Technological and informational frames: explaining age-related variation in the use of patient accessible electronic health records as technology and information

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Funding: The work of Huvila, Enwald and Eriksson-Backa has been funded by the Academy of Finland Grant No. 287084 for the research project Taking Health Information Behaviour into Account: implications of a neglected element for successful implementation of consumer health technologies on older adults (HIBA).

The authors would like to thank the participants of the survey study. The work is supported by the under Academy of Finland Grant No. 287084 for the research project Taking Health Information Behaviour into Account: implications of a neglected element for successful implementation of consumer health technologies on older adults (HIBA). The work of Huvila, Cajander, Rexhepi and Moll is supported by the DOME consortium which studies the Development of Online Medical Records and eHealth Services. The authors would also like to thank Dr. Noora Hirvonen for insightful input in the beginning of the work towards this article and Inera AB (www.inera.se) for providing the data on the usage of the national e-services and managing the survey and data collection through Journalen.
Abstract

Purpose – Data from a national patient survey (N = 1,155) of the Swedish PAEHR “Journalen” users were analysed, and an extended version of the theory of technological frames was developed to explain the variation in the technological and informational framing of information technologies found in the data.

Design/methodology/approach – Patient Accessible Electronic Health Records (PAEHRs) are implemented globally to address challenges with an ageing population. However, firstly, little is known about age-related variation in PAEHR use, and secondly, user perceptions of the PAEHR technology and the health record information and how the technology and information-related perceptions are linked to each other. The purpose of this study is to investigate these two under-studied aspects of PAEHRs and propose a framework based on the theory of technological frames to support studying the second aspect, i.e. the interplay of information and technology-related perceptions.

Findings – The results suggest that younger respondents were more likely to be interested in PAEHR contents for general interest. However, they did not value online access to the information as high as older ones. Older respondents were instead inclined to use medical records information to understand their health condition, prepare for visits, become involved in their own healthcare and think that technology has a much potential. Moreover, the oldest respondents were more likely to consider the information in PAEHRs useful and aimed for them but to experience the technology as inherently difficult to use.

Research limitations/implications – The sample excludes non-users and is not a representative sample of the population of Sweden. However, although the data contain an unknown bias, there are no specific reasons to believe that it would differently affect the survey’s age groups.

Practical implications – Age should be taken into account as a key factor that influences perceptions of the usefulness of PAEHRs. It is also crucial to consider separately patients’ views of PAEHRs as a technology and of the information contained in the EHR when developing and evaluating existing and future systems and information provision for patients.

Social implications – This study contributes to bridging the gap between information behaviour and systems design research by showing how the theory of technological frames complemented with parallel informational frames to provide a potentially powerful framework for elucidating distinct conceptualisations of (information) technologies and the information they mediate. The empirical findings show how information and information technology needs relating to PAEHRs vary according to age. In contrast to the assumptions in much of the earlier work, they need to be addressed separately.

Originality/value – Few earlier studies focus on (1) age-related variation in PAEHR use and (2) user perceptions of the PAEHR technology and the health record information and how the technology and information-related perceptions are linked to each other.

Keywords e-health, Information seeking behaviour, End users, Technology, Theoretical concepts

Paper type Research paper

1. Introduction

Patient Accessible Electronic Health Records (PAEHRs) are implemented to meet multiple healthcare challenges, including those relating to ageing populations, information access and patient empowerment. Earlier studies of PAEHRs have investigated attitudes towards an eventual introduction of PAEHRs (Petersson and Erlingsdóttir, 2018) and later on, attitudes and practices of individuals with experience of using such services (Moll et al., 2018; Rexhepi et al., 2018; Bell et al., 2019). So far, there are, however, relatively few comprehensive investigations of the age-related differences in experiences relating to PAEHRs, even if multiple studies show that age is a central factor that influences PAEHR use (Crameri et al., 2020). A parallel research gap, which is especially pertinent to older adults, relates to studies that make a distinction between experiences of PAEHRs as technology of accessing information and experiences with the electronic health record (EHR) information itself (cf. Huvila et al., 2016; Hirvonen et al., 2020). Even if negative attitudes, low self-efficacy and technology problems can lead to problems in accessing information (Pourrazavi et al., 2020), technology and information-related needs and desires are distinct issues (Huvila et al., 2016). Earlier research shows that the health and health information needs change and increase (Huvila et al., 2018) with age, while the propensity to adopt new technologies changes (Birkland, 2019) and sometimes decreases (Hong and Cho, 2016; Keränen et al., 2017; Vorrink et al., 2017; Pourrazavi et al., 2020). These two gaps point to a critical need for comprehensive comparative research on age-related variation in PAEHR usage and a better theory-informed
analytical understanding of the differences and their underpinnings from the perspective of framing or perceiving PAEHRs as a distinct form of technology and as a source of a specific type of health information.

Considering that the user–technology–information nexus is not pertinent only to PAEHRs, this article has a two-fold aim. First, it provides novel insights into how the use and perceptions of information in PAEHRs and PAEHRs as a technology vary across age groups. Second, in more general terms, it adds to our understanding of how perceptions of information content and information technologies are intertwined but distinct to each other and proposes an analytical framework to explain these differences. The framework builds on Orlikowski’s and Gash’s (1994) notion of technological frames of reference, broadening its scope from technology (see the critique of Gal and Berente, 2008) to information by making a distinction between users’ technological frames (TF) and informational frames (IF) of reference.

The study addresses two research questions: (RQ1) how the theory of technological frames can be used and complemented to explain the variation of perceptions of technologies and information they are conveying (such as PAEHRs and medical record information) in different user groups and (RQ2) how such an extended framework can be applied to analyse how the preferences and use of, respectively, PAEHR and PAEHR information, differ between younger adults (under 51 years old), older adults (51–66 years old), and elderly (older than 66). The analysis is based on analysing data from a country-wide online survey of patients (N = 1,155) who have accessed the Swedish national PAEHR *Journalen*.

2. Literature review
2.1 Patient accessible electronic health records
In 1997, the region of Uppsala, Sweden, started a series of projects to provide patients access to their medical records online. A comprehensive PAEHR system was launched in 2012 when all region residents, from 18 years of age, gained online access to their medical records. In 2015, the local system was migrated to a national service platform to enable nationwide access to the service. Today, all 21 self-governing regions in Sweden offer access to medical notes covering all healthcare professions and all public and private providers connected to the system and have agreed to give access to the notes. Due to different administrative decisions, individual regions provide access to information to a varying extent. This makes it difficult for the users to know what information is accessible and especially what remains inaccessible.

PAEHRs have also been introduced in many other countries. Common for many of these systems is that they enable patients to access, control and share health information as they choose (Mamra et al., 2017). In Europe, the development has been especially rapid in the Nordic-Baltic region, for example, in Estonia, Denmark (Rahbek, 2013), Norway (Zanaboni et al., 2020) and Finland (Jormanainen et al., 2019). In the US, the pioneering Open Notes initiative started around 2010 (Delbanco et al., 2012; Walker et al., 2019). Studies of PAEHR use suggest improved doctor–patient communication, adherence, understanding of the medical condition, healthcare delivery and better preparation for healthcare appointments (Moll et al., 2018; Walker et al., 2019). In parallel to reported benefits, healthcare workers, have voiced critique (Alander and Scandurra, 2015). In particular, physicians have been concerned that PAEHRs will cause patients distress, confusion and increase professionals’ workload (Grünloh et al., 2018; Klein et al., 2015).

2.2 Age, PAEHR, health information and technology use
A recent systematic review on older adults’ views on e-health services (Hirvonen et al., 2020) indicates that existing research on older adults as e-health service users focuses on social uses
and health management rather than personal information management. User experiences, the purposes and benefits of e-health services or their long-term value for people are rarely investigated. E-health is unlikely to impact the target group unless it is actually used (Rockmann and Gewald, 2016). Research on PAEHR use has been conducted on patients with different conditions, for example, in oncology (cf. Gerber et al., 2014; Rexhepi et al., 2018) and psychiatry (O’Neill et al., 2019). Also, the impact of demographic factors such as age (Huvila et al., 2016) has been studied to a certain extent. Nevertheless, studies explicitly comparing different groups, e.g. related to age, are still relatively scarce.

In general, age is a strong indicator of differences in use of information and communication technology (ICT). Despite the growing use of the internet, older adults are still falling behind younger adults (Hong and Cho, 2016). The gap in technology adoption between younger and older individuals might diminish but not disappear completely in time (Charness and Boot, 2009). Older adults have different attitudes towards and reasons for using technologies (Birkland, 2019). According to a review by Ma et al. (2015), older adults have a positive attitude towards using ICTs. However, life changes, such as retirement, might affect access to and attitudes toward technology (Birkland, 2010). In some studies, the use of new technologies in ICT has been found to decrease by age (Heart and Kalderon, 2013; Keränen et al., 2017; Vorrink et al., 2017), while in others (e.g. Halmdienst et al., 2019), the age effect did not apply to specific attitudes towards health-related ICT devices. In contrast, Heart and Kalderon (2013) confirmed that older age, especially together with poorer health, decreased adoption of healthcare-related ICT. Lee et al. (2011) found that barriers to use were perceived differently among pre-seniors (50–64 years), young–old (65–74 years) and older-old (75 years or over). The older-old had most difficulties with technology use. Based on the findings, Lee et al. emphasise that seniors’ needs should be considered according to their age groups.

In the context of PAEHRs, one of the few examples that compares age groups is Nurgalieva et al. (2020), who report that older patients share the content of their PAEHRs more frequently. Similarly to this study, also others have investigated age differences concerning specific activities or issues. Middle-aged (40–59 years) and older people (60–85 years) have been compared on their ability to use a personal health record system (Taha et al., 2013). Papoutsi et al. (2015) studied public views on security and privacy of electronic health records showing some differences between age categories. Also, studies on the adoption of mobile health services show differences between youth (18–49 years) and elderly (50 years and above) (Guo et al., 2016) as well as middle-aged (40–59 year-olds) and older (60+) (Deng et al., 2014).

ICT use and digital inequality have been linked to the older adults’ social well-being (Ihm and Hsieh, 2015). E-health is ideally positioned to empower older adults and support their well-being. There are, however, possible obstacles to use due to problems with physical health and cognition, differences in literacies, including health literacy, digital literacy and numeracy and attitudes towards technology (Berkowsky and Czaja, 2018; Enwald et al., 2017). Also, older adults often face challenges when searching online health information. Bol et al. (2016) found that adults 65 years or older needed more time to read online health messages to recall as much information as younger ones. Also, Sanchiz et al. (2017) found lower cognitive flexibility in information processing among those aged 60 or over. Furthermore, cognitive function and health literacy are related (Kobayashi et al., 2015), and e-health literacy scores might decrease with older age (Tennant et al., 2015).

3. Theory
In 1994, Orlikowski and Gash introduced the concept of technological frames of reference (TF) to instigate socio-cognitive perspective into the field of information technology research
Orlikowski and Gash (1994). Orlikowski and Gash defined TF as “structures or mental models that are held by individuals” and proposed further that the TFs are also “assumed to be shared by a number of individuals”. The concept of TF is understood in a wide sense as “not only the nature and role of the technology itself, but the specific conditions, applications, and consequences of that technology in particular contexts” (p. 178). In their definition, TFs concern assumptions, expectations, and knowledge that people use to understand technology. Congruence and incongruence of TFs refer to how well (or badly) TFs of different stakeholder groups (e.g. developers and users) of technologies align with each other. Incongruence can lead to skepticism, conflicting expectations and resistance to the use of technologies (Orlikowski and Gash, 1994). Orlikowski and Gash (1994) presented three general types of TFs: (1) the nature of technology – what the technology is; (2) technology-in-use - how it is used to create various changes in use and (3) technology strategy – why it was introduced. They suggest these three frames as a starting point, and further, that it might be possible to identify others. Since then, various new TFs have been introduced (c.f. e.g. Bartis, 2007; Davidson and Pai, 2004; Iivari and Abrahamsson, 2002; Olesen, 2014a, b).

Building on how Orlikowski and Gash see technology in TFs, we suggest that information can be conceptualised using a similar approach. Similarly to how TFs can be seen as “structures or mental models that are held by individuals”, it is possible to conceive informational frames (IF) as structures or models held by individuals that concern assumptions, expectations and knowledge they use to understand information (i.e. in a broad sense what is informative). IFs extend the original narrow focus of the theory from technology (criticized e.g. by Gal and Berente, 2008) to cover information (content) as a parallel, but often disregarded (Hirvonen et al., 2020), aspect of the social context of e-health use. Like TFs, also IFs can be shared by several individuals (as e.g. in Olesen, 2014a, b, cf. Gal and Berente, 2008) and compared to each other to investigate the congruence or incongruence of frames within a group or between different groups of individuals. Further, even if the data we have analysed in the present study represent a snapshot of individuals, the analysis and age-related variation suggest that IFs like TFs (e.g. in Olesen, 2014a) change in time. Analogously to TFs, we suggest that IFs can also be categorised according to parallel domains (in Table 1) to those proposed for TFs (Orlikowski and Gash, 1994), including (I) the

| Technological frame | Informational frame |
|---------------------|---------------------|
| Technology-in-use   | Information-in-use  |
| Technology Strategy | Information strategy |
| Nature of Technology| Nature of information |

**Source(s):** Developed on the basis of Orlikowski and Gash (1994, pp. 183–184)
nature of information (what information is, in an ontological sense); (2) information-in-use (how it is used to create various changes in use) and (3) information strategy (why it was introduced). Further, similarly to how Orlikowski and Gash suggest that the three original TFs are only examples, it is conceivable that additional IFs can be identified.

The rationale behind IFs is to introduce a comprehensive framework for explicating assumptions, expectations and knowledge that people use to understand technologies and information within one framework. Earlier research has on several occasions emphasised that although preferences, the usefulness of and perspectives to information and information technologies (whether digital or non-digital) are tightly intertwined, technology and “content” are two different matters (e.g. Blandford and Attfield, 2010; Fidel, 2012). We argue that elucidating informational and technological frames together provides a useful perspective to technology and content, quoting Orlikowski and Gash (1994, p. 174), “for explaining and anticipating actions and meanings that are not easily obtained with other theoretical lenses”.

The proposed framework complements approaches that have focussed on describing how information and technologies are entwined in practices and activities, including practice and activity theories, sociomateriality (Allen et al., 2019) and, for instance, the concept of information worlds (Jaeger and Burnett, 2010). In contrast to approaches focussing on elucidating the respective roles of information and technologies separately, concurrent analysis of the two from parallel perspectives can help to see congruencies, incongruencies and links between views related to information and technology that risk remaining invisible if studied in isolation.

4. Methods and material

4.1 Participants and data collection procedure

The analysis investigates material gathered through a national online survey of patients who have accessed the national PAEHR (Journalen) in Sweden. The survey was based on an anonymous self-completion questionnaire. It was distributed on the login page of Journalen meaning that everyone who logged in the system (open at the time for everyone of 18+ of age with a Swedish personal identity number) were included in the study. The study was ethically approved by the Regional Ethical Review Board in Uppsala (EPN 2016/129). The data were collected between June and October 2016. The total number of responses was 2,587 (response rate of 0.61%, 2,587/423141 of individuals who logged in the system during the survey period), of which \( N = 1,155 \) responses were included in this study, leaving out incomplete data for the analysed questions.

4.2 Survey instrument

The survey questions focussing on attitudes, experiences of use, usage of information, information content, security, personal health and demographics, were developed based on a literature review and earlier studies related to Journalen including Huvila et al. (2015), Rexhepi et al. (2018), Grünloh et al. (2016) and Scandurra et al. (2015). A comprehensive description of the development of the survey instrument and a descriptive overview of the non-age-group specific survey results, left out from this paper because of the lack of space, is presented in Moll et al. (2018) together with a copy of the survey instrument. Five-point Likert-like-scale questions from all categories mentioned above, except security, were chosen for analysis to provide a basis for assessing the respondents’ attitudes towards PAEHR information and technology, and further, to investigate whether the different views could be framed and explained in terms of TFs and IFs.

4.3 Analysis

The data were analysed in SPSS 25.0 with Kruskal–Wallis tests, with a 95% confidence interval to investigate how the group of respondents labelled as older adults (294/
1,155 = 25% of respondents), born between 1950 and 1964 (by the time of data collection between 51 and 66 years old) differ from those born after 1965 (i.e. younger than 51 by the time of data collection) labelled as young (695/1,155 = 60%), and those born before 1949 (older than 66 when the data were collected) labelled as elderly (166/1,155 = 14%). Hence, years of age was used as a grouping variable in the analysis. The categorisation was based on an earlier observation of the significance of the transitory period of older adulthood (Huvila et al., 2018, cf. e.g. Bol et al., 2016). Older adults form a category of individuals with a long life experience, who are still active in their life, either working or recently retired, but already anticipating or experiencing changes in their healthcare needs. Two-way MANOVA was used to investigate the effect of work experience in the healthcare sector (binary question yes/no), and of suffering of chronic conditions (multiple choice questions with options covering cancer, psychiatry, high blood pressure and diabetes).

5. Results
5.1 General findings
70% (805 of 1,155) of the respondents were female and 30% (350 of 1,155) male. 74% (777 of 1,155) had at least secondary- or upper-secondary-level education. Three percent (34 of 1,155) had no formal education. 71% had a chronic condition (825 of 1,155), and 46% worked or had previously worked in healthcare (531 of 1,155).

In general, the respondents were fairly satisfied with their health (mean 3.11, SD 1.193 on a five-point scale). They considered it a very good idea to read medical records online (mean 4.78, SD 0.595). They were also highly confident that they understood most of the medical record’s content (mean 4.51, SD 0.756).

The most prominent reasons to use PAEHRs online were to get an overview of one’s own health or condition (mean 4.62, SD 0.767), to recapitulate a visit (mean 4.40, SD 0.942), to get more involved in (one’s own) healthcare (mean 4.23, SD 1.050), and general interest (mean 3.74, SD 1.243). The respondents were most inclined to seek information by themselves, e.g. on the internet (mean 4.30, SD 0.984) and ask healthcare staff during their next visit (mean 4.05, SD 1.084) if they did not understand something in their medical record. The most significant implications of being able to read their medical records were that the respondents considered that they felt better informed (mean 4.65, SD 0.668), thought that it improves communication between them and healthcare professionals (mean 4.29, SD 0.924), that they will be able to understand their health or condition better (mean 4.25, SD 0.971) and that they felt safer (mean 4.25, SD 0.951).

The respondents were generally optimistic about the usefulness of the suggested information services based on the information found in their medical record (see Table 2 for alternatives). Only the ability to write their own comments in the text of the record (mean 3.39, SD 1.406), the ability to communicate with healthcare in the patient portal (mean 2.01, SD 1.120) and the ability to block access to the medical record information, with mean 3.06 and standard deviation of 1.435, scored below 3.5 on the five-point scale.

Elderly respondents worried less about their health compared to older adults and young respondents (Table 3). The difference was significant between the elderly and older adults ($\chi^2(2) = 6.666, p < 0.05$). Otherwise, there were no statistically significant differences between the groups on how they perceived their health or how often they thought about it.

The effects of working in healthcare and having chronic conditions were studied using MANOVA. Due to the large group size (500+ in both cases), non-homogeneity of covariance matrices (significant Box’s test $p < 0.001$) of the dependent variables could be omitted (Allen and Bennett, 2008). Multivariate normality of the data was assumed based on using the Shapiro–Wilks test of normality on each individual dependent variable. No multicollinearity
Referral (content and how it is handled in care) 19.494 0.000 553.80 634.64 579.01
List of all prescribed pharmaceuticals 2.395 NS
Overview of all vaccinations 2.260 NS
Results of tests 8.386 0.015 565.54 608.73 575.74
Overview of all healthcare contacts 5.914 NS
Being able to read record entries from psychiatry 10.443 0.005 589.68 590.60 506.77
Being able to read all types of record entries 4.974 NS
Ability to order and manage medical certificate and other certificates 21.897 0.000 585.97 610.69 486.74
Ability to point out errors I find in the record 22.042 0.000 544.46 634.75 601.55
Ability to write own comments to text in Journalen 9.976 0.007 556.66 627.91 578.96
Contribute with information on health, e.g. by providing health declaration for next visit 8.164 0.017 591.80 580.47 515.84
Contribute with information of self-testing or monitoring at home 6.061 0.048 562.11 617.31 572.92
Contribute information about expectations for the healthcare visit 14.593 0.001 552.10 633.62 587.95
Contribute with information on health electronically and ask questions about medical record 2.115 NS
Ability to contact healthcare electronically and ask questions about medical record 5.596 NS
Ability to communicate electronically with other patients 7.557 0.023 581.43 601.74 521.60
Ability to block certain medical records from access by other medical staff 109.441 0.000 653.61 497.25 404.45

Table 2. Importance of the contents of the medical record

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Table 3. Questions about health
was detected by examining variance inflation factors. Besides, no outliers were detected by examining Malahanobis distances.

According to the analysis, there were no statistically significant interaction effects between age categories and respondents work experience in healthcare ($F(188, 2090) = 1.057$, $p = 0.292$; Wilks’ $\Lambda = 0.834$), age categories and respondents chronic conditions ($F(188, 2090) = 0.952$, $p = 0.663$; Wilks’ $\Lambda = 0.848$), or the three ($F(188, 2090) = 1.098$, $p = 0.182$; Wilks’ $\Lambda = 0.828$) on the combined dependent variables. The analysis proceeded with examining the main effect of age categories.

### 5.2 Differences between the young, older adults and elderly

The findings on significant differences and similarities are reported below according to the five surveyed themes: (1) reasons for reading medical record (Table 4), (2) contents of the medical record (Table 5), (3) the meaning of reading medical records (Tables 2 and 6), (4) usability of the Journalen system (Table 7) and (5) online e-health services and information (Table 8).

#### 5.2.1 Reasons for reading medical record

Young respondents were most likely to read their medical record online for general interest (young versus elderly $X^2(2) = 4.742$, $p < 0.001$; young versus older adults $X^2(2) = 4.487$, $p < 0.001$) but least likely to use it for getting an overview of personal medical history and treatment (young versus elderly $X^2(2) = 2.657$, $p < 0.05$; young versus older adults $X^2(2) = 2.959$, $p < 0.01$), to prepare for a visit (young versus elderly $X^2(2) = 4.261$, $p < 0.001$; young versus older adults $X^2(2) = 4.455$, $p < 0.001$) and to become more involved in one’s own healthcare (Young vs. Elderly $X^2(2) = 3.907$, $p < 0.001$; Young vs. Older Adults $X^2(2) = 3.870$, $p < 0.001$).

#### 5.2.2 Contents of the medical record

The young respondents were least likely to consider that the medical records contain too much technical language. The difference was significant in comparison to the elderly ($X^2(2) = 2.502$, $p < 0.05$). The young were also least inclined to think that the medical records should be written more comprehensible (young versus elderly $X^2(2) = 3.753$, $p < 0.005$; young versus older adults $X^2(2) = 2.555$, $p < 0.05$). Moreover, they were the least confident that they understand the most of the test results ($X^2(2) = 3.213$, $p < 0.01$) and referral information ($X^2(2) = 3.005$, $p < 0.01$) reported in the medical record with a significant difference to the elderly.

The older adults were least likely to ask anonymous questions via the public health portal www.1177.se to seek clarifications if they had not understood something in their medical record. The difference between them and the young was significant ($X^2(2) = 2.417$, $p < 0.05$).

| Statements                                      | Chi-square | Mean rank (Kruskal-Wallis) | Older adult ($n = 294$) | Elderly ($n = 166$) |
|-------------------------------------------------|------------|---------------------------|-------------------------|---------------------|
| Mostly general interest                         | 34.402     | 622.33                    | 522.29                  | 491.05              |
| To get an overview of my medical history and treatment | 12.785     | 556.23                    | 608.71                  | 614.74              |
| To get an overview of my relatives’ medical history and treatment | 4.367      | NS                        |                         |                     |
| Because I am not sure if I got the right care    | 1.168      | NS                        |                         |                     |
| To follow up what has been said during a healthcare visit | 5.200      | NS                        |                         |                     |
| Because I suspect inaccuracies                   | 2.544      | NS                        |                         |                     |
| To prepare for my healthcare visit              | 30.668     | 535.27                    | 635.75                  | 654.61              |
| To become more involved in my care              | 24.400     | 542.50                    | 624.17                  | 644.86              |

Table 4. Reasons for reading medical records
They were also least likely to seek clarification by themselves (with a significant difference to the young $X^2(2) = 2.645, p < 0.05$), to do nothing (young versus older adults $X^2(2) = 4.132, p < 0.001$; elderly versus older adults $X^2(2) = 3.220, p < 0.005$), and to ask their relatives. In contrast, the young were the most likely to do so (young versus elderly $X^2(2) = 4.649, p < 0.001$; young versus older adults $X^2(2) = 7.473, p < 0.001$).

With a significant difference to the young respondents, the older adults were more inclined to consider that referrals ($X^2(2) = 4.415, p < 0.001$) and test results ($X^2(2) = 2.894, p < 0.02$) are important. In contrast, the elderly were least likely to think that the possibility to order and manage medical certificate and other certificates (young versus elderly $X^2(2) = 4.074, p < 0.001$; older adults versus elderly $X^2(2) = 4.528, p < 0.001$), and information about mental health (young versus elderly $X^2(2) = 3.127, p < 0.01$; older adults versus elderly $X^2(2) = 2.813, p < 0.02$) would be important. With a significant difference to the young, they also thought that the possibility to add comments to the text of the medical record ($X^2(2) = 3.158, p < 0.005$) and to write information about expectations for the healthcare visit ($X^2(2) = 2.458, p < 0.05$) is important. Older Adults were also most positive to the possibility of communicating electronically with other patients – with a significant difference to the young ($X^2(2) = 3.794, p < 0.001$).

| Statements                                                                 | Chi-square | Sig.  | Mean rank (Kruskal–Wallis) |
|----------------------------------------------------------------------------|------------|-------|-----------------------------|
| I understand most of what is in the medical records                        | 3.413      | NS    | 566.19                      |
| I think that the medical records contain too much technical language       | 6.352      | 0.042 | 573.01                      |
| I think that the medical records should be written more comprehensible    | 16.994     | 0.000 | 548.09                      |
| I understand most of the test results                                      | 10.765     | 0.005 | 557.01                      |
| I understand most of the log list                                          | 11.994     | 0.002 | 552.45                      |
| The content in the record reflects the information I think that healthcare has about me | 4.456      | NS    | 605.81                      |
| There is information about me that is missing in the record which I think should be there and that the staff should know | 2.015      | NS    | 635.70                      |

Table 5. Understanding the contents of the medical record

ITP 35,8
The young respondents were least inclined to consider it important to be able to point out errors in the medical record (significant difference to the older adults $\chi^2(2) = 4.521, p < 0.001$) but most likely to think that adding notes about one’s own health is useful (significant difference to the elderly $\chi^2(2) = 2.853, p < 0.02$).

Older adults and young were more inclined to think that it is important to be able to access log lists to see which professionals had accessed their medical record information (significant difference between the elderly and older adults $\chi^2(2) = 2.709, p < 0.05$). The young were the most and the elderly least likely to consider that accessing children’s medical record information is important (young versus elderly $\chi^2(2) = 9.143, p < 0.001$; older adults versus elderly $\chi^2(2) = 3.030, p < 0.01$; older adults versus young $\chi^2(2) = 7.125, p < 0.001$).

5.2.3 The meaning of accessing own patient information. Young respondents were least likely to consider that reading medical records helps to improve communication with medical staff (young versus elderly $\chi^2(2) = 5.158, p < 0.001$; young versus older adults $\chi^2(2) = 4.113, p < 0.001$) that it would help them to take better care of their health (young versus elderly $\chi^2(2) = 5.328, p < 0.001$; young versus older dults $\chi^2(2) = 3.959, p < 0.001$) or that it would be essential for their ability to actively participate in decisions on their own or their relatives’ health (young versus elderly $\chi^2(2) = 3.808, p < 0.001$; young versus older adults $\chi^2(2) = 4.101, p < 0.001$). In comparison to the elderly ($\chi^2(2) = 2.992, p < 0.01$), they were, however, less inclined to believe that it leads to improvements in health and social care or that it would improve their understanding of their condition ($\chi^2(2) = 3.348, p < 0.005$). In comparison to the elderly, the young were also less likely to discuss the contents of their medical record with healthcare staff ($\chi^2(2) = 2.812, p < 0.05$) and to keep their patient information for own documentation ($\chi^2(2) = 3.330, p < 0.005$). In contrast, no significant differences were observed between the young and older adults.

5.2.4 Usability of the Journalen system. Older adults were most and the young least likely to use Journalen regularly ($\chi^2(2) = 3.200, p < 0.005$). The elderly were most likely to consider that they would need personal technical support to use Journalen (young versus elderly

| Statements                                                                 | Chi-square | Sig. | Mean rank (Kruskal-Wallis) Mean rank (Kruskal-Wallis) Mean rank (Kruskal-Wallis) | Young $(n = 695)$ | Older adult $(n = 294)$ | Elderly $(n = 166)$ |
|----------------------------------------------------------------------------|------------|------|---------------------------------------------------------------------------------|------------------|------------------------|-------------------|
| It improves communication between medical staff and me                     | 35.395     | 0.000| 536.59                                                                           | 623.15           | 671.39                 |
| It leads to improvements in health and social care                         | 11.566     | 0.003| 553.60                                                                           | 603.59           | 634.83                 |
| It improves my understanding of my condition                              | 11.897     | 0.003| 556.68                                                                           | 590.71           | 644.73                 |
| It makes me feel safe                                                      | 2.450      | NS   | 556.88                                                                           | 622.39           | 681.34                 |
| It makes me feel informed                                                  | 4.546      | NS   |                                                                                  |                  |                        |
| It leads to that I can take care of my health better                       | 36.027     | 0.000| 534.39                                                                           | 622.39           | 681.34                 |
| It leads to that I can take care of my relatives’ health better             | 1.966      | NS   |                                                                                  |                  |                        |
| It is essential that I am able to actively participate in decisions about my or my relatives’ health | 25.294     | 0.000| 539.18                                                                           | 631.55           | 645.67                 |
| For my own documentation                                                   | 11.777     | 0.003| 556.02                                                                           | 591.14           | 646.74                 |
| It has no relevance                                                        | 3.495      | NS   |                                                                                  |                  |                        |
| I discuss the content of Journalen with medical staff                      | 10.636     | 0.005| 553.81                                                                           | 604.75           | 631.89                 |
| It has no relevance                                                        | 3.495      | NS   |                                                                                  |                  |                        |
| I discuss the content of Journalen with medical staff                      | 10.636     | 0.005| 553.81                                                                           | 604.75           | 631.89                 |

Table 6. The meaning of reading medical records

The young respondents were least inclined to consider it important to be able to point out errors in the medical record (significant difference to the older adults $\chi^2(2) = 4.521, p < 0.001$) but most likely to think that adding notes about one’s own health is useful (significant difference to the elderly $\chi^2(2) = 2.853, p < 0.02$).
5.2.5 Online e-health services and information. Young respondents differ from the other groups in that they were less likely to consider that access to online medical records is a positive reform (young versus older adults $X^2(2) = 3.758, p < 0.0001$; young versus elderly $X^2(2) = 3.072, p < 0.01$), and in comparison to older adults, that access to Journalen is good for them ($X^2(2) = 3.639, p < 0.0001$). They were also most inclined to compare information from different sources (significant difference to the Elderly; $X^2(2) = 3.256, p < 0.01$) and least likely to suffer from information overflow (young versus older adults $X^2(2) = 2.980, p < 0.01$; young versus elderly $X^2(2) = 2.799, p < 0.02$).

5.3 Summary
According to the findings, the young respondents were more likely to be interested in the PAEHR for general interest. In contrast, the two other groups were inclined to read medical
records to understand their own health condition, prepare for visits and become more involved in healthcare. The two older groups were also most likely to think that reading their EHR leads to concrete benefits and activities. The young considered further that they understood least the content of their medical records. It is too difficult to read and should be made more comprehensible. In contrast, the older respondents were primarily concerned of the difficulty of using the Journalen system and navigating information overflow. For their part, older adults were least likely to seek clarification by themselves if they failed to understand something but simultaneously least likely to do nothing. In contrast, with only a few exceptions, they scored the highest on how they ranked the importance of accessing different types of information and services in the PAEHR, except for using the system for their children and contributing information about their health.

6. Young, older adults and elderly as users of electronic health records
The findings show differences and similarities between the age groups in their use of EHRs and attitudes. In the following, the theory of technological frames extended with the notion of informational frames is used as a framework for explicating the characteristic perspectives of each age group, i.e. what is their view of the use and usefulness, what are their assumptions
of the underpinning strategies and nature of Journalen (PAEHR) as a technology and EHR as a type of information. Instead of testing the validity of the theory by measuring TFs or IFs of the respondents in the survey, the theory of Orlikowski and Gash (1994) and the technological frames included in the original study with their corresponding informational counterparts were used as an analytical lens to make sense of the variation in attitudes towards information (content) and PAEHR technology investigated in the survey.

### 6.1 Young

Young (Table 9) are most likely to use the EHR system for general interest rather than for a specific need. At the same time, they are least likely to consider that the online access or PAEHR system to EHR information is a positive development. In their technological frame, a PAEHR unfolds as a system they use independently together with many other technologies (technology-in-use). It is not developed for that specific group (technology strategy) even if it as a whole is a good idea (nature of technology). In contrast to older age groups, they are not worried that the system would be difficult to learn or use but are more concerned with not understanding the contents, i.e. information.

The young are most likely to read their EHR for general interest (information-in-use) rather than for a specific purpose like receiving an overview of medical history, to prepare for visits and to get more involved in care. The information written in technical language is not directed to them (information strategy). It is merely one type of information they encounter in their everyday life (nature of information). They form the most proactive group concerning seeking and comparing information from different sources in case they would not understand something, for instance by asking anonymous questions online via 1177.se, asking others or searching by themselves – probably partly because they feel that they do not know everything but at the same time lack regular contact with healthcare. Overall, in their technological and informational frames, they feel competent to seek information (in general) and use the PAEHR system but are not proficient in understanding medical information and terminology.

### 6.2 Older adults

Older adults (Table 10) are in a life stage where they have begun to anticipate the increasing need for more information about their health and are prepared to seek help if they have not understood something. As a whole, they are largely positive about PAEHRs as a technology and EHR information. In their technological frame, the system is potentially beneficial for them (technology-in-use). It might have been developed for them to help them with their changing health information needs (technology strategy). PAEHR is for them a technology with a lot of potential (nature of technology). From an informational perspective, the

| Technological frame | Informational frame |
|---------------------|---------------------|
| Technology-in-use   | Information-in-use  |
| Using independently, together with other online sources | Written for someone else (difficult to understand, not so many benefits) |
| Developed for someone else | A part of the flood of health information; not suffering from information overload |
| Positive idea in general |                               |

**Table 9. Technological and informational frames of the Young relating to PAEHRs**
information in the EHR is potentially useful, especially in the future. Therefore, it would be important to determine what it means if something is difficult to understand (information-in-use). In par, the older adults can consider that the information has been made available to them to exploit (information strategy) and consider it essential for them by its nature (nature of information). They are least likely to do nothing if they do not understand something but most inclined to want to use Journalen regularly and think that it is good. The impression of the trust in the usefulness of the technology is further supported by them being the most likely group to believe that the log list function can be useful.

6.3 Elderly
The elderly (Table 11) were most likely to see multiple benefits with PAEHRs and understand the information in EHRs. Within their technological frame, Journalen is likely to be difficult to learn or use both for them (technology-in-use) and for others to the extent that not everyone finds it easy to learn (technology strategy), and they themselves would need technical support. Considering the generally negative view of its usability, their pessimism might extend to the level of the nature of Journalen as a technology. In contrast, in their informational frame, the elderly seems to consider EHR information useful for specific purposes (information-in-use) rather than general interest (cf. young). This group is the most confident regarding their capability to understand EHR contents, but probably because it is only one source of health information for them (information strategy), they are least likely to seek clarifications if they do not understand something (nature of information) and explicitly compare information from different sources but are most likely to get too much health information.

| Technological frame | Informational frame |
|---------------------|---------------------|
| Technology-in-use   | Information-in-use  |
| Technology strategy | Information strategy|
| Nature of technology| Nature of information|

| Technology-in-use   | Information-in-use |
|---------------------|---------------------|
| Technology strategy | Information strategy|
| Nature of technology| Nature of information|

Table 10. Technological and informational frames of the Older Adults relating to PAEHRs

Table 11. Technological and informational frames of the Elderly relating to PAEHRs
7. Discussion

7.1 Differences between the young, older adults and elderly

The present findings support the idea that PAEHRs have multiple potential benefits (e.g. Gerard et al., 2017; Moll et al., 2018; Walker et al., 2019). The analysis shows, however, that the experienced benefits vary between age groups and confirm earlier observations that age significantly influences PAEHR use (Crameri et al., 2020) and e-health adoption in general (e.g. Keränä et al., 2017; Lee et al., 2011; Vorrink et al., 2017). The new findings are beneficial considering that age is an easily measurable factor and straightforward to use to guide the development of PAEHR technologies and information. Echoing the reminder of Rockman and Gewald (2016) that e-health services have no impact if they are not used, the present findings show that it is apparent that much work still needs to be done to help older adults and elderly, who have positive attitudes but doubts about their skills, to use PAEHRs in practice.

The general trends in the findings can be linked to typical immediate needs (or the lack thereof) in the age groups. Older individuals are more likely to have medical conditions (as in Greenberg et al., 2017; Sakaguchi-Tang et al., 2017) and more complex personal medical histories, forthcoming visits to healthcare or immediate interest to be involved in their own healthcare. Also, the differences in how particular age groups perceived difficulties in understanding their medical record information can plausibly be linked to how people in different ages experience and interpret medical information about themselves. Similarly to earlier findings (e.g. Archer et al., 2011; Deng et al., 2014; Hong and Cho, 2016; Lee et al., 2011), the elderly respondents were least confident of their technical skills. However, as a whole, our findings suggest that technology adoption in different age groups is a more complicated question than that of attitudes or technical skills. One possible explanation to earlier contradictory findings of differences between age groups is undoubtedly a mismatch between general attitudes and expectations (e.g. Ma et al., 2015). However, it can also depend on how well a particular technology matches specific user group’s informational needs, wants and skills. According to the findings, older adults are largely positive about both PAEHRs as a technology and EHR information. In contrast, the elderly are pessimistic about PAEHR technology – although thinking that the possibility to access medical record information online is a positive reform that they would likely benefit from (cf. e.g. Kim et al., 2009; Zanaboni et al., 2020). In this sense, the age group–specific findings provide strong evidence for a broadening of the focus from technology acceptance and adoption only as the contents of EHRs and the PAEHR technology need to be considered in tandem but separately from each other when information is developed, tailored and delivered (i.e. technology) to different age groups.

7.2 Technological and informational frames

Apart from the empirical results on the differences between the three surveyed age groups, another key implication of this study relates to the use of the theory of technological frames (TF) (Orlikowski and Gash, 1994) and its extension with informational frames (IF) as means to systematise the understanding of the overlap and differences in how people conceptualise technologies and (informational) content, differently but in parallel to each other. IFs extend the original theory beyond technology (cf. Gal and Berente, 2008). The analysis with TFs and IFs shows that the three age groups’ technological and informational frames differ, illustrating the fact that the framing of technologies (e.g. PAEHR) differs from how the age groups conceive the information it is used to mediate and deliver (e.g. EHR). The young respondents considered PAEHR as a positive idea. However, they did not think that EHR information would play a particular role for them in any specific sense. Simultaneously, they considered that the technology and the contents were developed for someone else. Older adults were more inclined to believe that the EHR information was made available for them
and could benefit from it. Their attitude towards PAEHRs was positive even if they were unsure if it would work for them. In contrast, the elderly strongly doubted their ability to master the technology. However, they were mostly very confident of the usefulness of EHR information and their ability to benefit from it. The findings indicate what Orlikowski and Gash (1994) described as incongruence between the different stakeholder groups’ frames that can explain a part of the experienced anxieties and relative dissatisfaction with the PAEHR technology and EHR information. Distinguishing TFs and IFs showcases also that potentially harmful incongruence may stem from misalignment of TFs concerning IFs within a single group. This underlines the relevance of studying the incongruence of frames within groups, as suggested by Young et al. (2016) or smaller groups within larger ones. The simultaneous, fairly high level of satisfaction shows, however, that incongruence between the TFs and IFs of different user groups does not necessarily lead to problems if the frames are not, as Khoo (2001) suggests, completely incommensurate but at least somehow hospitable (cf. Huvila, 2009) enough to each other. From the (in)congruence perspective, future studies describing patients’ TFs and IFs together with those of healthcare professionals, healthcare management and systems developers will undoubtedly be interesting and useful for complementing the present understanding of how their views align or collide. Similarly, as Davidson and Pai (2004) suggest, it could be useful to inquire into the development and change of frames – not only of TFs but of TFs together with and in concerning to IFs. Moreover, the present analysis conducted on quantitative data should be complemented with more in-depth qualitative inquiries.

As a whole, the analysis shows that the combined framework of TFs and IFs complements approaches that have focussed on describing how information and technologies are entwined in practices and activities, including practice and activity theories, sociomateriality (Allen et al., 2019) and, for instance, the concept of information worlds (Jaeger and Burnett, 2010). The different (in)congruencies between TFs and IFs highlight the broader sociotechnical or in this study more precisely the information-technological (i.e. pertaining to information and technology) nature of information technologies. Addressing technology and information (content) in parallel to each other (cf. Hirvonen et al., 2020) helps to identify and underlie discrepancies, similarities and links between the information and technology–related views that otherwise risk to remain invisible or indistinct from each other if they are studied in isolation or assumed to be subordinate to each other. Young et al. (2016) suggest solving incongruencies between specialist communities by engaging in perspective-taking and inconsistencies between communities by focussing on perspective-making. While working with such broad non-specialist groups as age groups that only to a limited extent qualify as communities, much of the responsibility of making and taking perspectives and facilitating the activities falls on experts who are envisioning, developing, deploying and promoting technologies and providing information. The diversity of perspectives to PAEHRs between groups and the two types of frames identified in the analysis suggests the need for both – understanding and taking the perspectives of different stakeholder groups of PAEHRs and making them support effective use of technologies and their capabilities to convey information.

7.3 Limitations

When interpreting the present findings, certain limitations need to be taken into account. Because the survey was available only for those who logged in to the Journalen system, the sample excludes non-users. Further, even if the survey population is broad, it is not a representative sample for Sweden or other countries. However, although the data contain an unknown bias, there are no specific reasons to believe that it would differently affect the survey’s age groups.
8. Conclusions

This study contributes to bridging the gap between information behaviour and systems design research by showing how the theory of technological frames complemented with the explication of the parallel informational frames can provide a potentially powerful framework for elucidating distinct conceptualisations of (information) technologies and the information they mediate. There is room for future research to elaborate and investigate further into different types of informational frames and the concept in relation to technological frames and research on the parallel implications of how people conceptualise information and (information) technologies.

The empirical findings show how information and information technology needs relating to PAEHRs vary according to age. In contrast to the assumptions in much of the earlier work, the present study and its findings stress the vital importance of addressing these needs separately in the research of patient attitudes and experiences and the development, deployment and promotion of new systems and services. Future research on technological and information frames in different age groups is still needed to expand on current findings and refine the present understanding of how frames change during people’s life-course.

In practice, the analysis suggests that much of the variation can be explained as a function of actual and anticipated health information needs and how information and technology are respectively experienced as useful or problematic. Successful tailoring of information services such as PAEHRs requires parallel but separate consideration of the use and perceptions of technologies and the content they are designed to deliver. Content does not come with the technology – they come together and need equal attention.

References

Alander, T. and Scandurra, I. (2015), Experiences of Healthcare Professionals to the Introduction in Sweden of a Public Ehealth Service: Patients’ Online Access to Their Electronic Health Records, MedInfo, Amsterdam, pp. 153-157.

Allen, P.J. and Bennett, K. (2008), SPSS for the Health and Behavioural Sciences, Thomson, South Melbourne.

Allen, D., Given, L.M., Burnett, G. and Karanasios, S. (2019), “Information behavior and information practices: a special issue for research on people’s engagement with technology”, Journal of the Association for Information Science and Technology. doi: 10.1002/asi.24303.

Archer, N., Fevrier-Thomas, U., Lokker, C., McKibbon, K.A. and Straus, S.E. (2011), “Personal health records: a scoping review”, Journal of the American Medical Informatics Association, Vol. 18 No. 4, pp. 515-522.

Bartis, E. (2007), “Two suggested extensions for SCOT: technological frames and metaphors”, Society and Economy, Vol. 29 No. 1, pp. 123-138.

Bell, E., Woo, H., Baldwin, K., Pfeffer, M. and Tsai, R. (2019), “How patients use a patient portal: an institutional case study of demographics and usage patterns”, Applied Clinical Informatics, Vol. 10 No. 1, pp. 096-102.

Berkowsky, R.W. and Czaja, S.J. (2018), “Challenges associated with online health information seeking among older adults”, Aging, Technology and Health, Academic Press, London, pp. 31-48.

Birkland, J. (2010), “Exploring impacts on older adults’ channel selection when faced with an information need”, Proceedings of the IConference 2010.

Birkland, J. (2019), Gerontechnology: Understanding Older Adult Information and Communication Technology Use, Emerald, Bingley.

Blandford, A. and Attfield, S. (2010), Interacting with Information, Morgan and Claypool, San Rafael, CA.
Bol, N., van Weert, J.C.M., Loos, E.F., Romano Bergstrom, J.C., Bolle, S. and Smets, E.M.A. (2016), “How are online health messages processed? Using eye tracking to predict recall of information in younger and older adults”, Journal of Health Communication, Vol. 21 No. 4, pp. 387-396.

Charness, N. and Boot, W.R. (2009), “Aging and information technology use: potential and barriers”, Current Directions in Psychological Science, Vol. 18 No. 5, pp. 253-258.

Cramer, K.-A., Maher, L., Van Dam, P. and Prior, S. (2020), “Personal electronic healthcare records: what influences consumers to engage with their clinical data online? A literature review”, Health Information Management Journal, 1833358319895369.

Davidson, E. and Pai, D. (2004), “Making sense of technological frames: promise, progress, and potential”, Information Systems Research, Springer, New York, pp. 473-491.

Delbanco, T., Walker, J., Bell, S.K., Darer, J.D., Elmore, J.G., Farag, N., Feldman, H.J., Mejilla, R., Ngo, L., Ralston, J.D., Ross, S.E., Trivedi, N., Vodicka, E. and Leveille, S.G. (2012), “Inviting patients to read their doctors’ notes: a quasi-experimental study and a look ahead”, Annals of Internal Medicine, Vol. 157 No. 7, pp. 461-470.

Deng, Z., Mo, X. and Liu, S. (2014), “Comparison of the middle-aged and older users’ adoption of mobile health services in China”, International Journal of Medical Informatics, Vol. 83 No. 3, pp. 210-224.

Enwald, H., Hirvonen, N., Kangas, M., Keränen, N., Jämsä, T., Huvila, I. and Korpelainen, R. (2017), “Relationship between everyday health information literacy and attitudes towards mobile technology among older people”, European Conference on Information Literacy, Springer, Cham, pp. 450-459.

Fidel, R. (2012), Human Information Interaction: An Ecological Approach to Information Behavior, MIT Press, Cambridge, MA.

Gerard, M., Fossa, A., Folcarelli, P.H., Walker, J. and Bell, S.K. (2017), “What patients value about reading visit notes: a qualitative inquiry of patient experiences with their health information”, Journal of Medical Internet Research, Vol. 19 No. 7, p. e237.

Gal, U. and Berente, N. (2008), “A social representations perspective on information systems implementation: rethinking the concept of ‘frames’”, Information Technology and People, Vol. 21 No. 2, pp. 133-154, doi: 10.1108/09593840810881051.

Gerber, D.E., Laccetti, A.L., Chen, B., Yan, J., Cai, J., Gates, S., Xie, Y. and Lee, S.J.C. (2014), “Predictors and intensity of online access to electronic medical records among patients with cancer”, Journal of Oncology Practice, Vol. 10 No. 5, pp. e307-e312.

Greenberg, A.J., Falisi, A.L., Finney Rutten, L.J., Chou, W.-Y.S., Patel, V., Moser, R.P. and Hesse, B.W. (2017), “Access to electronic personal health records among patients with multiple chronic conditions: a secondary data analysis”, Journal of Medical Internet Research, Vol. 19 No. 6, p. e188.

Grünloh, C., Cajander, A. and Myreteg, G. (2016), “The record is our work tool”—physicians’ framing of a patient portal in Sweden”, Journal of Medical Internet Research, Vol. 18 No. 6, p. e167.

Grünloh, C., Myreteg, G., Cajander, A. and Rexhepi, H. (2018), “Why do they need to check me?” patient participation through eHealth and the doctor-patient relationship: qualitative study”, Journal of Medical Internet Research, Vol. 20 No. 1, p. e11.

Guo, X., Zhang, X. and Sun, Y. (2016), “The privacy–personalization paradox in mHealth services acceptance of different age groups”, Electronic Commerce Research and Applications, Vol. 16, pp. 55-65.

Haldmienst, N., Radhuber, M. and Winter-Ebmer, R. (2019), “Attitudes of elderly Austrians towards new technologies: communication and entertainment versus health and support use”, European Journal of Ageing, Springer, Vol. 16 No. 4, pp. 513-523.

Heart, T. and Kalderon, E. (2013), “Older adults: are they ready to adopt health-related ICT?”, International Journal of Medical Informatics, Vol. 82 No. 11, pp. e209-e231.
Hirvonen, N., Enwald, H., Käänsäkoski, H., Eriksson-Backa, K., Nguyen, H., Huhta, A.-M. and Huvila, I. (2020), “Older adults’ views on eHealth services: a systematic review of scientific journal articles”, International Journal of Medical Informatics, Vol. 135, doi: 10.1016/j.ijmedinf.2019.104031.

Hong, Y.A. and Cho, J. (2016), “Has the digital health divide widened? Trends of health-related internet use among older adults from 2003 to 2011”, The Journals of Gerontology: Series B, Vol. 72 No. 5, pp. 856-863.

Huvila, I. (2009), “Ecological framework of information interactions and information infrastructures”, Journal of Information Science, Vol. 35 No. 6, pp. 695-708.

Huvila, I., Cajander, A., Daniels, M. and Ahlfeldt, R.-M. (2015), “Patients’ perceptions of their medical records from different subject positions”, Journal of the Association for Information Science and Technology, Vol. 66 No. 12, pp. 2456-2470.

Huvila, I., Ek, S., Enwald, H., Eriksson-Backa, K., Hirvonen, N. and Käänsäkoski, H. (2016), “Taking health information behaviour into account in the design of e-health services”, Finnish Journal of EHealth and EWelfare, Vol. 8 No. 4, pp. 153-163.

Huvila, I., Enwald, H., Eriksson-Backa, K., Hirvonen, N., Nguyen, H. and Scandurra, I. (2018), “Anticipating ageing: older adults reading their medical records”, Information Processing and Management, Vol. 54 No. 3, pp. 394-407.

Ihm, J. and Hsieh, Y.P. (2015), “The implications of information and communication technology use for the social well-being of older adults”, Information, Communication and Society, Taylor & Francis, Vol. 18 No. 10, pp. 1123-1138.

Iivari, N. and Abrahamsson, P. (2002), “The interaction between organizational subcultures and user-centered design-a case study of an implementation effort”, Proceedings of the 35th Annual Hawaii International Conference on System Sciences, IEEE, Washington, DC, pp. 3260-3268.

Jaeger, P.T. and Burnett, G. (2010), Information Worlds: Social Context, Technology, and Information Behavior in the Age of the Internet, Routledge, New York.

Jormanainen, V., Parhiala, K., Niemi, A., Erhola, M., Keskimaä, I. and Kaila, M. (2019), “Half of the Finnish population accessed their own data: comprehensive access to personal health information online is a corner-stone of digital revolution in Finnish health and social care: Englanti”, Finnish Journal of EHealth and EWelfare, Vol. 11 No. 4, pp. 298-310.

Keränen, N.S., Kangas, M., Immonen, M., Similä, H., Enwald, H., Korpela, R. and Jämsä, T. (2017), “Use of information and communication technologies among older people with and without frailty: a population-based survey”, Journal of Medical Internet Research, Vol. 19 No. 2, p. e29.

Khoo, M. (2001), “Community design of DLESE’s collections review policy: a technological frames analysis”, Proceedings of the 1st ACM/IEEE-CS Joint Conference on Digital Libraries, ACM, New York, pp. 157-164.

Kim, E.-H., Stolyar, A., Lober, W.B., Herbaugh, A.L., Shinstrom, S.E., Zierler, B.K., Soh, C.B. and Kim, Y. (2009), “Challenges to using an electronic personal health record by a low-income elderly population”, Journal of Medical Internet Research, Vol. 11 No. 4, p. e44.

Klein, D.M., Fix, G.M., Hogan, T.P., Simon, S.R., Nazi, K.M. and Turvey, C.L. (2015), “Use of the Blue Button online tool for sharing health information: qualitative interviews with patients and providers”, Journal of Medical Internet Research, Vol. 17 No. 8, p. e199.

Kobayashi, L.C., Wardle, J. and von Wagner, C. (2015), “Internet use, social engagement and health literacy decline during ageing in a longitudinal cohort of older English adults”, Journal of Epidemiology and Community Health, Vol. 69 No. 3, pp. 278-283.

Lee, B., Chen, Y. and Hewitt, L. (2011), “Age differences in constraints encountered by seniors in their use of computers and the internet”, Computers in Human Behavior, Vol. 27 No. 3, pp. 1231-1237.

Ma, Q., Chen, K., Chan, A.H.S. and Teh, P.L. (2015), “Acceptance of ICTs by older adults: a review of recent studies”, International Conference on Human Aspects of IT for the Aged Population, Springer, Cham, pp. 239-249.
Mamra, A., Sibghatullah, A.S., Ananta, G.P., Alazzam, M.B., Ahmed, Y.H. and Doheir, M. (2017), “Theories and factors applied in investigating the user acceptance towards personal health records: review study”, International Journal of Healthcare Management, Vol. 10 No. 2, pp. 89-96.

Moll, J., Rexhepi, H., Cajander, Å., Grünloh, C., Huvila, I., Hägglund, M., Myreteg, G., Scandurra, I. and Ahlfeldt, R.-M. (2018), “Patients’ experiences of accessing their electronic health records: national patient survey in Sweden”, Journal of Medical Internet Research, Vol. 20 No. 11, p. e278.

Nurgalieva, L., Cajander, A., Moll, J., Ahlfeldt, R.M., Huvila, I. and Marchese, M. (2020), “‘I do not share it with others. No, it’s for me, it’s my care’: on sharing of patient accessible electronic health records”, Health Informatics Journal, Sage Publications Sage UK: London, England, 1460458220912559.

Olesen, K. (2014a), “Implications of dominant technological frames over a longitudinal period”, Information Systems Journal, Wiley Online Library, Vol. 24 No. 3, pp. 207-228.

Olesen, K. (2014b), “Technological frames: use of context, temporality, and individual focus”, SAGE Open, Vol. 4 No. 1, pp. 1-15.

Orlikowski, W.J. and Gash, D.C. (1994), “Technological frames: making sense of information technology in organizations”, ACM Transactions on Information Systems, Vol. 12 No. 2, pp. 174-207.

O’Neill, S., Chimowitz, H., Leveille, S. and Walker, J. (2019), “Embracing the new age of transparency: mental health patients reading their psychotherapy notes online”, Journal of Mental Health, Vol. 28 No. 5, pp. 527-335.

Papoutsi, C., Reed, J.E., Marston, C., Lewis, R., Majeed, A. and Bell, D. (2015), “Patient and public views about the security and privacy of Electronic Health Records (EHRs) in the UK: results from a mixed methods study”, BMC Medical Informatics and Decision Making, Vol. 15 No. 86, doi: 10.1186/s12911-015-0202-2.

Petersson, L. and Erlingsdóttir, G. (2018), “Open notes in Swedish psychiatric care (part 2): survey among psychiatric care professionals”, JMIR Mental Health, Vol. 5 No. 2, p. e10521.

Pourrazavi, S., Kouzekanani, K., Bazargan-Hejazi, S., Shaghaghi, A., Hashemiparast, M., Fathifar, Z. and Allahverdipour, H. (2020), “Theory-based e-health literacy interventions in older adults: a systematic review”, Archives of Public Health, Vol. 78 No. 1, p. 72.

Rahbek, J.N. (2013), “E-record-access to all Danish public health records”, Studies in Health Technology and Informatics, Vol. 192, p. 1121.

Rexhepi, H., Ahlfeldt, R.-M., Cajander, Å. and Huvila, I. (2018), “Cancer patients’ attitudes and experiences of online access to their electronic medical records: a qualitative study”, Health Informatics Journal, Sage Publications Sage UK: London, England, Vol. 24 No. 2, pp. 115-124.

Rockmann, R. and Gewald, H. (2016), “Examining older adults’ enhanced use of eHealth”, Procedia Computer Science, Elsevier, Vol. 98, pp. 401-406.

Sakaguchi-Tang, D.K., Bosold, A.L., Choi, Y.K. and Turner, A.M. (2017), “Patient portal use and experience among older adults: systematic review”, JMIR Medical Informatics, Vol. 5 No. 4, p. e38.

Sanchiz, M., Chin, J., Chevalier, A., Fu, W.T., Amadieu, F. and He, J. (2017), “Searching for information on the web: impact of cognitive aging, prior domain knowledge and complexity of the search problems”, Information Processing and Management, Vol. 53 No. 1, pp. 281-294.

Scandurra, I., Jansson, A., Forsberg-Franssson, M.-L. and Ålander, T. (2015), “Is ‘Patient’s Online Access to Health Records’ a good reform? - opinions from Swedish healthcare professionals differ”, Procedia Computer Science, Vol. 64, pp. 964-968.

Taha, J., Czaja, S.J., Sharit, J. and Morrow, D.G. (2013), “Factors affecting usage of a personal health record (PHR) to manage health”, Psychology and Aging, Vol. 28 No. 4, pp. 1124-1139.
Tennant, B., Stellefson, M., Dodd, V., Chaney, B., Chaney, D., Paige, S. and Alber, J. (2015), “eHealth literacy and Web 2.0 health information seeking behaviors among baby boomers and older adults”, *Journal of Medical Internet Research*, Vol. 17 No. 3, p. e70.

Vorrink, S.N., Antonietti, A.M., Kort, H.S., Troosters, T., Zanen, P. and Lammers, J.-W.J. (2017), “Technology use by older adults in The Netherlands and its associations with demographics and health outcomes”, *Assistive Technology*, Taylor & Francis, Vol. 29 No. 4, pp. 188-196.

Walker, J., Leveille, S., Bell, S., Chimowitz, H., Dong, Z., Elmore, J.G., Fernandez, L., Fossa, A., Gerard, M., Fitzgerald, P., Harcourt, K., Jackson, S., Payne, T.H., Perez, J., Shucard, H., Stamez, R., DesRoches, C. and Delbanco, T. (2019), “OpenNotes after 7 years: patient experiences with ongoing access to their clinicians’ outpatient visit notes”, *Journal of Medical Internet Research*, Vol. 21 No. 5, p. e13876.

Young, B., Mathiassen, L. and Davidson, E. (2016), “Inconsistent and incongruent frames during it-enabled change: an action research study into sales process innovation”, *Journal of the Association for Information Systems*, Vol. 17 No. 7, pp. 495-520.

Zanaboni, P., Kummervold, P.E., Sørensen, T. and Johansen, M.A. (2020), “Patient use and experience with online access to electronic health records in Norway: results from an online survey”, *Journal of Medical Internet Research*, Vol. 22 No. 2, p. e16144.

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