Understanding Resistance towards the use of Electronic Patient Health Data in South Australian General Practice

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ABSTRACT

This paper reports the results from a survey of 131 medical practitioners in South Australian General Practice concerning adoption of a computerised system for storing and potentially amalgamating health information from several practices. Practitioners were primarily influenced by the positively perceived potential for such technology use to improve patient health and well-being outcomes and secondarily by the negatively perceived potential for unwanted change in the status, control and autonomy of their professional role. Practitioner attitude reflected how they resolved the competing influences. The data suggest that strategies for implementing such systems should address individual perceptions by increasing belief in the potential for patient improvement or by decreasing belief of the inevitability of unwanted role change.

Keywords: change management, health, strategy

This paper explores the potential adoption of data amalgamating Health Informatics (HI) technology by South Australian practitioners in general practice medicine (GPs). General Practice mostly operates in South Australia as solo practices, partnerships or incorporated bodies averaging 2.5 GPs each (AMWAC Report, 2005). Estimated to see 85 percent of healthcare consumers annually, these organisations are gatekeepers to the wider healthcare system and integral to delivering any comprehensive, coordinated and continuing healthcare strategy to the wider health system (Commonwealth of Australia, 2005; Britt, Miller, Charles, Pan, Valenti, Henderson et al., 2007). Within this scenario, HI is promoted as an emergent interdisciplinary label for the application of computers to improving the efficiency and effectiveness of healthcare management by all levels of government (Knight, Patrickson and Gurd, 2008). Yet implementing HI systems requires adoption of electronic patient records and potentially the need to reengineer traditional workflows and disrupt existing business and clinical processes (Ford, Menachemi and Phillips, 2006).

Previous to this study, Australian Governments had targeted GPs with funding initiatives to increase the use of computers in general practice medicine (AMWAC Report, 2005). Nowadays almost all practices have at least one computer, and some are seen to have designed their processes to increase the use of technologically supported systems in order to increase practice income (Powell-Davies and Fry, 2005; Rudd and Watts, 2005; Weller and Dunbar, 2005; Henderson, Britt and Miller, 2006). Nonetheless a study between 2003 and 2005 reported that some Australian GPs who had access to computers and clinical software chose not to use them, and only a third kept all patient data in an electronic format (Henderson et al., 2006). Other findings indicate HI systems that are viewed as im-
proving diagnostics, reproducing accepted models of clinical reasoning or providing immediate pa-
tient benefit have been adopted, while those aimed at improving the overall efficiency and effective-
ness of healthcare appear to be have been resisted (Bolton, Mira, Kennedy and Lahra, 1998; Arroll,
Pandit, Kerins, Tracey and Kerse, 2002; Walsh, 2004).

Understanding why people accept a particular innovation remains a challenging and complex issue, and medical practitioners have been cited as classic examples of ‘professional’ populations where understanding decisions of what innovations are adopted and when has been especially problematic (Mintzberg, 1979; Davis, Bagozzi and Warshaw, 1989; Frambach and Schillerwaett, 2002; Green-
halgh, Glenn, McFarlane, Bate and Kyriakidou, 2004).

METHOD

The purpose of this study was to test tentative hypotheses from an earlier qualitative enquiry. Draw-
ing on paradigms and the empirical studies of Markus (1983), Rogers (1995), Venkatesh, Morris, Davis and Davis (2003) and Greenhalgh et al. (2004), the study had been directed at a small sample of GPs to try and capture potential reasons why they tend to resist (or not) adoption and implementa-
tion of HI systems. Findings suggested sources of GP resistance stemmed from deeply held GP be-
liefs, feelings, anxieties and values that could be challenged by such technology adoption (Knight et
al., 2008). The importance attached to forces pushing for resistance reflected GP beliefs about their professional and organisational role and the use of technology in their workflow. Findings also sug-
gested motivation for adoption reflected GP belief in the efficacy of the technology to improve health outcomes of their patients and the wider population. The importance attached to forces pushing for GP adoption reflected the perceived relevance of the potential for improved patient outcomes. Strate-
gies aimed at increasing such technology uptake by providing financial incentives enhanced any mo-
tivation to adopt, particularly within the practice boundary. However, perception of associated change to environmental antecedents which may impact the GP’s relationship with their patient was seen as undesirably changing the GP role in the delivery of healthcare.
These data led the authors to formulate five main hypotheses about the relationships between the forces influencing GP intention. Drawing from literature and recurrent themes, propositions and hypotheses derived from the qualitative study, a ‘concern’ dictionary was developed to test these hypotheses and explore potential strategies to reduce resistance. This formed the basis for a questionnaire distributed to a representative sample of GPs, and the findings are presented in this paper. The resultant conceptual model (see Figure 1) frames the hypotheses and reflects GP resistance as the outcome of the perceived potential for changes in valued antecedents associated with their role.

Anticipated to be the most important force, to underpin resistance and to mediate the influence of other forces, change to the GP role (C₁) focused on the perceived potential for change to GP autonomy, control, status and relationship with their patient. Anticipated as a positive force for adoption when associated with the health and well-being of GP patients, technology efficacy (C₂) focused on the perceived potential for HI technology to improve outcomes for different patient populations. Role context (C₃) focused on the extent to which GP perception of their environmental antecedents (including such characteristics as the number of practice GPs and nurses and their use of clinical and billing software) influenced GP intention concerning new HI technology use. While anticipated to be a positive force for adoption, incentives (C₄) also focused on how financial incentives to improve the penetration of HI technology in general practice were seen to address the value of the GP role, data, participation in policy decision-making and patient attitudes towards GP use of such technology. Role attributes (C₅) focused on the extent to which a combination of individual and role characteristics (such as self-perceived professional, technological and innovative traits) ameliorated or exacerbated GP perceptions of other influences. Interview content had indicated, for example, that experience as a GP and hours worked per week on direct patient care were potentially influential, while literature on professionals and technology adoption studies suggested alignment with professional organisations, age and gender may be relevant to attitude (Mintzberg, 1980; Venkatesh et al., 2003).

Once the survey instrument and study approach were approved by the University of South Australia Ethics Committee pre-testing of the questionnaire was undertaken. This resulted in rewording am-
biguous questions, alternate shading to better differentiate questions and an indication of the estimated GP time commitment being added to the survey introduction. Respondents were targeted from member practices of three South Australian Divisions of General Practice. This gave a potential sample size of 650 GPs from 210 practices and resulted in a return rate of 131 usable replies (20.15%). The sample demographic profile was found to roughly reflect both the South Australian and Australian GP population (Sims and Bolton, 2005; Britt, Miller et al., 2007).

DATA ANALYSIS AND RESULTS

Data analyses used the statistical computer program SPSS (version 16) for Windows. Factor analysis was performed to reduce each construct of items to fewer factors, to make the data set more manageable and to facilitate testing a theoretical model with valid variables (Coakes and Steed, 2007). Principal Axis Factoring was chosen because the aim was to describe structure and using Squared Multiple Correlations provides more accurate estimates of initial communalities (Tabachnick and Fidell, 1996). Only factors with eigenvalues >1 were extracted and only items correlating at >0.4 with the factor were considered. The single factors extracted were transformed into new variables.

The endogenous construct (GP resistance) readily transformed to one factor where a high score indicated the intention to not adopt new HI technology. Examination of the case-wise diagnostic statistics identified 28 cases (21.9%) showed more intention to resist than take-up new HI technology. Technology Efficacy (C_2) and Incentives (C_4) were anticipated to be constructs of positive influence on adoption and also readily transformed to single factors (Technology Efficacy, F_2 and Incentives, F_4). However, constructs of influence anticipated to underpin GP resistance did not so readily transform to single factors, and items excluded narrowed their focus. For the Undesirable Role Change factor (F_1), items excluded through factor analysis suggested GPs do not consistently see the need for GP training in HI technology or the ‘classical’ view of the GP-patient relationship as barriers to adoption. For role context influence on GP intention (F_3), items excluded suggested contextual influences being consistently perceived only in terms of the range and frequency of GP consultation types. Factor analysis similarly narrowed the focus of role attributes influence on GP intention (F_5). While the con-
ceptually conservative professional traits were anticipated to be a negative and the technological and innovation traits a positive influence on GP intention, current technology use was anticipated to detract from or reinforce the net influence. However excluded items in the transformed factor indicated that the GP was not influenced by their self-perceived comparative professional and innovation traits, but rather by whether they used HI technology as much as other GPs and had a similar propensity for its use in their workflow.

Factor correlation showed all five factors to have the anticipated significant relationship with GP intention to resist. The results also suggested the relationship between role attributes with GP resistance may be fully mediated by the perceived potential for undesirable role change as hypothesised. However, the influence of GP belief in the technology efficacy and the influence of financial incentives were at best partially mediated by the perceived potential for undesirable role change, while the influence of GP’s context was not mediated at all. Also, the anticipated influences of both GPs’ context and role attributes were reversed. It is noteworthy that the correlation between GP intention to resist and technology efficacy and undesirable role change were of similar strength, casting doubt on the anticipated mediating effect of undesirable role change on all other influences. Thus factor correlations supported the hypothesised significance (albeit not always the pathway) of relationships between the original constructs of influence and GP intention to resist. However the anticipated mediation of the influence of the GPs’ role attributes on intention by the context (H$_{5b}$) and financial incentives (H$_{5c}$) was not supported. Nor was the anticipated mediation of the GP context influence on intention by the potential for undesirable role change (H$_{3a}$) supported. Yet a significant relationship between financial incentives and belief in technology efficacy had not been hypothesised.

A series of ANOVAs were carried out to examine the effect of the categorical variables on the derived factors. The $F$-values showed solo GP status, accreditation, number of practice nurses employed, experience as a GP and AMA membership all had significant relationships with GP intention to resist adoption. On the other hand, none of the categorical variables had a significant relationship
with GP context and incentives, while hours worked, gender and practice designation had no significant relationship with any of the factors or with GP intention.

Analysis to determine whether the derived factors were predictive of GP intention to resist utilised exploratory factor analysis through multiple regression. The first model with all categorical measures of attributes showed their coexistence had the effect of suppressing the previously identified significance of some of the relationships with GP intention. While not disproving the significance of the relationships per se, this highlighted they were only significant outside of the regression model. Nonetheless, this appeared to illustrate the individual and practice attributes did not have significant individual or collective direct relationships with GP intention and were more likely, singularly or together, to indicate a moderating influence(s) on the relationships of the derived factors with GP intention.

The addition of Role Context as a predictor predicted the dependent variable (GP resistance, DV) significantly better, and addition of Incentives as a predictor explained 33.3% of the variance in GP intention. This model also suggested the relationship between role context and GP intention may in some manner be mediated by the influence of Incentives, and this was tested through mediated regression (Baron and Kenny, 1986). Yet this relationship was not clearly supported by this sample. Even so, it seems conceptually reasonable that the influence of GP consultation type, range and frequency on GP intention to resist adoption was, for some GPs at least, impacted by incentive strategies that attempted to increase GP adoption of new HI technology. It is noteworthy in this model that the complete loss of significance of this factor meant there was no evidence of direct influence of role context on GP intention in the presence of the other factors.

While the addition of Role Attributes as a predictor predicted GP intention significantly better than previous models, the anticipated significance of the direct and indirect Role Context relationships with GP resistance were not supported. Thus Hypotheses H$_{3}$, H$_{3a}$ and H$_{3b}$ were not supported wholly or in part by this sample. The addition of Technology Efficacy as a predictor suggested belief in the efficacy of the technology may in some manner mediate the influence of both incentives and role at-
tributes on GP adoption intention. Mediated regression suggested the influence of Incentives was only partially mediated by Technology Efficacy. While this relationship had not been hypothesised it seems conceptually reasonable that for at least some GPs, belief (or not) in the potential of new HI technology to improve patient outcomes would mediate the impact of financial incentives on GP intention. Mediated regression also showed the influence of Role Attributes on GP intention was partially mediated by Technology Efficacy, supporting Hypothesis H5a for this sample.

The addition of the perceived potential for Undesirable Role Change as a predictor to the model represented all the constructs and the categorical variables and explained 65.2% of the variance in GP intention to resist adoption ($F_{(21, 97)} = 8.658, p<.001$). This also suggested the influence of GP role attributes on intention was in some way mediated by the perceived potential for undesirable role change. Testing showed Role Attributes was partially mediated by Undesirable Role Change, supporting Hypothesis H5d. However there was no change in the significance of Technology Efficacy relationship with GP intention, so Hypothesis H2a was not supported. Similarly, there was no change in the significance of Incentives relationship with GP intention, so Hypothesis H4a was not supported. A summary of how the study hypotheses were either supported or not by these regression results can be seen in Table 1.

In order to establish whether a more parsimonious representation of relevant predictive factors of influence on GP resistance could be identified, hierarchical linear regression was performed with only factors that had a significant individual relationship with GP intention in the presence of the other factors. This excluded the Role Context Factor and the categorical individual and practice attributes as predictive variables. The subsequent model ($F_{(4, 122)} = 44.772, p<.001$) explained 59.5% of the variance in GP intention. Although not predicting GP intention as accurately as the model with all the constructs and categorical variables, this model was seen to represent the key common factors influencing GP attitude formation. This model also identified the potential for HI technology to improve patient outcomes as statistically the most important factor in predicting GP intention to resist adoption.
Although not statistically significant, the negative $\beta$-weight of the Technology Efficacy and the positive $\beta$-weight of Undesirable Role Change were also seen to increase, giving the net effect of widening their relative impact on GP intention to resist. This could arguably be the outcome of change in the influence of incentives on GP resistance in the presence of the categorical variables. This suggested the range and frequency of consultation types in combination with individual and practice attributes may be more appropriately seen as indicators of a moderating influence on the relationship between Incentives and GP resistance. Thus, moderation of the Incentives Factor and GP resistance relationship may be indicated by different combinations of individual and practice attributes for different GPs. Also, the anticipated indirect relationship between the Role Attributes and Undesirable Role Change Factors emerged as a significant direct relationship. While not hypothesised, the study showed a direct relationship between Role Attributes and GP resistance was probable.

**DISCUSSION**

GPs are integral to delivering any comprehensive healthcare strategy to the wider health system. Increased GP use of HI technology is seen by all levels of government as a pathway for improving management of the healthcare delivery system. This study sought to explore why GPs tend to resist (or not) adoption and implementation of HI systems. Findings indicate the perceived potential for undesirable changes to their role is a barrier to GP adoption of HI technology, while resistance is abrogated by belief in the potential of the technology to improve patient health outcomes. Findings also suggest that GP use of HI technology and propensity to use technology influences the perceived desirability of any potential for technologically facilitated change to their role. Also that the influence of incentives targeted at increasing GP uptake of new HI technology on attitude formation is moderated by individual GP and practice attributes. This thinking is represented in the modified research model (see Figure 2 below).

While the role attribute construct supported the focus of Venkatesh et al., (2003) and others regarding the importance of the current use of technology in understanding new technology adoption, it was GP use of and propensity to use such technology compared to other GPs that became significant. Simi-
larly, factor analysis excluded GP perceptions of the healthcare system, profession and practice context antecedents as consistent indicators of resistance and the role context construct became exclusively a measure of the GP consultation types. Although this may be seen to reflect inappropriately formulated questionnaire items, it also confirmed consistent themes uncovered in this research:

- Unlike extant literature concerning adoption of new technology with non-professionals (see for example Venkatesh et al., 2003), GPs do not generally see mastering the use of computers for data entry in the practice of medicine as a barrier to adoption, particularly if use is evidence-based. Hence potential barriers to change perceived in terms of power or professional structures are more appropriately characterised as belonging to a different source of influence focused on the GP sense of being a professional.

- The autonomous nature of the GP role in an environment of demand for their services essentially means trying to implement involuntary change in their workflow is unlikely to be successful. This view is supported by evidence that while the healthcare system may aim to make it increasingly difficult, it is by no means impossible for a GP to choose to operate their practice without using computers. Thus the current use (or not) of HI technology may reasonably be seen to in part reflect how tightly a GP retains a classical view of practicing medicine or the strength of their professional traits. In the same vein, propensity to use technology in their workflow may reasonably indicate their innovator traits or of practice and GP readiness and receptiveness for technologically facilitated change. This suggested the range and frequency of consultation types may be an indicator of GP and practice norms, values and ways of working, or the importance attached to increasing practice income.

- The GP did not spend time considering the potential for change unless they believed they could exert some immediate control over change outcomes. Findings show the majority of GPs believed they exerted some degree of control over change in their practice environment. However, they did not deeply consider strategies predicated on change in socio-political attitudes, their profession, or understanding the motivation for change in healthcare policy that was not transparent. So despite some GPs espousing a more holistic approach to the delivery of healthcare, effective change concern-
ing GP capability to interact and integrate with the wider healthcare system needed some sense of voluntariness attached. This is seen to support the approach of Mintzberg (1980) on professionals, particularly in predicting resistance to involuntary change to their profession and role.

- The smaller the practice, the more likely practice norms, values and ways of working can be seen to reflect the individual GP attributes. Hence the more important it is to address individual GP concerns over practice uptake of change. It is noteworthy that over 50% of Australian GPs work in practices of less than five GPs, and 13% of GPs (and 37% of practices) operate as solo practices (Britt et al., 2007; Hordacre, 2008). While the larger the practice, the less likely it would reflect individual GP norms and values and the more likely it will have a less professional bureaucracy structure (such as being entirely staffed by salaried GPs). This in itself highlights a changing approach to the Australian system of healthcare delivery. HI technology implementation perceived to be driven by a strategy that involuntarily facilitates such foundational change to the GP role was a powerful barrier.

CONCLUSION

This research was directed towards understanding the reasons for GP resistance as the identified gap in the existing body of knowledge (Greenhalgh et al., 2004; Pare, Sicotte and Jacques, 2006). Findings challenge contemporary thinking that aims to design generalised models of technology adoption behaviour, suggesting the poor uptake of HI technology by GPs may simply reflect the ineffectiveness of past and existing strategies. Considering an individual’s interaction with the system and context makes change behaviour more comprehensible and supports the thinking of Greenhalgh et al. (2004), Kaplan (2001) and Markus (1983) when they cite the importance of understanding individual, system and context interactions. Financial incentives would more likely be effective in changing GP practice behaviour, for example, if uptake was within the realm of GP control and addressed such specific concerns as the potential for incurring unremunerated practice costs. A situation could then be created where the forces for adoption were stronger than the forces for resistance. However this research suggested certainty about unwanted outcomes could also raise the impact of factors that encourage rejection. Adoption strategies would therefore be less effective if non-adoption, resistance or
rejection was predicated on GP perception that implementation would lead to fundamental change to their role. Then, a strong motivation to move away from adoption would likely underpin an imbalance of forces favouring resistance. Adoption can then be seen as the outcome of the relative strengths of opposing forces, not simply a consequence of diffusion.

The exploratory nature of this research uncovered GP and practice attributes of potential influence, yet their significance to GP resistance was neither proved nor disproved. This allows for future research to theorise different combinations of individual and practice attributes as potentially indicative of moderating influences on the process of GP attitude formation. In this way the research also provides theoretical grounding and empirical evidence for the direction of future investigations into acceptance of technological innovation in different healthcare contexts and settings by the medical professional. Findings indicate, for example, that anticipated change to role or valued contextual antecedents are potentially powerful inputs to emergent resistance. Thus adoption strategies should consider the collective influence on medical professional perceptions of individual and organisation attributes, such as the nature of consultation types and current use of technologies in their workflow. Such focus would better emphasise the perceived relevance of patient populations potentially benefiting from new technology adoption and be more likely to overcome belief of the inevitability of undesirable change to the professional role. The implication for policymakers and change practitioners is that strategies that emphasise benefits to patients rather than change to the professional role are more likely to overcome any GP resistance to the diffusion of HI technology in the delivery of healthcare.

**Acknowledgements:** The authors would like to acknowledge the generosity of the General Practitioners and their organisations who took part in this research, and the Australian Research Council and the South Australian Divisions of General Practice for their support.
REFERENCES


Table 1: Summary of support for Hypotheses

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Figure 1: Theoretical Model of Forces of Influence on GP Resistance
Figure 2: Most parsimonious hypothesised Model.