakefield, B. J. 2008. "Work-arounds in health care settings: Literature review and research agenda," *Health Care Management Review* (33:1), pp. 2-12.

Haynes, S. N., Richard, D., and Kubany, E. S. 1995. "Content validity in psychological assessment: A functional approach to concepts and methods," *Psychological Assessment* (7:3), p. 238.

Koppel, R., Smith, S. W., Blythe, J., and Kothari, V. 2015. "Workarounds to computer access in healthcare organizations: you want my password or a dead patient?," *ITCH*, pp. 215-220.

Lin, Y.-K., Lin, M., and Chen, H. 2019. "Do electronic health records affect quality of care? Evidence from the HITECH Act," *Information Systems Research* (forthcoming).

Little, R. J., and Rubin, D. B. 1989. "The analysis of social science data with missing values," *Sociological Methods & Research* (18:2-3), pp. 292-326.

MacKenzie, S. B., Podsakoff, P. M., and Podsakoff, N. P. 2011. "Construct measurement and validation procedures in MIS and behavioral research: Integrating new and existing techniques," *MIS Quarterly* (35:2), pp. 293-334.

Markus, M. L., and Tanis, C. 2000. "The enterprise systems experience-from adoption to success," *Framing the domains of IT research: Glimpsing the future through the past* (173:2000), pp. 207-173.

Orlikowski, W. J. 2000. "Using technology and constituting structures: A practice lens for studying technology in organizations," *Organization Science* (11:4), pp. 404-428.

Petter, S., DeLone, W., and McLean, E. 2008. "Measuring information systems success: models, dimensions, measures, and interrelationships," *European Journal of Information Systems* (17:3), pp. 236-263.

Preacher, K. J., Rucker, D. D., and Hayes, A. F. 2007. "Addressing moderated mediation hypotheses: Theory, methods, prescriptions," *Multivariate Behavioral Research* (42:1), pp. 185-227.

Raymond, L., Paré, G., de Guinea, A., Poba-Nzaou, P., Trudel, M., Marsan, J., and Micheneau, T. 2015. "Improving performance in medical practices through the extended use of electronic medical record systems: a survey of Canadian family physicians," *BMC Medical Informatics and Decision Making* (15:1), p. 27.

Savoli, A., Barki, H., and Pare, G. 2019. "Examining how chronically ill patients' reactions to, and effective use of, information technology can influence how well they self-manage their illness," *MIS Quarterly* (forthcoming).

Shachak, A., Randhawa, G., and Crampton, N. 2019. "Educational approaches for improving physicians' use of health information technology," *Healthcare Management Forum*: SAGE Publications.

Strong, D. M., and Volkoff, O. 2010. "Understanding organization—enterprise system fit: A path to theorizing the information technology artifact," *MIS Quarterly* (34:4), pp. 731-756.

Van den Hooff, B., and Hafkamp, L. 2017. "Dealing with dissonance: misfits between an EHR system and medical work practices," International Conference on Information Systems.

VanGeest, J. B., Johnson, T. P., and Welch, V. L. 2007. "Methodologies for improving response rates in surveys of physicians: a systematic review," *Evaluation & the Health Professions* (30:4), pp. 303-321.

Wand, Y., and Weber, R. 1995. "On the deep structure of information systems," *Information Systems Journal* (5:3), pp. 203-223.

Weeger, A., Neff, A., Gewald, H., and Haase, U. 2013. "Exploring determinants of effective use: The role of misfits between a hospital and its information system," *Multikonferenz Wirtschaftsinformatik*.

Wright, R., Campbell, D., Thatcher, J., and Roberts, N. 2012. "Operationalizing multidimensional constructs in structural equation modeling: Recommendations for IS research," *CAIS* (30:23), pp. 367-412.

Zheng, K., Abraham, J., Novak, L., Reynolds, T., and Gettinger, A. 2016. "A survey of the literature on unintended consequences associated with health information technology: 2014–2015," *Yearbook of Medical Informatics* (25:1), pp. 13-29.