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EXTENDING FEATURE USAGE: A STUDY OF THE POST-ADOPTION OF ELECTRONIC MEDICAL RECORDS

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Abstract

Post-adoption use of a system progresses through stages from acceptance through to infusion. The Technology Acceptance Model (TAM) posits that Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) influence the ‘intention to use’. The Post-Acceptance Model (PAM) posits that continued use is influenced by prior experience.

In order to study the factors that influence how professionals use complex systems, we create a tentative research model that builds on PAM and TAM. Specifically we include PEOU and the construct ‘Professional Association Guidance’. We postulate that feature usage is enhanced when professional associations influence PU by highlighting additional benefits. We explore the theory in the context of post-adoption use of Electronic Medical Records (EMRs) by primary care physicians in Ontario. The methodology can be extended to other professional environments and we suggest directions for future research.

Keywords: Post-adoption, continued use, technology acceptance model, electronic medical records.
1 Introduction

Today’s IT systems include multiple capabilities that allow users to customize the application to fit their specialized way of performing tasks (Jasperson, Carter, & Zmud, 2005). Yet not all users avail themselves of these extensions (Saeed & Abdinnour-Helm, 2008); especially professionals who have a high degree of expertise and are autonomous in determining their means of achieving desired outcomes (Walter & Lopez, 2008). In studies of use of an IT system, the Technology Acceptance Model (TAM) (Davis, 1986, 1989) and the Post Acceptance Model (PAM) (Bhattacherjee, 2001; Bhattacherjee, Perols, & Sanford, 2008) treat the dependent variable as dichotomous. In TAM, the actor accepts or rejects the system. In PAM, the actor continues or discontinues use of the system. However when there are multiple features this does not apply because users are able to deploy some features and not others and they are therefore making acceptance decisions at a feature level. They may accept some features and continue to use them, but they may simply decide not to accept others. Given this difference in usage, we postulate that practitioners will benefit from interventions that increase deployment. Hence our research question is: how are professional users influenced to make more extensive use of the features available in complex systems?

From a review of the literature of acceptance and post-acceptance we derive a tentative model. Past studies have not singled out the additional influence that professional associations may have on their members when they are using a complex system. We address this gap by adding to the tentative model the guidance offered by a professional association. Our model allows us to investigate antecedents that influence PEOU and PU. Users may be satisfied because they find that the system is easy to use and delivers significant benefits. We postulate that if they are confident of their ability to learn new features and at the same time they perceive advantages from their use, they will invest more time to extend their usage to gain the additional benefits. In contrast, users, who believe they are expending a large effort to gain just a small benefit, may decide that it is not worth spending more time to learn new features because, based on past experience, there will be insufficient incremental advantage. They will continue to use the system, but at a level of equilibrium where they are content with the effort expended for the benefits received. If we are able to gain a deeper understanding of the factors that can change this equilibrium, we will be able to design interventions that will create the opportunity for users to extend feature usage so that they make greater use of functionality already designed into the system.

Our research model is built on both TAM and PAM, with their combined key constructs of Perceived Ease of Use (PEOU), Perceived Usefulness (PU), confirmation and satisfaction. The selected context for the exploration of the model is post-adoption use by healthcare professionals with a specific focus on Electronic Medical Records (EMRs). Physicians represent professionals who apply their clinical skills and medical knowledge with a large degree of autonomy to provide patient care (Chau & Hu, 2002; Walter & Lopez, 2008). EMRs store patient information as ‘computer-based clinical data … that are location specific and kept by a single physician practice’ (Protti, 2007, p. 109).

The organization of this paper is as follows. The next section is the review of the literature of acceptance and post-acceptance. The research model is depicted at the end of this section. The research methods are detailed in the third section. The fourth section shows the results from the semi-structured interviews. The fifth section is a discussion including limitations of the research. The final section is the conclusion and includes suggestions for future research.

2 Literature Review and Research Model

2.1 Stages of Post-Adoption

Innovations are ideas or practices perceived as new (OECD) and they are adopted because of their perceived benefits (Rogers, 1995). Some innovations are considered complex because they are ‘relatively difficult to understand and use’ (Rogers & Shoemaker, 1971, p. 154). Our focus is on complex IT innovations which are systems with multiple features, structure and functionality capable of delivering outcomes that can be shaped by the user (Boyatzis, 2006; Butler & Gray, 2006).
Because of their multiple capabilities, there is a learning curve as users gain more experience familiarizing themselves with the many capabilities that can be applied to their specific needs (Adler & Clark, 1991).

Cooper and Zmud (1990) looked more closely at the progress through the learning curve during the post-adoption use of an IT system. They defined three stages: acceptance, routinization and infusion. When the system is first implemented, actors need to be trained and persuaded that the change is an improvement. There is a process of acceptance where users are cautious and they initially use the innovation to replicate what was done before (Bhattacherjee & Harris, 2009; Burton-Jones & Straub, 2006; Cooper & Zmud, 1990). As more confidence is gained some tasks become repetitive and features that were designed into the system become part of the routinization of the normal work schedule (Cooper & Zmud, 1990; Sundaram, Schwarz, Jones, & Chin, 2007; Zmud & Apple, 1992). In the infusion stage, features become more embedded through extension (Jasperson, et al., 2005; Sullivan, 1985; Zmud & Apple, 1992) and users create functionality ‘that goes beyond typical usage leading to better results’ (Hsieh & Wei, 2007, p. 217).

2.2 PEOU and PU in the Post-Adoption Model

It is not sufficient to decide to adopt an innovation. It must be used in order to realize the anticipated benefits and acceptance has become the term to describe this initial use (Cooper & Zmud, 1990). Organizations make a decision to adopt an IT system but it is the individual who determines how the technology will be used. Hence, Davis (1986, 1989) asked the question ‘What causes people to accept or reject a technology?’ He introduced the Technology Acceptance Model, TAM and his seminal paper has been the subject of many studies (King & He, 2006; Lee, Kozar, & Larsen, 2003; Legris, Ingham, & Collerette, 2003; Turner, Kitchenham, Brereton, Charters, & Budgen, 2010). The original focus of TAM in Davis’ doctoral thesis was on organizational systems where the employees have discretion about its use (Davis, 1986; Sheppard, Hartwick, & Warshaw, 1988). The objective was to help system designers gauge an understanding of users’ reactions early in the development cycle of the system and thereby avoid more costly redesigns at a later time. This early assessment of the intention to use a system was called ‘user acceptance’ by Davis (1986, p. 12).

One reason for the success of the model is its parsimony (Benbasat & Burki, 2007; Straub & Burton-Jones, 2007) with only five constructs including two key independent variables, Perceived Ease of Use (PEOU) and Perceived Usefulness (PU). PU is ‘the degree to which a person believes that using a particular system would enhance his or her job performance’ and PEOU is ‘the degree to which a person believes that using a particular system would be free of effort’ (Davis, 1986, p. 26; 1989, p. 320).

However, it is difficult to define when a complex system is accepted. Such systems have many features: some of the features may be accepted at the stage of initial use and others may only be deployed when the system is extended in the infusion stage. Schwarz suggests that the term ‘IT Acceptance’ should be expanded to include ‘the user’s behavioural interaction over time’ (Schwarz & Chin, 2007, p. 232) taking into account progress as a user advances through the stages of acceptance, routinization and infusion (Cooper & Zmud, 1990). We propose that the concepts of TAM and its theoretical extensions apply not only to the first post-adoption stage of ‘acceptance’ but also to the acceptance of features that occurs in the later two stages of routinization and infusion. Users reach a level of equilibrium where they use features which are easy to use and useful and they perceive it is not worthwhile spending more time and effort to learn more functionality that will only have marginal usefulness. They remain at their level of comfort. Therefore our post acceptance research model includes PEOU and PU as predictors of feature usage.

2.3 Influencing factors

We turn to the consideration of other antecedents which were not part of the original model of TAM

Subjective Norms. In the Theory of Reasoned Action (TRA), subjective norm is defined as ‘the perceived expectations of specific referent individuals …and by the person’s motivation to comply
with those expectations’ (Fishbein & Ajzen, 1976, p. 17). Davis excluded this construct because his research evaluated intention to use prior to the system being in use and therefore there were no ‘referent others’ (Davis, 1986, p. 228). Later studies added ‘subjective norms’ (Mathieson, 1991; Taylor & Todd, 1995; Venkatesh & Davis, 2000) and we too add this construct to our research model because in the stage of post-adoption there are ‘others’.

**Facilitating Conditions and Self efficacy.** The Theory of Planned Behaviour (TPB) extended TRA by adding Perceived Behavioural Control (PBC) (Ajzen, 1991). When Taylor and Todd (Taylor & Todd, 1995) compared models of acceptance, they conceptually linked PBC to ‘self efficacy’ and ‘facilitating conditions’. Facilitating conditions refer to the technical and organizational infrastructure that supports use (King & He, 2006; Thompson, Higgins, & Howell, 1991) while self efficacy is an individual’s judgement of his/her ability to execute a task (Bandura, 1977; Compeau & Higgins, 1995). Users who have confidence in their ability to learn new features (high self efficacy) and who believe the infrastructure is in place (good facilitating conditions), will be more likely to use the system for ‘emergent’ use, where there are features that provide innovative means of performing new tasks (Ahuja & Thatcher, 2005; Bagozzi & Kimmel, 1995).

**Satisfaction with Past Use.** The IS Continuance Model (Bhattacherjee, 2001), adapted from the Expectation Confirmation Theory (Oliver, 1980), compares continued use of an IT artefact with the repurchase decision of a consumer. Continued use depends upon the accumulation of experience: from implementation, training, initial support, ease of learning past functions and the usefulness of the system (Barki, Titah, & Boffo, 2007; Compeau & Higgins, 1995). If users had spent a lot of time learning a function only to find it had marginal benefit, they would be less likely to adopt additional features. Their level of use would plateau at a relatively basic level. On the other hand, if past experience had been satisfying with functionality easy to learn and useful, more features would be deployed and a more advanced level would be attained.

**Task Fit.** Systems are adopted in order to assist users with their tasks. There must be a good fit such that system utilization turns inputs into the desired outcomes (Goodhue, 1995; Larsen, Sorebo, & Sorebo, 2009). The concept is similar to ‘result demonstrability’ which is one of the characteristics of a successful innovation in the Innovation Diffusion Theory (IDT) (Rogers, 1983).

**Knowledge of the System.** In the IS Continuance Model, evaluation of the functionality actually used is an independent variable influencing the decision to continue or discontinue system use (Bhattacherjee, 2001; Bhattacherjee, et al., 2008). In our model we extend this concept: users are influenced not only by functionality actually experienced but also by functionality to be experienced. They must therefore be aware of the additional capabilities of the system that they have not yet utilized.

**Professional Association Guidance.** Members of a profession have specialized knowledge which they apply in an autonomous manner (Chau & Hu, 2002; Hu, Chau, Sheng, & Tam, 1999). They are governed by a professional association which conducts peer reviews and maintains exclusivity of knowledge (Sharma, 1997; Walter & Lopez, 2008). The association has the means to influence members’ behaviour by setting standards, offering incentives and supporting specialized educational programs. Therefore the association is able to influence members to use an IT system and to attain a specific level of utility.

### 2.4 Research Model of Post Adoption Use

The tentative research model is tailored for professional users of complex systems and is shown in Figure 1. The constructs are supported in the literature (see above) with the exception of Professional Association Guidance and Knowledge of the System. Many studies of TAM have ‘system use’ as the dependent variable which has been typically measured as frequency or duration (Legris, et al., 2003; Venkatesh, Morris, Davis, & Davis, 2003), but this measure is not rich enough when studying the different ways that the many features of complex systems can be deployed (Burton-Jones & Straub, 2006). Therefore the dependent variable in the model is feature usage (Hsieh & Wei, 2007; Lippert & Forman, 2005).
3 Research Methodology and Process

Qualitative research methods provide a deeper understanding of complexity and ambiguity (Gummesson, 2006). The unit of analysis is the individual physician who has been using an EMR for one year or more and in order to bound the study, we adopt Ontario as the single case (Stake, 2000). We adopt a pre-structured design (Miles & Huberman, 1994) in which we build the conceptual framework of post adoption use and then follow an interview protocol derived from the literature.

Via a purposive sample, we conducted semi-structured interviews with 40 physicians in order to confirm the research model. In Ontario, Canada there are 11,000 primary care physicians, of whom 3,000 have been using an EMR for one year or more. The success of their EMR adoption and subsequent use is the responsibility of OntarioMD, which is jointly owned by the Ontario Medical Association (OMA) and the Ministry of Health and Long-Term Care (OntarioMD, 2009). Through OntarioMD we sent out 1,800 e-mails with a request to participate in a 30 minute interview. In order to guard the privacy of the physicians, all e-mails were initially sent by OntarioMD. Fifty eight (58) physicians opted in to the research program by e-mailing to us and from then on we were in contact with them directly, assuring confidentiality. This represented a response rate of 3.2%. In addition, all interviewees were asked to refer colleagues to us and as a result a further 13 physicians opted in for a total of 71. Once doctors had indicated their willingness to participate, they were sent a consent form, approved by the ethics review board, and a short questionnaire asking for some demographic information. They were also asked to suggest times for the interview. Fifty four (54) questionnaires were returned and 53 interviews successfully conducted.

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The interview protocol was prepared based on the research model. The questions had to be direct and to the point given the restriction of 30 minutes for the interview. This duration was determined based on preliminary discussions with OntarioMD and some physicians. The questions were also customized for the EMR environment. The protocol was tested on the first three doctors and modified for clarity. No further changes were made. Because the dependent variable was feature usage, we guided the respondents to comment on specific features. The Interview Protocol is shown in Table 1: Interview Protocol.

![Research Model of Post-Adoption Use](image-url)
<table>
<thead>
<tr>
<th>Qstn</th>
<th>Construct</th>
<th>Discussion Points</th>
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| 1    | Subjective Norm | Are your patients critical of your use of the EMR?  
Is the computer a barrier between you and your patient? |
| 2    | Facilitating conditions | Is the system up and running when you want it?  
Are you satisfied with the level of support? |
| 3    | Self efficacy | What word best describes your attitude towards computers in general - 'playful' or 'anxious'?  
What other word would you use?  
How do you learn new features about any software you are using?  
How good are your typing skills? |
| 4    | Satisfaction | Rated on a Likert scale of 1 to 6 |
| 5    | Task Fit | Does the software do what the vendor said it would? |
| 6    | Guidance from Professional associations | What help has OntarioMD given you?  
What else could OntarioMD do to help physicians become more advanced users of EMRs? |
| 7    | Knowledge of benefits | How well do you feel you know the capabilities of your EMR?  
How were you trained? (self or trainer on site)  
How much were you able to teach yourself? |
| 8    | Perceived Ease of Use | Do you find it easy to use?  
Is it ‘intuitive’?  
What are the barriers stopping you from using more features within the EMR? |
| 9    | Perceived Usefulness | Does the EMR help you improve patient care?  
How?  
Are you connected with private labs?  
Are you connected with hospital labs? |
| 10   | Features used | Some features of the EMR allow you to customize: templates, reminders, searches.  
How much do you use such features?  
Other features of the system offer decision support.  
How much do you use such features? |

Table 1: Interview Protocol

Saturation. All interviews were recorded with the consent of the participants and then transcribed and imported into NVivo 8 which is software designed to manage large volumes of qualitative data with tools to query the data, manage ideas and generate reports (Bazeley, 2007). As each interview was imported, its content was scanned and we identified that saturation had occurred after 40 interview with no new viewpoints being expressed (Guest, Bunce, & Johnson, 2006).

Triangulation. Senior executives from the four major software vendors were interviewed. The topics of the interview protocol were addressed by asking how they believed physicians would respond to the questions. In addition, similar questions were asked of five OntarioMD practice consultants who work with physicians guiding them to achieve full advantage from their EMR implementation.

Analysis. From a thematic analysis of the interviews, nodes were defined in NVivo and used to group similar comments about the same topic. In addition, frequently used words were found and their context analyzed. Cross comparisons were performed between topics and also between topic and attributes of the respondents.

Validation. The evidence collected from the triangulation was consistent with the responses from the physicians. The process and results were shared with a selected group of experts and have been rigorously documented to support our knowledge claims (Weber, 2004).

4 Results

Physicians are busy professionals whose prime responsibility is to provide care to their patients. They are only willing to learn a new feature if they perceive it will be easy to use with identifiable benefits. Their time is a scarce resource, mostly spent with patients. Attitudes of the physicians towards computers varied from ‘tolerant’ to ‘I love them’. Those with high self efficacy learned by ‘playing with the system’ and were able to find the time to use tools such as templates and achieve more benefit from their EMR. Patients did not view the computer as a barrier and in many cases were pleased ‘their doctor had entered the 21st century’.
4.1 Perceived Usefulness - Improving Health Care

Several categories of benefits emerged from the thematic analysis.

More Organized Information. Over 60% of the participants mentioned that they were able to provide improved healthcare because the information about the patient was more organized than the paper chart. Data is up to date and diagnostic decisions are made more quickly based on more complete information.

   It allows me to process and bring together a huge amount of information in a brief period of time so that I can do a much better job ... particularly with complex or sick patients with multiple problems and multiple medications.

More Comprehensive Encounters. Over 35% of the physicians stated that patient care was improved because the EMR was able to function as a memory prompt for them. Some physicians use templates in order to guide them through an examination so that no important question or data is forgotten. In addition, tests are scheduled on time due to the prompts by reminders.

Patient Medications. Over 30% of the physicians stated that the EMR’s capability to track all the medications that the patient has taken increases the efficiency of prescribing. It does take time at the implementation stage to input the list of medications, but once entered, any renewal is one keystroke. The EMR also records the history of patients’ adverse reactions to drugs guiding the physician at the time of prescribing.

   If you use it for one thing only, use it to prescribe medications. ... Because, once they have those medications inputted, and then they start renewing them, it’s a dream.

Patient Education. Over 30% of the physicians actively share results as part of their program of patient education. Charts can be reviewed with the patient comparing their results to the ideal as noted in health guidelines. Patients are shown flowcharts which can be printed for the patient to take home and reference.

   I turn the screen and I just tell someone, “Look. If you were to quit smoking and if you were to manage your weight,” and their risk goes from 20% to 2% risk of cardiovascular. That can be very powerful.

Legibility. Over 20% of the physicians commented on legibility, stating that legible notes resulted in improved patient care. Notes in the EMR are typed and legible. The governing body of medicine also conducts peer reviews in order to ensure that standards are maintained and improved. Both the reviewer and the reviewed physician can easily read the notes.

   I think that it's great that every note is legible. You can have multiple users; accessing it very easily as part of a team and the information is there; you don't have to flip through too much.

Managing Routine Tests. Reminders are an effective way to ensure that routine tests are not missed. Physicians believed that preventive care was improved when they were prompted by a reminder during the patient encounter.

   I have all of my diabetics in there; all my hypertensive's... the reminders are useful for mammograms, Pap tests, etc.

Reduction of prescription errors. Patient safety is enhanced because prescriptions are legible for pharmacists and drug doses are checked by the computer.

More Efficient use of Clinical Resources. Patients can be micromanaged and resources used more effectively. On an individual basis, physicians can ask themselves ‘do I need to see this patient?’ when responding to a phone call. Other healthcare professions attached to the clinic, such as dieticians, may be the right resource for follow-up. Communication within the clinic is enhanced allowing for more efficient use of all clinical resources with the electronic record easily shared simultaneously by multiple care providers.

   Well, the main thing is that you can micromanage your patient population; that's number one so that you're not simply answering the door when they come knocking.
**Pro-active Patient Management.** The search feature within the EMR allows physicians to proactively manage their patient population. They can find patients with a specific condition and schedule the desired next steps. For drug recalls, although not frequent, the patient population can be searched and patients contacted, which is just not possible with paper records.

> I went on my computer system and within fifteen seconds, it ...would tell me everybody who had ever been on that drug...my secretary could call every single last one of them ... within 24 hours

**Summary.** PU was a dominant factor. Physicians only adopted those features that they perceived to be useful as part of their every day routine.

> So, I think I’m definitely at a level where I’m adequate and I don’t feel a big incentive to put in a lot of time to learn more.

> I probably haven’t tried to learn some of the other functionalities of it coz I just can’t see how I could use them in the day to day thing.

### 4.2 Perceived Ease of Use

The basic functions of an EMR are entering patient encounter notes, recording medications e-prescribing and the automatic updating of lab results. In some cases, they were intuitive ‘out of the box’ but in other cases repeated use on a daily basis brought familiarization and ease of use.

> Once you start doing something long enough it seems intuitive. At first it wasn’t, but I’ve forced myself to use it so it’s coming fairly quickly now.

> There are medical residents that come in...and within the first afternoon they're in there up and running their document and they can prescribe. They can do at least all the basic things.

**Time.** Functions that have not yet been adopted are perceived to be less intuitive and therefore less easy to use. Finding the time was the most mentioned response to ‘what are the barriers stopping you from learning more features?’ The word ‘time’ was the most frequently used word of significance, indicating that physicians were very conscious of the time demands of learning new functionality.

> There is a bit of a learning curve ...not willing to spend the time.

> I guess the barrier is just me having the time to actually sit down and you know play around with it a bit more.

**Summary.** PEOU was a key factor in overcoming the time and constraints of the learning curve.

### 4.3 Antecedents

We evaluated the antecedents of feature usage, PU and PEOU from the tentative research model.

**Subjective norms.** Patients have no issues with the physician’s use of a computer and in many cases are pleased that their doctor is now ‘in the 21st century’.

**Facilitating conditions.** The majority of physicians are well supported by their software vendor. For local issues, such as hardware and network, they either employ an IT specialist or contract with a local company.

**Self efficacy.** Just over half of the physicians were ‘comfortable’ with computers. They learned to maximize their use of the EMR by ‘playing with it’.

**Satisfaction.** This varied due to many different factors impacting it. Some systems were difficult to use, so although the physician was ‘very comfortable with computers’, satisfaction was poor. At the opposite extreme, some physicians, with limited computer knowledge, were using their EMR for basic functions only and were very satisfied.
Task fit. Approximately half of the physicians had to change the way they conducted their patient encounter, whereas the other half felt that the software followed the way they practised. Once they had become familiar with the system, they were able to accomplish their tasks of recording and reviewing patient charts.

Professional Associations. All respondents agreed that OntarioMD’s incentive funding persuaded many physicians to adopt EMRs. The majority believed that physicians would extend their feature use if they were made more aware of additional benefits through peer mentoring and focussed training from OntarioMD. In addition, the association could improve facilitating conditions, such as connectivity with hospital labs, which would in turn enhance feature usage.

Knowledge of benefits. Approximately half of the physicians were not aware of the full potential of the EMR. They were content in performing the basic functions of entering and retrieving patient notes without using additional tools such as templates or reminders.

Summary. Our finding was that all the antecedents are relevant factors in a healthcare EMR context.

5 Discussion

EMRs are complex IT systems with many functions used by physicians who apply their professional knowledge autonomously. As a result of semi-structured interviews with physicians who have been using an EMR for one year or more, the influence of selected independent variables on feature usage was analyzed. PU was a dominant factor. Users were performing frequently used functions that were considered beneficial. However, both PEOU and PU influenced their readiness to adopt additional functions. They continued to accept new features until they reached a balance where they believed that the additional benefit from adopting a feature was not worth the effort to learn how to use it.

Physicians with high self efficacy played with the system more and therefore had greater potential to reach more extensive feature usage. There were no specific social factors influencing EMR use and, in general, patients were pleased that physicians were using computers.

The professional association OntarioMD could have a major impact through financial incentives, education and training. The results show that physicians are willing to find the time to learn if they perceive there will be benefits. Therefore if OntarioMD were to design interventions that would highlight the benefits of more advanced feature usage, physicians will spend more time and become more advanced users.

Limitations. The sample comprised respondents who agreed to volunteer their time for the interview. They were asked why they had agreed to participate and the majority of them were enthusiastic about EMRs and believed that other doctors should be adopting them. These responses indicate that the sample may to some extent be a biased representation of the population, although this is less of an issue given that we are not exploring success or failure.

The responses to the semi-structured interviews were specific to EMRs. Results with other fields and applications may differ due to the type of system being used, its perceived benefits and the role of the professional in applying its features. We believe that with modifications to the questionnaire the model and methodology can be applied to the post-adoption use by professionals of other complex systems.

6 Conclusions

Once an IT artefact has been adopted, different benefits accrue depending upon use in the post-adoption stage. Many studies have explored the factors which have influenced the decision to adopt (Lee, et al., 2003). Fewer studies have differentiated the stages of post-adoption use. Of value to practitioners is the measure of the benefits gained in the continued use of complex systems and such benefits depend upon functionality deployed.

The model has been validated through a qualitative analysis within the context of EMR adoption. EMRs have the potential to deliver significant benefits: for the patient by providing legible access to medical history; for the physician by improving the flow of diagnostic information; and for the government by reducing costs (Hillestad et al., 2005). Once the investment is made, practitioners
would like to be confident that the functions of the EMR are fully used. Future research should
develop and validate an instrument to measure the dependent variable ‘feature usage’. Then a
quantitative study of the entire model could be conducted where the independent variables can be
measured with instruments from the literature. With future results from such a study, practitioners
will be able to design interventions to enable physicians to make richer use of EMRs for the benefit of
all parties involved in healthcare. Comments from practitioners indicated that the research was
addressing a gap, which is best summarized by the words of one physician:

*What I think needs to be the focus is why so many users cannot move to the “advanced” state, something that in my experience is either achieved within 24 months of going live or remains persistently out of reach.*

This paper contributes to academic research by constructing an extended post-adoption model built on
a framework which combines TAM and PAM. Because we are dealing with complex systems with
multiple features, the dependent variable is feature usage rather than a holistic measure of system use.
Users of these complex systems determine which features to accept on a feature by feature basis.
They are influenced by their prior experience with the system and the PU of the feature. They invest
time to learn new features until they reach a balance where they perceive that the additional time
required to learn new features is not worth the benefit to be gained. The features used by autonomous
professionals can be influenced through guidance from their professional association.

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