Views from the field: Industry opinion and commentary papers

EJISE has an open invitation for Industry practitioners to submit opinion and commentary papers. In this section we publish viewpoints of Industry experts on current or emerging industry-based Information Systems management practice, or on current or emerging technologies. The objective of this section of the issue is to stimulate discussion and debate on topical Information Systems issues from an industry perspective, thereby feeding into the academic research cycle.

Designers are from Mars, Physicians are from Venus: challenges on integrating HCI and IS perspectives into Healthcare

Guido Giunti MD
Salumedia Tecnologias, Spain
University of Oulu, Finland
guidogiunti@salumedia.com

The ubiquity of information and communication technologies (ICTs) can't be challenged in today's world. The current global use of smartphones has reached 2.6 billion (Ericsson 2017) and this is without counting other type of devices like personal computers or tablets. It is a surprise to no one that the underlying Information Systems (IS) have permeated other fields and disciplines, changing and redefining them. What is surprising, however, is its relatively slow adoption in healthcare and medicine. There are several factors at play that can explain this situation.

A large number of health IS are available to assist clinicians in providing efficient, quality care. Healthcare institutions have been increasingly implementing electronic health records (EHR) over the last decade. Despite many positive outcomes, clinicians continue to complain about difficulties with usability, lack of cognitive support or failures to match workflow in design (Yen & Bakken 2012; Kushniruk et al. 2004; Kossman 2006; Patterson et al. 2002). In this sense, health IS evaluation is complex because it is often intended to serve multiple functions and is conducted from the perspective of a variety of disciplines (Wyatt & Wyatt 2003). Health IS that provides cognitive support should be expected to match the users' task-based mental processes such as perception, memory, reasoning and behavior. This might explain why usability methods that have emerged from the field of cognitive psychology are gaining traction. These are considered to transcend the level of revealing interface design flaws; and advance to the stage of providing insight into clinicians' cognitive processing in achieving their intended tasks (Kushniruk & Patel 2004; Peute et al. 2011). The importance of designing intuitive health IS lies in supporting and facilitating clinical care by keeping the cognitive task workload of its users to a minimum (Horsky et al. 2005). To ensure the best utilization of health IS, however, it is essential to keep in mind its key components such as its intended users (eg, physicians, nurses, or pharmacists), tasks (eg, medication management, free-text data entry, or patient record search), and environment (eg, operation room, ward, or emergency room). The relevance of human–computer interaction (HCI), which relates to the design and use of computer technology, focused on the interfaces between people (users) and computers (Carroll 1997), is thus paramount. Developers of health IS should adopt user-centered design when possible, drawing upon experience among people with different ages, different abilities and different levels of education and literacy (Nath & Sharp 2015).

There is currently a surge of digital health start-ups (Sung Kim 2015) focused on designing mobile health (mHealth) applications; however 51% of these companies are in danger of failing within 20 months of their launch according to an Accenture report (Accenture 2015). Entrepreneurs who decide to launch patient-facing mHealth apps lack any well established best practice guide to help them navigate their first steps towards an effective and let alone a successful health app. The vast majority of health apps usually fall into the general wellness, exercise and diet category. This is likely because of individual entrepreneur's lack of experience in the healthcare sector and would appear to outsiders be a "safer bet". However, going forward it's likely those

Reference this paper: Giunti G "Designers are from Mars, Physicians are from Venus: challenges on integrating HCI and IS perspectives into Healthcare" *The Electronic Journal Information Systems Evaluation Volume 20 Issue 1 2017, (p55-58)* available online at www.ejise.com

kinds of apps will not survive long as patients are starting to look for apps designed with their specific needs in mind, to engage them and deliver relevant and actionable information.

Another issue that is often underestimated by designers and developers is the importance healthcare professionals place on evidence base and clinical validation. There is an almost instinctive reaction from the healthcare community when faced with the implementation of any type of digital health intervention. This needs to be understood and handled appropriately to ensure success, as clinicians will rarely approve any intervention that hasn't been properly designed and tested. Here's where the differences in backgrounds becomes more apparent; generally speaking, healthcare professionals value more quantitative approaches with statistically significant outcomes. Such an approach has even been dubbed by some as "the tyranny of randomized controlled trials" (Roitberg 2012). This means that an mHealth app for Cancer that was designed without proper patient's needs assessment or "tested" with just a handful of users is not likely to cut the mustard for them.

This brings to light an important concern that IS professionals usually don't have to deal with: bioethical considerations. Unlike the development of regular applications where end-users can interact with preliminary versions of a product, the testing of patient-facing health applications should go through an Institutional Review Board (IRB) process to assess whether exposing patients to it presents any risk or potential harm. The IRB is a type of committee whose focus is to approve, monitor, and review biomedical and behavioral research involving humans. This caution can sometimes be seen as excessive but it has its reasons for existing. From the healthcare professional perspective, any recommendation or instruction given to a patient becomes a medical action and thus carries all that this entails. Suppose an app encourages users to exercise and is recommended to a patient by his physician; because it's the physician doing the recommending, that patient will "trust" the app. He might expect the app to warn him before starting any activity that could cause him harm and in lacking that warning, do it anyway and get hurt as a result of that. This is an extreme case of course, but the point stands: there is a power asymmetry that needs to be considered.

Legislation and regulations exist to prevent pharmaceutical companies from launching to market untested drugs, forcing them to comply with strict validation regimes. A similar rigor is beginning to be expected for health IS interventions. In the United States of America for example, the Food and Drug Administration (FDA) has created regulations for mHealth apps that directly influence patient treatment (FDA 2015), however most medical apps are not formally evaluated under the current guidance (Barton 2012; Visvanathan et al. 2012). The absence of healthcare provider involvement in health IS development is particularly interesting, especially considering that the medical community raised concerns around non-medical personnel promoting app design and development (O'Neill & Brady 2012; Connor et al. 2014; Hamilton & Brady 2012; Wong et al. 2015; Ventola 2014).

Determining the level of engagement users have with a specific technology is a complex and multifaceted matter. Some authors even consider that it's a dynamic process with four distinct stages: (1) point of engagement, (2) period of engagement, (3) disengagement, and (4) reengagement (O'Brien & Toms 2008; Taki et al. 2017). In a way, user engagement and its measurement differs when thinking either short or long term, reflecting the degree of involvement a user has with the system over time (Bickmore et al. 2010). We should also consider that users will behave differently if they are forced to use our health IS (eg, the case of an EHR in a hospital setting) or if they adopt it willingly (eg, an app that has been downloaded).

Regardless of the possible challenges that designing and evaluating health IS may present, it is without a doubt a growing field that will require active involvement from multidisciplinary teams and will provide interesting opportunities worthy of exploration. Taking a page from the "the Blue Ocean Strategy" marketing theory; just as companies can succeed by creating a product in "blue oceans" of uncontested market space, as opposed to "red oceans" where competitors fight and shed blood for dominance, so too we can approach this space with the knowledge that its waters are still blue.

Challenges and Considerations on Designing Health IS

• **Condition-specific and user-specific needs**
  o *Understanding inherent differences between target populations are key; ie assuming breast cancer patients will behave similarly to prostate cancer patients is a recipe for failure.*
• **Clinical Validation**
  o *Healthcare professionals generally value more quantitative approaches with statistically significant outcomes similar to clinical research.*
• **Governmental Regulations**
  o *Health IS interventions that directly influence patient treatments will become regulated.*
• **Ethical Concerns**
  o *Involvement of patients in design and testing stages should require the approval of an Institutional Review Board to assess potential risks.*
• **Stakeholder biases**
  o *Risk aversion and change management are major determinants for proper technology adoption in this field.*

References

Accenture, 2015. *Healthcare IT : Zombie Start-Ups and Vulture Capital*,

Barton, A.J., 2012. The regulation of mobile health applications. *BMC Medicine*, 10(1), p.46. Available at: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3364852&tool=pmcentrez&rendertype=abstract.

Bickmore, T., Schulman, D. and Yin, L., 2010. Maintaining engagement in long-term interventions with relational agents. *Applied Artificial Intelligence*, 24(6), pp.648–666. Available at: http://www.tandfonline.com/doi/abs/10.1080/08839514.2010.492259.

Carroll, J., 1997. Human-Computer Interaction: Psychology as a Science of Design. *Journal of Human-Computer Studies*, 46, pp.501–522.

Connor, K. Brady, R.R., de Beaux, A., Tulloh, B., 2014. Contemporary hernia smartphone applications (apps). *Hernia*, 18(4), pp.557–561.

Ericsson, 2017. *Ericsson Mobility Report 2017*, Available at: https://www.ericsson.com/assets/local/mobility-report/documents/2017/ericsson-mobility-report-june-2017.pdf.

FDA, 2015. Mobile Medical Applications. *U.S. Deapartment of Health and Human Services Food and Drug Administration*, p.44. Available at: http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/UCM263366.pdf.

Hamilton, A.D. and Brady, R.R.W., 2012. Medical professional involvement in smartphone “apps” in dermatology. *British Journal of Dermatology*, 167(1), pp.220–221.

Horsky, J., Zhang, J. and Patel, V.L., 2005. To err is not entirely human: Complex technology and user cognition. *Journal of Biomedical Informatics*, 38(4), pp.264–266.

Kossman, S.P., 2006. Perceptions of impact of electronic health records on nurses’ work. *Studies in health technology and informatics*, 122 Mennonite College of Nursing, Illinois State University, USA.), pp.337–341. Available at: http://www.embase.com/search/results?subaction=viewrecord&from=export&id=L44993685%5Cnhttp://ucelinks.cdlib.org:8888/sfx_ucsf?sid=EMBASE&issn=09269630&id=doi:&atitle=Perceptions+of+impact+of+electronic+health+records+on+nurses%27+work.&stitle=Stud+Health+.

Kushniruk, A., Triola M., Stein, B., Borycki, E., and Kannry, J., 2004. The relationship of usability to medical error: An evaluation of errors associated with usability problems in the use of a handheld application for prescribing medications. *Studies in Health Technology and Informatics*, 107, pp.1073–1076.

Kushniruk, A.W. and Patel, V.L., 2004. Cognitive and usability engineering methods for the evaluation of clinical information systems. *Journal of Biomedical Informatics*, 37(1), pp.56–76.

Nath, P.A. and Sharp, C.D., 2015. A User-Centered Design Approach to Information Sharing for Older Patients and Their Families. *JAMA internal medicine*, pp.1–2.

O’Brien, H.L. and Toms, E.G., 2008. What is user engagement? A conceptual framework for defining user engagement with technology. *Journal of the American Society for Information Science and Technology*, 59(6), pp.938–955. Available at: http://doi.wiley.com/10.1002/asi.20801.

O’Neill, S. and Brady, R.R.W., 2012. Colorectal smartphone apps: Opportunities and risks. *Colorectal Disease*, 14(9), pp.530–534.

Patterson, E.S., Cook, R.I. and Render, M.L., 2002. Improving Patient Safety by Identifying Side Effects from Introducing Bar Coding in Medication Administration. *Journal of the American Medical Informatics Association*, 9(5), pp.540–553. Available at: https://academic.oup.com/jamia/article-lookup/doi/10.1197/jamia.M1061.

Peute, L.W.P., de Keizer, N.F., van der Zwan, and Jaspers, M.W., 2011. Reducing clinicians’ cognitive workload by system redesign; A pre-post think aloud usability study. *Studies in Health Technology and Informatics*, 169, pp.925–929.

Roitberg, B., 2012. Tyranny of a “Randomized Controlled Trials.” *Surgical Neurology International*, 3(1), p.154. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3551523/.

Sung Kim, J., 2015. What's Really Killing Digital Health Startups. Available at: http://techcrunch.com/2015/10/30/whats-really-killing-digital-health-startups/ [Accessed March 14, 2016].

Taki, S., Lymer, S., Russel, C.G., Campbell, K., Laws, R., Ong, K.L., Elliot R., Denney-Wilson, E., 2017. Assessing User Engagement of an mHealth Intervention: Development and Implementation of the Growing Healthy App Engagement Index. *JMIR mHealth and uHealth*, 5(6), p.e89. Available at: http://mhealth.jmir.org/2017/6/e89/.

Ventola, C.L., 2014. Mobile Devices and Apps for Health Care Professionals : Uses and Benefits. , 39(5), pp.356–364.

Visvanathan, A., Hamilton, A. and Brady, R.R.W., 2012. Smartphone apps in microbiology — is better regulation required ? *Clinical Microbiology and Infection*, 18(7), pp.E218–E220. Available at: http://dx.doi.org/10.1111/j.1469-0691.2012.03892.x.

Wong, S.J., Robertson, G.A., Connor, K.L., Brady, R.R., Wood, A.M., 2015. *BMC Sports Science, Medicine and Rehabilitation*, 7(1), p.23. Available at: http://www.biomedcentral.com/2052-1847/7/23.

Wyatt, J.C. and Wyatt, S.M., 2003. When and how to evaluate health information systems? *International Journal of Medical Informatics*, 69(2–3), pp.251–259.

Yen, P.-Y. and Bakken, S., 2012. Review of health information technology usability study methodologies. *Journal of the American Medical Informatics Association*, 19(3), pp.413–422. Available at: https://academic.oup.com/jamia/article-lookup/doi/10.1136/amiajnl-2010-000020.