

Personal Health Records in the South African Healthcare Landscape: A Socio-Technical Analysis

*Avuya Mxoli
Nelson Mandela Metropolitan University
Council for Scientific and Industrial Research
South Africa*

*Nicky Mostert-Phipps
Nelson Mandela Metropolitan University
South Africa*

*Mariana Gerber
Nelson Mandela Metropolitan University
South Africa*

Abstract

Personal Health Records (PHRs) offer various advantages for individuals making use of these systems to document and maintain information related to their health. In addition, PHRs may play a positive role in preventative care and efforts to prevent and control non-communicable lifestyle diseases. Despite numerous benefits adoption rates are low, and little is known regarding the factors that affect adoption in the South African context.

This exploratory paper highlights socio-technical factors that can affect the adoption of PHRs in the South African context. Socio-Technical Systems theory is applied as a theoretical lens to identify the social, technical, and environmental factors that can affect the adoption of PHRs. Factors that can positively contribute to, as well as negatively inhibit, the adoption of PHRs are identified.

Keywords

Personal Health Records, Socio-Technical Systems Theory, South Africa

Introduction

Costs related to caring for patients with preventable lifestyle diseases are placing an enormous strain on South Africa's struggling healthcare system (Watermeyer, 2013). Patients with hypertension and diabetes account for approximately 17 million visits to healthcare centers in South Africa each year, resulting in significant healthcare costs and use of human resources. As a result, the South African Department of Health has implemented a strategic plan to prevent and control non-communicable diseases. One of the strategies relates to increasing health awareness and healthy lifestyle promotion (Watermeyer, 2013). With the imminent implementation of the National Health Insurance (NHI) in South Africa, there will also be a shift towards offering more effective preventative care as opposed to the South African healthcare system that is currently highly hospital-centric with a strong curative focus (Department of Health, 2011).

A Personal Health Record (PHR) is an electronic application, usually web-based, that allows an individual to document and maintain information related to his own health. PHRs can play a significant role in promoting health and supporting healthcare providers in offering more effective preventative care (Lehmann, et al., 2006; Markle Foundation, 2004; Sprague, 2006). Despite well-documented benefits associated with the adoption and use of PHRs, adoption rates are typically low, especially in developing countries (Dohan, Abouzahra, & Tan, 2014).

Little is known regarding the factors that can affect the adoption and meaningful use of PHRs in the South African context. This exploratory paper will highlight such socio-technical factors. Socio-Technical Systems theory will be applied as a theoretical lens to identify the social, technical, and environmental factors that can affect the adoption of PHRs in the South African context.

The next section will describe the concept of a Personal Health Record in more detail.

Personal Health Records

A Personal Health Record (PHR) is a patient-oriented electronic record, usually web-based, that allows an individual to manage his own healthcare and contains his health related information that has been gathered from many sources (Christopherson, 2005; Sprague, 2006; Tang, Ash, Bates, Overhage, & Sands, 2006). The PHR is typically owned, created, and managed by the individual and allows him to have a lifelong summary of all of his health information in one convenient place. A PHR should typically contain information on past and current illnesses, allergies, immunizations, medication, procedures, tests results, and more (Tang et al, 2006). This is especially useful for individuals who manage chronic conditions such as diabetes and hypertension or diseases such as cancer, tuberculosis, or HIV/AIDS (Markle Foundation, 2004).

General benefits associated with the use of PHRs include the following (Markle Foundation, 2004; Tang et al. 2006):

- Empowering individuals and their families by:
 - Providing them with relevant and credible information to gain a deeper understanding of the health issues and decisions they face.

- Enabling them to assume a greater responsibility for their care and share in the decision-making process.
- Monitoring important indicators such as blood pressure, symptoms, glucose levels, and so forth. This is especially beneficial for individuals managing chronic conditions.
- Providing a way for individuals to involve friends and family in their care when necessary.
- Reminding individuals to schedule relevant preventative services.
- Improving the relationship between a patient and healthcare provider by improving both communication and the sharing of information.
- Increasing patient safety by alerting patients and healthcare providers of potential drug interactions, contraindications, side effects, and allergies, and alerting them to missed procedures and lapses in adherence to treatment regimes.
- Improving the quality of care that patients receive by providing the healthcare provider with a more complete history of the patient and increasing the understanding of and engagement with treatment plans by the patient.
- Improving the outcomes of care for patients with chronic conditions.
- Promoting earlier interventions when patients with chronic conditions encounter a problem.

Despite these benefits associated with PHRs, adoption rates are typically low, especially in developing countries. Socio-Technical Systems theory will be applied as a theoretical lens to identify the social, technical, and environmental factors that can affect the adoption of PHRs in the South African context.

Theoretical Lens: Socio-Technical Systems Theory

Socio-Technical System (STS) theory has its roots in the field of work redesign and is based on the premise that people (the social subsystem) make use of tools, techniques, and knowledge (the technical subsystem) to achieve a specific task and is open to outside influences from the greater environment in which they operate (the environmental subsystem) (Scacchi, 2004). The STS approach provides significant insights into the interrelationship between people and technology, as well as the influence of the external environment on this interrelationship (Baxter & Sommerville, 2011; Scacchi, 2004). As such, the STS approach is considered as a powerful framework through which the contributors to adoption and meaningful use of many ICT systems can be investigated (Coiera, 2007).

Whilst PHRs are consumer-oriented tools, Nazi (2013) states that PHR use have far-reaching implications for healthcare providers and the greater healthcare system. He also stresses the importance of studying PHR technology as a social practice that is influenced by, and has an influence on, the greater healthcare landscape. STS theory is thus deemed an appropriate theoretical lens through which to investigate factors that may both inhibit, as well as positively contribute, to the adoption and meaningful use of PHRs in the South African context.

Phase 1 of the data collection and analysis focused on identifying literature related to PHRs in the South African context. Only two recorded studies that focus on South African consumers' perceptions towards PHRs could be identified by the authors (Pottas & Mostert-Phipps, 2013; Jojo & Mostert-Phipps, 2013). Relevant South African literature and

statistics related to access to technology and so forth were also consulted. Based on this literature review several factors that may inhibit/contribute to PHR adoption in the South African context were identified.

In Phase 2 of the data collection and analysis STS theory was applied as a theoretical lens. All identified factors were analysed to determine whether the factor should be classified as a social, technical, or environmental inhibitor/contributor to PHR adoption in the South African context. The following were considered in terms of the STS analysis:

- **Social subsystem:** The influence of consumers on the adoption and meaningful use of PHRs was considered in terms of the analysis of the social subsystem. PHRs are typically owned, created, and managed by an individual, and as such consumers are considered the main roleplayers in the social subsystem.
- **Technical subsystem:** Since PHRs are typically web based, factors related to Internet access, Internet literacy, and so forth were considered in the analysis of the technical subsystem.
- **Environmental subsystem:** Factors related to outside influences that could inhibit or contribute to the adoption of PHRs were considered in the environmental analysis. This includes the influence of government policies, the South African healthcare landscape, and so forth.

Social, technical, and environmental factors that may contribute to or inhibit the adoption and meaningful use of PHRs will be discussed in the sections that follow.

Social Analysis

Since a PHR is typically owned, created, and managed by an individual, the influence of consumers on the adoption and meaningful use of PHRs will be considered in terms of the social analysis. Only two recorded studies that focus on South African consumers' perceptions towards PHRs could be identified by the authors. In 2012 a survey was conducted in the Nelson Mandela Bay (NMB) area of South Africa that investigated the perceptions of consumers regarding PHRs (Pottas & Mostert-Phipps, 2013). A similar nation-wide survey was conducted in 2013 (Jojo & Mostert-Phipps, 2013). Social factors that could inhibit and contribute to the adoption of PHRs in the South African context as derived from the results of these studies are described below.

Social inhibiting factors:

The results of the studies mentioned above indicate the following social factors that may contribute to a lack of adoption and meaningful use of PHRs in the South African context:

- **Personal record keeping practices:** The study conducted in the NMB area indicated that most participants (69%) did not keep a record of their full medical history. Those participants that did keep a record of their medical history primarily made use of paper-based means. The study also indicated that it was more likely for participants with chronic medical conditions to keep a record of their medical history.
- **Lack of awareness:** In the NMB survey, participants were asked if they were aware of the existence of PHRs that could aid them in keeping track of their full medical history and 84% of participants indicated that they were not aware of the existence of PHRs before participating in the survey.

Social contributing factors:

The South African-based studies further indicated the following results that may positively contribute to the adoption and meaningful use of PHRs in the South African context:

- Importance of medical history knowledge: In the national survey, 70% of participants indicated that it is extremely important for their healthcare provider to be aware of their full medical history whilst 42% indicated that their healthcare provider was not informed of their full medical history.
- Benefits offered by PHRs: Once they were made aware of the existence of PHRs, participants in the national survey expressed great interest in the features of web-based PHRs, especially viewing their medical records, test results and educational materials related to their health, as well managing medication lists, setting reminders for preventative health services and communicating with their healthcare providers. 69% of the participants indicated that they are interested in making use of PHRs to view their health information and manage their healthcare.
- Willingness to pay for PHR use: As seen in Figure 1 below, it was encouraging to note that participants in the national survey expressed a willingness to pay a monthly fee for the use of a PHR.

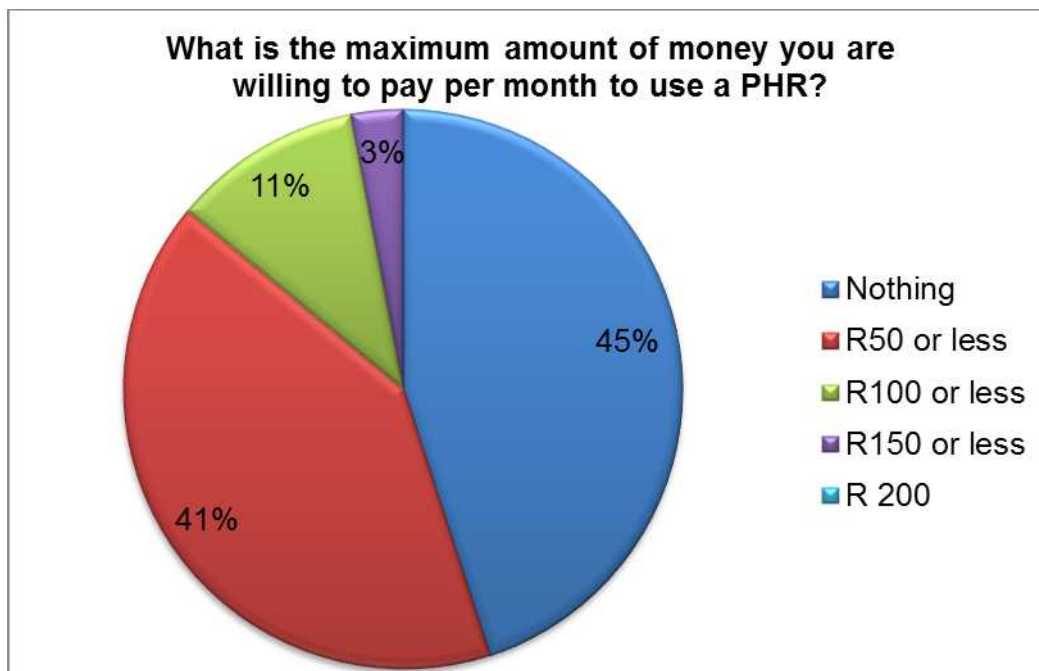


Figure 1. Willingness to pay for PHR use.

- Improved communication with healthcare providers: Participants in the national survey indicated that PHRs could potentially improve communication between themselves and their healthcare providers, with 48% indicating a great improvement, 31% a slight improvement, 13% no effect on communication and only 8% indicated that PHRs could potentially worsen communication.
- Improved understanding of own health: 53% of the participants in the national survey indicated that they believe that PHRs could greatly improve their understanding of matters related to their own health and 28% indicated a possible

- slight improvement in understanding.
- Improved sense of control: Participants in the national survey indicated that PHRs could give them an improved sense of control over their own healthcare (53% greatly improve and 30% slightly improve).

In the next section, technical factors that could inhibit and contribute to the adoption of PHRs are described.

Technical Analysis

Since PHRs are typically web-based, Internet access is a requirement for the adoption and meaningful use of PHRs. Other technical factors that may affect the adoption and meaningful use of PHRs include Internet literacy levels and so forth. Technical factors that could inhibit and contribute to the adoption of PHRs in the South African context are described below.

Technical inhibiting factors:

- Internet access: Statistics from Statistics South Africa's General Household Survey for 2013 reveal that access to the Internet remains a problem in South Africa (Statistics South Africa, 2013). As seen in Table 1, while the statistics vary from one province to the next, on average only 10% of South African households have access to the Internet at home (Statistics South Africa, 2013). When considering access to the Internet outside the home, the statistics further revealed that for 16.1% of households at least one member of the household has access to the Internet at home and 9.6% at Internet cafes or educational facilities. These statistics exclude access to the Internet via mobile devices such as cellular phones or 3G cards.

| Place Internet is accessed | Province (%) | | | | | | | | | |
|---|--------------|------|------|------|------|------|------|------|------|-------------|
| | WC | EC | NC | FS | KZN | NW | GP | MP | LP | RSA |
| At home | 21.0 | 4.8 | 6.6 | 6.9 | 5.7 | 4.4 | 15.6 | 6.8 | 3.0 | 10.0 |
| At work | 24.4 | 9.5 | 10.2 | 10.4 | 11.5 | 8.6 | 27.5 | 8.5 | 4.9 | 16.1 |
| Using mobile devices | 35.4 | 24.4 | 32.5 | 34.3 | 25.3 | 30.9 | 38.3 | 31.9 | 16.5 | 30.8 |
| At Internet cafes or educational facilities | 16.7 | 5.1 | 3.1 | 10.0 | 7.1 | 7.1 | 15.1 | 4.8 | 1.6 | 9.6 |

Table 1. SA Household Internet access by place of access (Statistics South Africa, 2013).

- Internet literacy:** The national survey referred to in previous sections indicated that participants in that survey did not rate themselves as particularly Internet literate (Pottas & Mostert-Phipps, 2013). When asked to rate their Internet literacy level, less than half of the participants considered themselves to be 'skilled' or 'very skilled' in terms of navigating the Internet to search for information (45%) and uploading and downloading information (47%).

Slightly more participants (52%) rated themselves as 'skilled' or 'very skilled' in terms of their ability to send e-mails.

- **Privacy concerns:** In the NMB survey mentioned previously the majority of participants (58%) indicated that they would be concerned about the privacy of their personal health information when using a PHR (Pottas & Mostert-Phipps, 2013).

Technical contributing factors:

- **Access to mobile technology:** Statistics South Africa's General Household Survey for 2013 reveal that at least 81.9% of South African households had access to at least one cellular phone (Statistics South Africa, 2013). As shown in Table 1, it is also encouraging to note that mobile technology has made access to the Internet much more accessible to South African households with 30.8% of households having mobile access to the Internet (Statistics South Africa, 2013).

As mentioned, PHRs have far-reaching implications for healthcare providers and the greater healthcare system and as such environmental factors that may contribute to or inhibit the adoption and meaningful use of PHRs will be discussed in the next section.

Environmental Analysis

Since this study focused on identifying factors through a literature review that focused on the South African context only, no environmental inhibiting factors could be identified. This does not imply that there are no environmental factors that could potentially inhibit the adoption and meaningful use of PHRs in the South African context, but it does indicate that it is a research area that has received little attention. The section below highlights environmental factors that may positively contribute to the adoption and meaningful use of PHRs in the South African context.

Environmental contributing factors

National Health Insurance (NHI): Once the National Health Insurance (NHI) is implemented in South Africa, primary healthcare services will be re-engineered to focus mainly on health promotion and preventative care (Department of Health, 2011). PHRs can play a significant role in achieving these goals by enabling patients to better manage their healthcare (Sprague, 2006). PHRs could be utilized to better educate patients about their medical conditions, improve adherence to medical and lifestyle changes, and engage them in medical decision-making. Its role in increasing health awareness could prove invaluable in promoting health and supporting healthcare providers in offering more effective preventative care as opposed to the South African healthcare system that is currently highly hospital-centric with a strong curative focus (Department of Health, 2011; Lehmann, et al., 2006; Markle Foundation, 2004).

- **Managing and reducing costs:** The use PHRs may gain support from healthcare funders since it may reduce healthcare costs due to fewer admissions and emergency room visits, avoidable drug-drug interactions, avoidable over-use of medications and increased use of over-the-counter medication in treating common chronic conditions (Adão, 2013).
- **Improved quality of healthcare:** Participants in the national survey mentioned previously perceived PHRs to contribute to an improvement in the healthcare that they receive with 45% indicating a potential great improvement and 33% a slight improvement. Participants also indicated that PHRs can contribute to a reduction in medical errors due to a lack of information, with 37% indicating a potential great improvement and 38% a slight improvement.

Discussion

The results of this study have revealed that whilst there are many factors that may positively contribute to the adoption and meaningful use of PHRs by South African consumers, there are also some significant barriers. The greatest of these being a lack of awareness in terms of the existence of PHRs and the benefits offered by PHR use, as well as a lack of access to the Internet through traditional channels. Despite the results that indicate a lack of Internet access as a significant barrier, emerging mobile PHRs (mPHRs) hold great promise to encourage the adoption and meaningful use of PHRs as a platform to engage South African consumers in self-care (Adão, 2013). Statistics also indicate that significantly more South African households have access to the Internet via mobile devices than through any other means, as previously seen in Table 1 (Statistics South Africa, 2013).

Conclusion

This exploratory study focused only on literature relating to the South African context in an effort to identify socio-technical factors that may inhibit or positively contribute to the adoption and meaningful use of PHRs by South African consumers. There are limited published studies related to the adoption and meaningful use of PHRs in the South African context. The socio-technical analysis discussed in this paper provides insights into the interrelationship between the various role-players involved in the adoption of PHRs, as well as the influence of such role-players on the successful adoption of PHRs. Whilst this paper highlighted various barriers that should be addressed to support the adoption of PHRs, it is encouraging to note that consumers (social subsystem) are very interested in the features offered by PHRs and that there are various environmental factors that may also contribute to the successful adoption of PHRs in the South African healthcare landscape.

This study further revealed that there is a need for further research to identify comprehensive factors that may inhibit or positively contribute to the adoption and meaningful use of PHRs in the South African context. Future research will focus on identifying such factors, as well as investigating the relevance of international literature on the topic in the context of the South African healthcare landscape.

Acknowledgements

The financial assistance of the South African National Research Foundation (NRF) towards this research is hereby acknowledged. Opinions expressed and conclusions arrived at, are those of the authors and are not necessarily to be attributed to the NRF.

References

- Adão, W. (2013, May 27). *Technology enabled self-care to overhaul healthcare industry*. Last accessed June 26, 2014, from Deloitte: <http://www.cover.co.za/healthcare/technology-enabled-self-care-to-overhaul-healthcare-industry>
- Baxter, G., & Sommerville, I. (2011). Socio-technical systems: From design methods to systems engineering. *Interacting with Computers*, 23(1), 4 - 17.
- Christopherson, G. A. (2005). HealthePeople: Person-Centered, Outcomes-Driven, Virtual Health Systems. In J. E. Demetriades, R. M. Kolodner, & G. A. Christopherson, *Person-Centered Health Records: Toward HealthePeople*. Springer.
- Coiera, E. (2007). Putting the technical back into socio-technical research. *International Journal of Medical Informatics*, 98 - 103.
- Department of Health. (2011). National Health Act (61/2003): Policy on National Health Insurance. *Government Gazette*, 554(34523).
- Dohan, M. S., Abouzahra, M., & Tan, J. (2014). Mobile Personal Health Records: Research Agenda for Applications in Global Health. *47th International Conference on System Science*, 2576 - 2585. Hawaii: IEEE.
- Jojo, S., & Mostert-Phipps, N. (2013). Awareness and interest in web-based Personal Health Records. *Proceedings of the 15th Annual Conference on World Wide Web Applications*. Cape Town: Cape Peninsula University of Technology.
- Lehmann, H. P., Abbott, P. A., Roderer, N. K., Rothschild, A., Mandell, S., Ferrer, J. A., et al. (2006). *Aspects of Electronic Health Records* (2nd ed.). Springer.
- Markle Foundation. (2004, July). Last accessed June 10, 2014, from Connecting Americans to their Healthcare: Working Group on Policies for Electronic Information Sharing Between Doctors and Patients: http://www.markle.org/sites/default/files/eis_exec_sum_final_0704.pdf
- Nazi, K. M. (2013). The Personal Health Record Paradox: Health Care Professionals' Perspectives and the Information Ecology of Personal Health Record Systems in Organizational and Clinical Settings. *Journal of Medical Internet Research*, 15(4).
- Pottas, D., & Mostert-Phipps, N. (2013). Citizens and Personal Health Records - The Case of Nelson Mandela Bay. *Studies in Health Technology and Informatics*, 192, 501-504. IOS Press.

Scacchi, W. (2004). Socio-technical design. In W. S. Bainbridge (Ed.), *The Encyclopedia of Human-Computer Interaction*. Berkshire Publishing Group.

Sprague, L. (2006). *Personal Health Records: The People's Choice?* Last accessed June 10, 2014, from National Health Policy Forum. Issue Brief Number 820. : URL: http://www.nhpf.org/library/issue-briefs/IB820_PHRs_11-30-06.pdf.

Statistics South Africa. (2013). *General Household Survey 2013*. Last accessed June 26, 2014, from <http://beta2.statssa.gov.za/publications/P0318/P03182013.pdf>

Tang, P. C., Ash, J. S., Bates, D. W., Overhage, J. M., & Sands, D. Z. (2006). Personal Health Records: Definitions, Benefits, and Strategies for Overcoming Barriers to Adoption. *Journal of the American Medical Informatics Association*, 13(2), 121-126.

Watermeyer, L. (2013, 9 18). *Health-e*. Last accessed June 27, 2014, from Government unveils NCD strategic plan: <http://www.health-e.org.za/2013/09/18/government-unveils-ncd-strategic-plan/>