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Effect of age on perceptions of a Clinical Information System by physicians in a French Teaching hospital

Authors: Roxana Ologeanu-Taddei, Claudio Vitari

Abstract. Objective. Previous research highlighted generation and age effects on the perceptions and uses of technology. The goal of this study was to examine the relationship between age and perceptions of a Clinical Information System (CIS) for physicians, surgeons, anesthesiologists and residents. Methods. A survey was conducted in September 2015 in a French Teaching Hospital, based on a questionnaire consisting of items on the Likert scale. Results. The impact of age has a strong impact on Perceived Ease of Use, anxiety and Self-efficacy. The result related to Perceived Ease of Use is unexpected. Younger staff reported to be less comfortable with technology than older. This result is not consistent with literature. We propose an explanation consisting in the importance of clinical process and organization knowledge and skills while general technology skills of young generations may be less significant. Conclusion. This study shows that age does have an effect of self-efficacy, anxiety and ease of use but the relationship between age and ease of use is not the same as expected.

KEY WORD : Hospital, Clinical Information Systems, Electronic Medical Records, Perceptions, Ease of Use, Clinical process.

1. Introduction

In recent years, a significant amount of research has been conducted on comparing the level of technology adoption between younger and older age employees. A recent trend of research is focused on generational differences [1] and gap attitudes to technology between different generations. Generation is defined as groups, which are identifiable in terms of year of birth, age, location, and significant events at critical developmental stages [2]. Currently many authors consider Generation Z [3], named also Digital Natives or Millennial Generation (born after 1985-1990) as having more "sophisticated technological skills" [4] which should transform the use of new technologies in the workforce.

Nevertheless, research pointed out that the generation is not homogeneous in its use and appreciation of new technologies [5]. Furthermore, literature has not come to identify if differences in technology skills and forms of technologies uses are related to generation or age effect.

Another trend of research is focused on the age effect on technology adoption level. Authors highlighted age differences in information processing have an impact on older workers' performance of computer-based tasks (e.g., data entry, file maintenance, and inventory management) [6]. A longitudinal study [7] showed age has important influences on technology adoption and sustained usage decisions. Specifically, younger workers appear to be more driven by a cost and benefits evaluation of the use of technology whereas older workers are more motivated by social norm and the perception of their competency to use the technology. Authors suggest this difference may be related to generation effect taking into account that workers were familiarized with information technologies during their scholarship. Consequently, young workers may be more reliant on the use of technology for job accomplishment while older workers may be much more habituated to seeking and applying "no technology" solutions to job-related tasks.

Generally, older workers have a more difficult time adapting to changes in the work environment and would prefer methods that are familiar to them [6]. An older staff is negatively related to the probability of introducing new or significantly improved technologies [8].

Given this background, it may be expected that age factor influences clinical use and adoption of a Clinical Information System (CIS). Nevertheless, little or any evidence is offered to support this

relationship. The aim of this paper is to measure the link between age and perceptions of the CIS in a French teaching hospital.

1. Theoretical framework

Research focused on technology adoption or on Information Systems evaluation by users identified main factors adoption decision or users' satisfaction: ease of use, usefulness [9], anxiety and perceived behavioral control, defined as "one's belief in his or her ability to execute a particular task/job using a computer" [10], system quality, information quality, service quality [11] and trust [12]. Ease of use and customization are main indicators of system quality [11]. System quality represents the desirable characteristics of an information system, as ease of use, flexibility, system reliability, and ease of learning, as well as system features of intuitiveness, sophistication, flexibility, and response times [11]. Thus, ease of use is one dimension of system quality. Information quality is shaped by four dimensions: completeness as the degree to which the system provides all necessary information; accuracy, meaning the user's perception that the information is correct, format, meaning the user's perception of how well the information is presented, and currency or timeliness, representing the user's perception of the degree to which the information is up to date [13].

2. Research method and design

2.1. Context

Our investigation was conducted in September 2015 in a large French University hospital. The hospital has more than 2500 beds; it covers all the clinical specialties and an Emergency department. The aim was to measure the link between age and the users' perceptions related to CIS of the hospital, namely information and system quality (security and liability), ease of use, non customization (to the clinical process and needs), self-efficacy, anxiety, trust, usefulness and intention of use. We consider intention to not use even if the use of the CIS is mandatory. We consider that intention to not use (if it could be possible) is a good indicator of proactive use.

The CIS incorporates computerized physicians order entry, medical and nursing observation, laboratory tests results, medical prescription, operating room process management, planning and billing management.

2.2. Method

A questionnaire was developed and administered online to the medical staff (n= 1124, meaning 844 physicians, surgeons and anesthesiologists and 280 residents). 668 questionnaires were collected (499 from physicians, surgeons and anesthesiologists and 169 for residents), which means a response rate of 60%. Each variable is measured using a question derived from a review of previous studies, adapted from different scales [7, 11, 13-16] and each question was answered using a seven-point Likert scale, with one indicating "strongly disagree" and seven indicating "strongly agree." Age is measured through 4 ordinal categories: less than 35, 35-45, 45-55, more than 55 years old. We applied the Kruskal Walls test to assess if age has an impact on the information systems variables.

We have to specify that these categories are very closely of professional status categories because the age of residents is less than 35 while permanent employment is in general more than 35. For the clinical staff, median age is 45.

3. Results

We found that age has an impact on perceived anxiety, self-efficacy, ease of use, trust, non customization and system quality. Nevertheless, age has no influence on intention of use and usefulness. These results are summarized in the table 1:

[Insert Table 1 about here]

4. Discussion

A rapid view of these results shows age has an effect on different perceptions of the CIS. The impact of age factor is very strong on Anxiety, Self-efficacy and Ease of Use. But, surprisingly, these relationships are not the same as expected. First, younger physicians reported less anxiety than older. We may explain this result by the fact that younger are generally residents, which are

supervised by seniors for medical tasks as prescribing or inpatient's discharge. Thus, the responsibility of medical errors is assumed by seniors.

Second, youngers stated to have less Self-Efficacy. The growth of this relationship is continuous over the for age categories. This means older staff reported more abilities to use CIS. We explain this result by the lack of sufficient clinical knowledge of younger that predominates over general technology skills.

Third, youngers reported to be less comfortable with technology than the other categories, especially middle categories (35-45 years and 45-55 years). These results may be explained by the fact that using CIS is not intuitive [17] and requires learning and developing skills related to particular clinical process of medical specialties. Other explanation may be focused on the gap between younger staff habits to use intuitive and ludic applications, which contrast with CIS ergonomics.

The impact of age is also strong on Trust and Non customization. Youngers reported the lowest rate of trust. This result may be connected to results related on Behavioral Control and Ease of Use. Youngers reported less non customization rate, which may be explained by their less knowledge of clinical process and specificity.

The impact of age is little on System Quality (security). Youngers stated less System Quality rate, which it is not surprising given the previous results. But, surprisingly, older staff reported System Quality. We have no explication for this result and we suggest to make further research to find out if system security is an important topic for all the age categories.

Last, the impact of age is not significant on Usefulness neither Intention of use.

These mixed results do not confirm previous studies on age impact on technology use. First, the specificity of clinical process, by occupations and specialties, seems to be more important than general technological skills [17]. More in-depth research is needed to explore the link between clinical specialties (e.g. Pediatrics, Gerontology) and CIS perceptions. Second, age has not the same effect on different variables. Behavioral Control, Ease of Use and Anxiety seem to be more discriminant than other variables.

5. Conclusion

While literature pointed out generation and age effects on technology perceptions and attitudes, related to younger people technological skills, our study shows that age does have an effect of self-

efficacy, anxiety and ease of use but the relationship between age and ease of use is not the same as expected. Younger staff reported less self-efficacy and ease of use, probably because they have less knowledge about clinical and organizational process. Other perceptions related to CIS are less or not at all correlated with age. We conclude that age factor is not the most relevant for the analysis of CIS perceptions.

CONFLICTS OF INTEREST

The authors have no relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript.

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