

Perceived Ease of Use in Information Technology Acceptance Across Different Healthcare Systems – A Research Review

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Abstract

With society becoming increasingly dependent upon technology due to its multitude of uses and functions, healthcare professionals have followed suit. As the use of technology and electronic health records is encouraged upon all formats and sizes of healthcare systems more healthcare professionals are being mandated to learn new software and tools to streamline their work. As their work becomes increasingly efficient, the demand for better performance and output increases as well. The continuous demand for improvement has resulted in increased stress levels amongst different healthcare professionals and decreased motivation in their obligations towards work. As the stress levels for healthcare professionals impacts their performance, additional consequences arise which in turn reflect upon the overall quality of healthcare services provided. This paper seeks to explore and understand how and why these technology-based stressors occur and how health administrators can better understand the conditions which could prevent it.

Keywords

Healthcare, Information Systems, Patient, Data

1. Introduction

As society has entered a newfound realm of understanding and precaution towards healthcare and healthy living, the way in which healthcare infrastructures are perceived by different consumers has shifted significantly over recent decades (Harris & Rogers, 2019). With novel health concerns, ailments and conditions being recognized by wider audiences, healthcare providers and therefore their treatment performance, the pace and standard of care are becoming increasingly observed and more readily discussed throughout society (Yalçin et al, 2020). With such an influx of information, consumers are becoming more aware of different treatments and options made available to them (Yan et al, 2013). Therefore, more healthcare consumers are seeking treatment and care than in the past (Tscholl et al., 2020). Given that more consumers are requesting necessary services, the need for specialized healthcare providers has also grown in response. Subsequently increasing the demand for their positions within different healthcare systems (Taherdoost, 2018).

Technology usage of tools and products such as medical imaging devices, computers, tablets and instruments have also become just as essential and prevalent in its presence and necessity within society's infrastructure (Vilcahuamán & Rivas, 2017). Through its presence in our handheld devices such as smartphones and tablets it has become quintessential in our daily living through its numerous facets and applications (Holden & Karsh, 2010). The convenience and accessibility it provides has allowed healthcare consumers and or patients to gain more accurate and

essential information pertaining to their wellbeing sooner and better formatted than before (Kamal et al, 2020). It provides healthcare workers and medical staff such as doctors, nurses as well as other practitioners and specialists to gain access to patient information which may not have been previously accounted for. Furthermore it allows these providers to communicate with one another as well as other important parties involved such as insurance providers and liasons to consult and convey the best course of treatment, progress and care for each individual patient (Raitoharju, 2007). This is especially important that the collaborative process between such individuals remain steadfast and informative given how every patient has a different history and may require a different course of treatment given their own, individual, experiences.

Upon the devastation brought forth with the presence of Hurricane Katrina in 2005, a conversation regarding the pertinence of digital data and electronic health record (EHR) usage was brought forth to the U.S. Government (Johnson, 2014). As many patients were faced with the loss of their livelihood, their medical records, patient information and medical history were also not accounted for, despite many having previously assumed that it would be. The aftermath resulted in patient information, kept in physical files, being lost amidst hurricane wreckage. Displaced patients who had lost everything and were seeking shelter or moving elsewhere had also lost their medical documentation and history for which they would need when seeking treatment elsewhere (Johnson, 2014). Such issues concerned public health officials and garnered attention to legal acts and regulations such as The Health Information Technology for Economic and Clinical Health (HITECH) four years later in 2009 to further promote the transfer for patient health information (PHI) onto digital platforms (Jones et al, 2014).

With the introduction of such acts, an influx of health information technology (HIT) was brought forth, encouraging healthcare providers throughout the nation to streamline its usage and prevent further discretion and loss of patient health information (Luxton et al, 2011). With newfound convergence of records and information, different healthcare providers adapted to this necessary shift based on their system's individual size and financial capacity. Given that not all healthcare providers can afford or need the same software as their counterparts, different healthcare record software and technologies are used. As new software and technologies are introduced throughout such healthcare systems, healthcare providers are obliged to learn and accept new systems and keep up with continuous changes and updates that are brought forth (Johnson, 2014).

While such progressive advances develop across various formats of computer technologies, the dilemma of understanding how different demographics of users of technology partake engage with technology differently from a behavioral perspective has long been analyzed using different models of technology acceptance. In regard to varying demographics of technology users, its rendered itself as essential in the adequate storage of As Davis defined the Perceived Ease of Use (PEOU) as "The degree to which a person believes that using a particular system would be free of effort" (Davis, 1989). Thus in behavioral terminology, the amount of effort required by the reinforcer usage dictates how the user will perceive its usage (Ismail, 2016). Due to different demographics of individuals applying effort based on their own experience, the measure of reinforcement and therefore the perception of ease for that technology may vary accordingly. With such implications in consideration, this research review will seek to understand how technology acceptance models have differed in terms of usage and implementation across different formats and structures of healthcare systems in regard to their usage and adoption efforts towards electronic health records and health information technologies.

2. Literature Review

Within Technology Acceptance Models, there are three major theories which have been widely observed amongst various contexts and settings (Conner & Armitage, 2006). Amongst these theories are the Theory of Planned Behavior (TPB), which states that an individual's intention to engage within a behavior based upon a specific location or time in which those factors are presented as an antecedent. Another theory includes the Diffusion of Innovation Theory (DIT) which suggests that the sooner and therefore the earlier a user is exposed to newer formats of technology, the more likely they are to continue to partake in said technology based on conditioned familiarity with that technology. Lastly, the third theory presented by Technology Acceptance Models include the Theory of Reasoned Action (TRA) which states that once an individual has gained the skills to partake and or engage in that action, they will utilize that skill more frequently to acquire that reinforcer. Currently, research also suggests that technology has the ability to influence its user's stress levels based upon the Technostress Model. The model which accounts for the relationship between users of the technology itself and how these objects can provide an antecedent for behaviors related to stress (Ayaagari et al, 2011).

While different healthcare settings observe the utilization of technology to varying extents, different sizes of healthcare infrastructures require different technology tools given their practices. For example, smaller healthcare settings such as a family primary care physician may require general scheduling software for day to day use and patient chart updates and patient health records (Raitoharju, 2007). In contrast to this, much larger healthcare settings such as an emergency room at a level one trauma center, may have a larger patient capacity, more beds, as well a larger variety of ailments, conditions and urgent matters in which they encounter everyday (Handler, 2004). Therefore, their technological needs would be more advanced and based upon the different scenarios which they'd encounter every day. Additionally, it is also important to note that when comparing such healthcare settings, that one setting, an emergency room setting, is operational twenty-four hours per day, every single day of the year, unlike smaller clinical settings which operate within the parameters of a traditional workweek (Table 1.0). Therefore, the urgency and rapidness required by the setting is reflected within their need for functional technologies at all times. Hence, information technology (IT) support must be made available to some extent at all hours of the day. Otherwise certain aspects of treatment and patient health information (PHI) would not be accounted for and would become delayed in update and transfer as medical staff would have to switch back to a paper-based format (Ghadamyari & Samet, 2020).

When considering the impact and usage of technology in daily use, it is important to consider the physiological influence it has upon a user and their hierarchy of needs. This is especially pertinent to note given that it has a direct impact on their motivation and thus the standard of care and performance in which they are required to provide. The concept of Technology Acceptance Models (TAM), proposed by Davis through the notions of perceived usefulness (PU) and perceived ease of usefulness (PEOU) suggest that a technology user is more inclined to continue participation, utilization and therefore usage, of that technology based on the amount of ease and comfort they feel when engaging with it (Davis, 1989). Since 2019, Technology Acceptance Models have become encompassed as the most widely accepted theory regarding the factors which contribute to a user's willingness to understand and accept various forms of technology (Table 1.0). Thus, the perceived ease of use (PEOU) can impact an individual user's Acceptance of physical technology and it's multitude of formats observed throughout different consumer lifestyles as it evolves from the basis of information technology (Ismail, 2016).

Table 1.0: Compares literature which notes the impact of TAM principles upon different formats of EHR and technology adoption.

Authors:	Research Objective:	TAM Principle Observed:	Outcome:
Ayaagari et al, 2011	Researchers observed the implications of the technostress model upon users who who utilize technology frequently. Observed a variety of factors contributing to technostress such as intrusiveness, complexity and reliability.	Usability (PU)	The outcomes of this study suggested that amongst the different contributing factors observed, that workoverload and role ambiguity had the largest influence upon participants exhibiting technostress. Overall, it was suggested that by identifying which factors contribute to technostress could help researchers identify and predict which aspects of technology usage could overwhelm users and lead to their stress in the future.

<p>Raitoharju, 2007</p>	<p>This study observed the interaction between technology usage and employee behavior based upon technology acceptance and intention of usage. Researchers contrasted adoption efforts and delays between private and public sectors to</p>	<p>Percieved Ease of Use (PEOU)</p>	<p>The oucomes of this research effort suggested that when comparing private and public healthcare sectors. It was noted that private sector healthcare facilities were more inclined to adopt, accept and integrate the utilization of HIT in comparison to public healthcare facilities due to increased funding for training and implementation strategies.</p>
<p>Handler, 2004</p>	<p>Researchers sought to understand how healthcare professionals adopting and utilizing technologies could be targeted for training. This was done through consensus feedback stratgies in efforts to understand how the majority of a demogrpahic of users may feel towards different formats of technology used within their daily healthcare practices.</p>	<p>Percieved Ease of Use (PEOU)</p>	<p>It was noted that consensus was often generalized based on user perception. Even with a large turnout in participants, feedback was often reduced to a response which echoed the sentiment of the majority of those inquired.</p>
<p>Ghadamyari & Samet, 2020</p>	<p>Research utilized blockchain application methods in efforts to improve the efficiency of transmitting EHR between different healthcare sectors when conveying pertinent patient information. In order to do so, the EHR had to be decentralized to allow healthcare professionals increased autonomy when engaging with technology through their daily practices. The sought to understand how efficiency was impacted based upon interoperability and maintenance requirements.</p>	<p>Usability (PU)</p>	<p>Overall, it was noted that the decentralization of electronic healthcare records and technologies catering to the usage of EHR allowed users, healthcare workers, to optimize their time, access essential patient information in a timely manner and control EHR information through secure approaches.</p>

<p>Ismail, 2016</p>	<p>Researchers sought to understand the how the PEOU and PU could be utilized to understand user conception of smartphone adoption. Approximately five different hypotheses were tested in this effort as researchers observed contributing factors such as usability and compatability while testing PU and PEOU.</p>	<p>Usability (PU) & Percieved Ease of Use (PEOU)</p>	<p>Researchers noted that there was a significantly postive correlation between factors of technological compatability to use in regards to both technology acceptance models of Percieved Ease of Use (PEOU) and Percieved Usefulness or usability (PU). However, intention of use was only noted to be positively correlated to PEOU.</p>
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3. Methods

Amongst the different types of software made available to healthcare professionals, they often encounter a variety of different software based on their specific needs and practices. Such practices include; EHR, medical diagnosis software, patient information portals, prescription software, hospital administration and management software and imaging software amongst others (Multak, 2013). With each format of technology and software providing a different function in its use, many healthcare providers find themselves at the intersection of such technologies as they need to use each for different purposes therefore often overwhelming them with the number of tools they need to use. Such disparities in functionality can further the frustration observed amongst users (Waddill-Goad, 2016).

This is especially pertinent and notable in faster paced settings such as the emergency room in which one format of software may heed information that is needed to relay patient information in order to proceed with other processes (Salvarani et al., 2019). For example, as EMT arrive with a patient who has been in a car accident, clerks must register the patient, whether they be identifiable or not, prior to doctors, nurses and other providers prescribing any medication in order to find any previously established chart or medical records as they may contain necessary information to assure their safety and wellbeing (Handler, 2004). The charting process, which as mentioned before, begins at the very inception of their arrival into the healthcare setting, initiates a relay system of information which begins at establishment of some sort of patient identity within the EHR system (Orruño et al, 2011). This is initially done through identifying patients based on identity information, confirmation and assurance as it is reviewed based on the system’s medical record numbers and what they had previously established and stored within their system.

With such situations of technology acceptance and adoption, there are both benefits and negative consequences which come with it. Behavioral models have suggested a strong prevalence between factors associated with the mere presence of the technology itself and the stress levels of its users (Millstein, 1996). Researchers noted an increase in the presence of technology alongside other stressful contexts and work overload resulting in role ambiguity between technology use amongst its users (Yalçin et al, 2020). Consequently, its reinforcing aspects, when conditioned alongside stressful situations and environments, causes technology to be observed as overwhelming to the users. With such presence, it pushes users to become distressed and satiated with it. Thus supporting the notion of Theory of Reasoned Action (TRA). Due to the nature of this study being a research review, multiple search engines were utilized in order to further understand the availability of relevant research pertaining to this topic. Peer-reviewed index and publication platforms such as PLoS One, Scopus, Google Scholar, Science Direct and Science.gove were utilized to obtain the articles reviewed in this study. Upon cross referencing the articles based on key identifiable words such as healthcare, information systems, technology adoption, TAM (amongst other TAM principles) and implying relevancy of key dates within publication searches, the articles were reviewed based upon their relation to one another and the varying lengths and degrees of pertinence to the topic at large.

5. Discussion

Perhaps the most notable influx of stress amongst healthcare workers, medical staff and employees are in situations and scenarios in which they must learn or re-establish learning software which is essential for them to conduct their daily practices (Rogers, 2010). As healthcare professionals become dependent upon and accustomed to certain technologies, patterns, methods and subsequently, shortcuts in approaching the daily tasks associated with their position a certain level of ease of use is established (Sobol & Prater, 2013). Therefore, switching gears and having to take on additional measures such as classes and training modules, to utilize a new technology further contributes to their stress. It can also deter them from their role overall as their role becomes paired with the previously utilized technology (Strudwick, 2015). In busier healthcare climates, and especially one undergoing a global pandemic, this pertinent relay of information is met with additional factors which contribute to stress such as high patient volumes, lack of adequate protection gear, protection as well as technical errors and delays. As such factors pertaining to technology usage accumulate, user experience becomes less and less reinforcing. This supports the notions observed within the Technostress model. Contributing factors such longer workdays, work shifts, overtime and competition also facilitate the stress observed within a highly technological workforce environment (Ahmad et al, 2014).

As technology researchers have sought to understand the notions of technology usage which enable a user to engage with a certain technology. Many of these theories are developed from an educational perspective, the influence of technology-related stress is not often observed or accounted for within healthcare settings. The difference in technology usage varies in terms of the context in which it is utilized, the capacity in which it is required by a certain role contributes to a user's perception of stress and their work. Automated systems bring forth additional accountability to reduce mistakes and miscommunication amongst healthcare professionals. The checks established within software which inhibit users from getting only essential information can further frustrate a user's perception of the software overall (Jaradat et al, 2013). Contrary to this, if a software is outdated and does not account for newfound, specific and relevant information pertaining to the treatment then sufficient information may be delayed or forgotten as the same patient chart is read by other treatment providers (Rahimi et al, 2018).

5.1 Proposed Improvements

In general, providers who did have to utilize EHR on a daily basis, thus causing frustration on their end, were 2.4 times more likely to feel burnt out as well (Gardner et al, 2019). Given these rates of observation, it is suggested that given the notion that HIT related stress is measurable throughout different settings, software and usages, such perspectives on burn-out is avoidable through further understanding. To avoid potential, burn out amongst healthcare professionals, it is important for healthcare administrators to understand these statistics and note the underlying cause in it's impact. Consequently, logistical shifts can be made based upon understanding how and why such occurrences of burnout continue to occur.

5.2 Validation

Overall, as technology advances and becomes increasingly integrated and woven throughout the framework of our healthcare systems, its dependence is inevitable. Its presence within systems is observed in a variety of formats. Ranging from the tools and instruments utilized in understanding a patient's body to the software utilized in organizing patient data and information to share with other healthcare professionals. The usage of technology also warrants the need for other tools to ensure that technology is HIPAA compliant and secure in the transmittance of patient data (Jones et al, 2014). With such significant influence, also comes additional stress as the faster paced environment brought forth by technology acquisition and usage can contribute to unforeseen outcomes such as physician and medical staff burnout, workplace toxicity as a result of stress as well as mishandling of pertinent patient information, resulting in liability issues, malpractice or perhaps even wrongful death (Handler, 2004).

6. Conclusion

Healthcare work-related burnout has become an on-going concern throughout the globe, and especially relevant given the 2020 COVID-19 pandemic (Yalçin et al, 2020). As more professionals are risking their own well-being in order to provide the service which they've trained to do, the risks and stressors involved are often surpassing the beneficial aspects of their role. As burn-out becomes increasingly prevalent amongst healthcare providers and professionals, their motivation to perform becomes hindered by stress. As PEOU debunks the presence and influence of stress amongst this demographic of technology users, their own mental health and wellbeing, is regarded. Healthcare providers who had to utilize EHR after work, at home, to complete work on patient charts and updates they'd observed

at work 1.9 times more likely to be burnt out in comparison to those who did not have to consistently complete EHR updates from home (Gardner et al, 2019).

Oftentimes healthcare administrators, software developers and those optimistic about the influence of technology take on technology usage without preemptive understanding regarding the influence that faster task accomplishments may have upon technology-related stress. The notion of getting things done faster is equated to efficiency and productivity. Thus, work dispersion becomes limited given how much faster, fewer, healthcare providers are performing due to the influence of technology (Cox, n.d.). This efficiency that is brought forth and often misconstrued, results in performance measurement becoming more focused upon pace rather than patient care (Daniel, 2018). This is subsequently reflected upon customer, or patient satisfaction. Moving forward, if healthcare administrators are more cognizant of the balance between efficiency and patient care when implementing different formats of technology and the daily tools that are utilized by healthcare professionals, burn-out and overall stress can be preventable.

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Biographies

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