

Electronic Medical Record implementation in Hospital:

An empirical investigation of individual and organizational determinants.

Anna De Benedictis^{1,2,#a*¶}, Emanuele Lettieri^{3#b¶}, Luca Gastaldi^{3#b¶}, Cristina Masella^{3#b¶}, Alessia Uргу^{1,#a¶}, Daniela Tartaglino^{1,2#a¶}

¹ Department of Healthcare Professions, Hospital General Management, University Hospital Campus Bio-Medico, Rome, Italy.

² Faculty of Medicine & Surgery, University Campus Bio-Medico, Rome, Italy.

³ Department of Economics, Management and Industrial Engineering, Politecnico of Milan, Italy.

#aCurrent Address: Department of Healthcare Professions, University Hospital Campus Bio-Medico, via Alvaro del Portillo, 200, 00128, Rome, Italy.

#bCurrent Address: Department of Economics, Management and Industrial Engineering, Politecnico of Milan, via Lambruschini 4/b, 20156, Milan, Italy.

* Corresponding author

E-mail: a.debenedictis@unicampus.it (ADB)

ORCID Id: <https://orcid.org/0000-0001-8655-0895>

¶ These authors contributed equally to this work.

Abstract

The implementation of hospital-wide Electronic Medical Records (EMRs) is still an unsolved quest for many hospital managers. Despite past studies acknowledged the numerous advantages of EMRs, hospital professionals such as physicians and nurses have been found indifferent, when not resistant, to the adoption of EMRs. This study combines institutional and individual factors to explain which determinants can trigger or inhibit the EMRs implementation in an hospital setting, and which variables managers can exploit to guide professionals' behaviours. Data have been collected through a survey administered to physicians and nurses in an Italian University Hospital in Rome. A total of 114 high-quality responses had been received. Results show that both, physicians and nurses, expect many benefits from the use of EMR. In particular, it is believed that the EMR will have a positive impact on: quality, efficiency and effectiveness of care; handover communication between healthcare workers; teaching, tutoring and research activities; greater control of your own business. Data show an interplay between individual and institutional determinants: normative factors directly affect perceived usefulness ($C = 0.30^{**}$), perceived ease of use ($C = 0.26^{**}$) and intention to use EMR ($C = 0.33^{**}$). Regulative factors directly affect only intention to use EMR ($C = -0.21^{**}$). Control variables have no impact on other variables in the model. The analysis carried out shows that the key determinants of the intention to use EMR are the normative ones (peer influence). Therefore, the Management can leverage on power users to motivate, generate and manage change.

Key Words

Digital Innovation, Healthcare, Hospital, Electronic Medical Record.

Introduction

The implementation of hospital-wide Electronic Medical Records (EMRs) is still an unsolved quest for many hospitals [1,2]. Despite a significant body of evidence about the numerous advantages of EMRs [e.g., 2-9], many initiatives of EMRs implementation still fall far behind expectations and hospitals appear unable to fully capture the opportunities offered by EMRs in terms of improvement of the organization of hospital healthcare delivery, performance monitoring and support to clinical research and trials. As a result of these failures, hospital managers and professionals developed different narratives to justify these negative outcomes. On the one hand, hospital managers complained that physicians and nurses were indifferent, when not resistant, to the adoption of EMRs [2,10]. This happened because hospitals are professional organizations, where hospital professionals have wide jurisdiction on decision-making and practices and, as consequence, hospital managers have limited authority to mandate innovation and change of established practices and behaviours [11]. On the other hand, hospital professionals complained that EMRs have been designed misaligned to their needs and to their clinical practice, thus generating more shortcomings than benefits [12-13]. Additionally, sometimes the transition towards EMRs has been poorly managed by hospital managers who focused their attention more to “technical issues” rather than to competencies and alignment to clinical practice [14].

These different narratives found echoes in a number of past reviews [e.g., 5,6,10,12] that crystallized the most significant barriers and facilitators to implement EMRs in hospitals and offered first-hand recommendations about strategies and initiatives that might increase the chance of success. Many authors agree that the most critical barrier refers to professionals themselves who appear often hostile to the implementation of EMRs and the consequent changes in their practices and behaviours [3,4,8,13]. Other important barriers reported are: (i) the poor design and technical concerns of EMR [4-6]; (ii) the complexity of system and development issues [13,14]; (iii) the lack of time and the high workload; (iv) the limited perceived ease of use; (v) still open privacy and security concerns; (vi) high investment costs; and (vii) the lack of real needs to use EMR [5]. Some authors identified also the following perceived disadvantages related to EMR implementation: (i) negative impact on productivity [5,14,15]; (ii) negative impact on patient and health professional interaction [5]; (iii) less high-quality time spent by professionals with patients; (iv) request of more training and daily support from IT office that hinder current activities [15]. On the other side, a number of enablers to use EMRs were found: (i) user-centric design and consequent ease of use [3,5,6]; (ii) hardware availability and system

76 reliability in terms of speed, safety and lack of failure [3,6,14]; (iii) hospital professionals' high digital literacy and familiarity with EMRs [5,6,13]; (iv) customized end-user training [6,7,13]; (v) reduction of time required for activities such as document search, edit and storage, management of laboratory orders and medical care, etc. [8,9]; and perceived support from hospital managers along the design and implementation phases [6,14]. Additionally, other studies gathered evidence that EMRs might improve some organizational needs, such as collaboration among different professionals, continuous team-working, empowered control over activities and development of new cultures and narratives about innovation and improvement [3,4,6,14].

In a nutshell, past contributions confirmed that the most salient predictor of the success of the implementation of an EMR in hospitals relies on hospital professionals' intention to use it and change their current practices and behaviours because they perceive that advantages will outbalance the costs of change. If claiming that the intention to use an EMR is the most significant predictor might appear as an expected – also trivial for many scholars of innovation management in healthcare –, the comprehension of which factors might trigger or inhibit such intention to use is still an open question that needs further research and evidence. In fact, despite the undoubted value of past studies, some main limitations still puzzle our understanding of what actually drives the intention to use EMRs by hospital professionals – namely, physicians and nurses. First, past reviews offered a list of relevant factors that might affect the intention to use without clarifying the potential interconnections among them within a coherent theoretical framework. Second, previous studies gathered evidence to confirm the role played by institutional factors as well as by individual, professional factors, without exploring the potential interplay among them. Third, how hospital professionals belonging to either different profession (e.g., physicians vs. nurses) or different speciality (e.g., cardiology vs. orthopaedics) might be interested to use an EMR has not been investigated in-depth, being the large part of past studies focused to generic “professionals”. Against these limitations, this study aimed at gathering original evidence to further the ongoing debate about the implementation of EMRs in hospitals by developing and empirically testing a research framework that clarifies the interconnections among the most relevant factors that might shape hospital professionals' intention to use an EMR, with particular attention to the potential interplay among institutional and individual factors. The research framework combines two different bodies of literature. On the one hand, we considered the well-respected Technology Acceptance Model (TAM), whose main assumption is that physicians and nurses are professionals whose decision of using EMRs is taken with limited

influence of hospital managers [16,17] on the basis of perceived usefulness and ease of use. On the other hand, we grounded on Institutional Theory, whose claim is that professionals are strongly subject to institutional forces put in place by their organization and thus “forced” to align their practice to what their organization expects from them [18]. In this view, physicians’ and nurses’ decision to engage with an EMR is not entirely based on rational thinking, but it is affected by the influence of the overarching structures, rules, social norms and culture in which they are embedded [19,20]. By combining these theories – that have been adopted so far to offer opposite explanations –, this study investigated the interplay between institutional and individual factors, thus offering novel insights on the determinants of hospital professionals’ intention to use EMRs. In this view, the main goal of this study is pointing-out how and to what extent individual and organizational determinants might trigger or inhibit EMR implementation in hospitals, and whether an interplay does exist between them.

Material and methods

Theoretical background

In order to evaluate the potential interplay between individual and institutional variables, a research framework has been created (Fig. 1). As anticipated above, the framework integrates into a coherent view of two theories that belong to two different – and still isolated – bodies of literature:

- The Technology Acceptance Model (TAM), from Information Science, that has been widely used in the last decades in healthcare to understand what leads professionals or patients to accept or reject Information Technology [21];
- The Institutional Theory, from Public Management, that has been largely adopted in the last decades to assess how institutional factors shape professionals’ behaviours [22-24].

Technology Acceptance Model

The **TAM** was introduced for the first time by Davis in 1989 [21]. The main problem raised by the author was to understand what leads people to accept or reject Information Technology. In this regards, two main variables have been identified: the perceived usefulness and the ease of use. Perceived usefulness measures “the degree to which a person believes that using a particular system would enhance his or her job performance” [21], and therefore induces individuals to use technology as it allows to obtain better results. On

the other hand, the ease of use measures “the degree to which a person believes that using a system would be free of effort” [21,25] and induces the potential users to use a certain technology since it requires low energy expenditure while it may bring advantages. The first one induces an individual to use technology as it allows to obtain better results in his work; the ease of use, on the other hand, stimulates potential users to use a certain technology since many advantages are supported with low energy expenditure.

Institutional Theory

The Institutional Theory refers to a line of organizational research that recognize the significant organizational effects that are associated with the increase of cultural and social forces. According to Scott [22-24], “Institutions are made up of cultural-cognitive, normative and regulative elements, which together with associated activities and resources offer stability and meaning to social life.” These three forces are present in totally developed institutional systems, with economists and political scientists placing emphasis on regulative, sociological and normative factors, and anthropologists and organizational theorists placing emphasis on cognitive-cultural factors. According to this perspective, individuals are embedded in institutional pillars that limit the scope of their rational assessment and direct the engagement of specific behaviours [22-24]. Scott [22-24] defines the three institutional pillars as follows:

- *regulative pillars*: which regard the existence of regulations, rules and processes whose breach is monitored and sanctioned;
- *normative pillars*: which introduce a social dimension of appropriate behaviours in the organization;
- *cultural pillars*: which emphasize the use of common schemas, frames, and other shared symbolic representations that create an attachment to the ‘appropriate’ behaviour.

Research Framework

Consistently to our research questions, we combined the two theories described above to develop an original, comprehensive research framework where individual and institutional determinants have been interlinked to explore their potential interplay in explaining hospital professionals’ intention to use an EMR. Coherently to past researches about user acceptance of new technologies [26,27], we considered age and job seniority as key control variables. Additionally, to narrow the knowledge gap about how hospital professionals belonging to either different profession (e.g., physicians vs. nurses) or different speciality (e.g., cardiology vs.

orthopaedics) might be interested to use an EMR, we included clinical speciality and profession as control variables. Figure 1 offers a synoptic view of our research framework, where the independent variable (i.e., the intention to use an EMR) is explained by individual factors from TAM (i.e., perceived usefulness and perceived ease of use) as well as by institutional factors from Institutional Theory (i.e., regulative factors that refer to the degree of adhesion to hospital managers' goals, and normative factors that explain the peer influence among hospital colleagues. Control variables have been also displayed.

Fig 1. Research Framework.

According to the research questions and the research framework the following research hypotheses (H) were stated: H1: Individual factors (perceived usefulness, perceived ease of use) directly affect the intention to use EMR; H2: Organizational factors (normative and regulative factors) directly affect individual factors and the intention to use EMR; H3: Some control variables (age, seniority, clinical specialties and different professions) directly affect individual factors and the intention to use EMR.

Setting and research methodology

Given the explorative nature of this study, a single case study research design has been adopted. The choice of a single case study offers the opportunity to eliminate potential confounding factors due to the heterogeneity – in terms of strategy, legacy, professionals' behaviours and technology infrastructure – that different hospitals might show. The choice of investigating a single case allowed us to focus our attention to those individual and organizational factors that might facilitate/inhibit the implementation of an EMR in hospitals, revealing the potential interplay among them. We selected the Teaching Hospital Campus Bio-Medico (CBM) in Rome (Italy) as an adequate setting for investigating our research questions. This hospital is mid-size (around 300 beds), many-disciplines, teaching and private. These characteristics are salient for our study because they have been found to increase the complexity of EMR implementation. Being teaching

hospital, there is more room for divergent goals between professionals and managers, thus creating the correct setting where to investigate the interplay between individual and organizational factors. Being many-discipline, there is room to study the potential conflict among professionals from different disciplines with respect to the implementation of an EMR. Finally, being mid-size, CBM is a valid setting to observe the potential divergence between nurses and doctors about EMR. These considerations persuaded us that CBM could be assumed as an exemplary case to be investigated. To increase the generalizability of our results, a mixed-method approach has been applied for both data collection and analysis. Structured interviews have been organized with hospital managers and professionals to understand the organizational context and deep-diving in the available secondary sources of information that have been made available (e.g., internal reports, meeting minutes, press release, etc.). This qualitative analysis has been coupled with a more quantitative one based on a survey administered to hospital professionals (physicians and nurses). The questionnaire has been designed based on the scales identified in the literature and reviewed in detail by the authors. Moreover, a pilot test of the questionnaire has been carried out before the survey. The questionnaire consists of two main sections: scales and constructs of the proposed model; control variables and characteristics of respondents. Individual variables were evaluated by 11 items, in particular, the scale for the measurement of perceived usefulness has been adapted from the studies of Venkatesh [28-31]. Organizational variables were explored through 4 items related to normative and regulative factors. The scale for the measurement of normative and regulative factors has been adapted from the study of Scott [32]. The survey items are made available in Annex (S1 Table). Additional questions have been designed to gather demographic and sample information. All questionnaire items related to the constructs of the proposed model were explored using a 7 point Likert scale with 1 indicating “strongly disagree” and 7 “strongly agree”. The first re-call has been made one week after the expiration date for compilation. Three days after the first follow-up, the second recall has been sent. Finally, three days after, the third recall has been sent. Statistical analysis was performed using the software Stata 14.1® The internal consistency of the constructs was verified through Cronbach’s alpha. A path analysis was performed in order to test the proposed model; a p-value of <0.05 was considered significant.

The study has been approved by the General Management and the Ethics Board of CBM. All questionnaires were filled out in a period between February and September 2018, and a total of 114 responses (78 nurses and 36 physicians) had been received. Characteristics of respondents are described in Table 1.

		Frequency	Percentage
Gender	Male	29	25%
	Female	84	74%
	No response	1	1%
Age	21-30	29	25%
	31-40	51	45%
	41-50	22	19%
	> 50	11	10%
	No response	1	1%
Profession	Physician	36	32%
	Nurse	78	68%
Seniority (years of working experience)	0-10	51	45%
	11-20	44	39%
	21-30	11	10%
	31-40	4	4%
	>40	1	1%
	No response	3	3%

Table 1. Characteristics of respondents.

Results

Questionnaire's constructs internal consistency

The internal consistency of constructs has been verified through the analysis of Cronbach's alpha (Table 2). As generally accepted, values greater than or equal to 0.7 were considered acceptable.

Construct	Items (corresponding to the survey questions)*	Cronbach's alpha
<i>Perceived Usefulness</i>	<p>A. I'm convinced that the EMR will help me carry out my tasks faster.</p> <p>B. Using the EMR will greatly improve the effectiveness of my work.</p> <p>C. Using the EMR in my work will greatly increase my productivity.</p>	0.79
<i>Perceived Ease of Use</i>	<p>A. The use of EMR will increase my workload.</p> <p>B. Using the EMR I will have more control of my own work.</p> <p>C. I will have problems to use the EMR.</p> <p>D. I will be able to get the system to do what I want.</p> <p>E. The EMR will be easy to use.</p>	0.73

<i>Intention to Use</i>	A. If I had the opportunity I would use the EMR, B. If I had the opportunity I would use the EMR for most of my work's processes. C. If I had the opportunity I would work in a Hospital where the EMR is already used.	0.76
<i>Peer Influence (Normative pillar)</i>	A. The colleagues I value most believe that I should systematically use the EMR. B. The colleagues I value most consider the use of EMR as essential for the Hospital.	0.82
<i>Adhesion to Management's objectives (Regulative pillar)</i>	A. I very much agree with most of the objectives of the management. B. I often come into conflict with the management on the priorities to give to my work (reversed).	0.77
<i>*All items were measured on a 7-point Likert scale, where 1 = strongly disagree, 2 = moderately disagree, 3 = somewhat disagree, 4 = neutral (neither disagree nor agree), 5 = somewhat agree, 6 = moderately agree, and 7 = strongly agree.</i>		

Table 2. Measurement properties of constructs.

Determinants of current behaviours

Our data show that both physicians and nurses expect many benefits from the use of EMR. In particular, they think EMR will have a positive impact on relevant factors such as quality, efficiency and effectiveness of care; handover communication among healthcare workers; teaching, tutoring and research activities; greater control of their tasks. Data confirm that perceived usefulness ($C=0.33^{**}$) directly affects the intention to use EMR. With respect to the organizational factors, data prove that does exist an interplay between them and individual determinants. In fact, normative factors directly affect perceived usefulness ($C=0.30^{**}$), perceived ease of use ($C=0.26^{**}$) and intention to use EMR ($C=0.33^{**}$). Regulative factors affect the intention to use EMR, with a negative sign ($C= -0.21^{**}$). Control variables (i.e., age, seniority, clinical area and profession) have no impact on other variables in our model. Fig 2 offers a graphical representation of our results.

Fig 2. Determinants of current behaviours.

Discussion

Our study sought to better clarify the relationship between organizational and individual determinants of the intention to use EMRs in a hospital setting by nurses and physicians. Previous studies [2,5,8-10,12,13,33] have focused mainly on either the barriers or the facilitators that might impact on the implementation of EMRs, but, to the best of our knowledge, it has never been deepened if and how organizational and individual factors interact and affect jointly hospital professionals' motivation to use EMRs. Our findings show that the main determinants of the intention to use EMRs are the normative ones (peer influence) [32], compared to the regulatory ones (adherence to the management's objectives) or the individual ones (perception of ease and utility of use). In other words, hospital managers can leverage on lead peer influence (i.e., innovation champions) to motivate, generate and manage change and generate a virtuous circle inside the hospital to motivate the use of EMRs.

The EMRs implementation process should take into account that professionals need proper time to re-establish control over their tasks and processes. In fact, the introduction of EMRs in daily clinical practice changes the status quo and, if on one hand, it allows many new opportunities, on the other hand, it involves changes that can have different effects on hospital professionals also based on their own characteristics, knowledge, skills and work type. In general, this is what happens in the case of effective implementation, while the consequences of poorly managed implementation can be very complex and involve a greater expenditure of time, energy and money to restart the processes at the previous speed and functionality. In this sense, to increase the motivation of users in all phases of the project represent an essential point for effective management of change. This study confirms the importance of involving front-line professionals, as soon as the hospital decides to start the implementation phase in order to increase their motivation to use EMRs. In fact, as a result of their involvement, professionals will better understand the rationale of this technological shift and their perception of usefulness will increase consequently. Moreover it is important to consider that,

as reported by Gastaldi et al. [34] in the absence of coercive mechanisms, institutional pressures toward EMR use are primarily normative (i.e., the organization has binding expectations about EMR use, with which professionals comply with social obligations) and/or mimetic (i.e., EMRs fit with existing taken-for-granted beliefs and logics of action, so professionals should support their adoption) [32]; therefore, as already mentioned, it is possible to leverage some power users in order to manage change.

Conclusion

This study offers original insights to further the ongoing debate about the digital transformation of hospitals, with a focus to EMRs. Our results show that there is an interplay between individual and organizational factors in shaping hospital professionals' intention to use EMRs. Professionals' perception of usefulness is affected by peer influence, thus confirming hospitals are professional organizations where change is difficult – when it is not impossible – to mandate without the consensus of professionals. When the adoption of new technologies is triggered by the adherence to hospital managers' goals without an understanding of the advantages that the technology might bring, the expected result is a decrease of the intention to use, as shown by the negative effect of the regulative pillar on the intention to use. In this view, hospital managers should pay attention to the strategies that are putting in place to support the transition towards digitally-enabled hospitals, taking into account that their actions should match with the individual factors that drive the intention to use.

Despite the original contributions, this study suffers at least two limitations that should be addressed by future research. First, the research design is based on a single case study. Further research should consider a multi-centre design, thus allowing the generalization of our results. Moreover, a multi-centre study will allow exploring the role that hospital characteristics – in terms of strategy, legacy, etc. – might have on shaping both the organizational and individual factors investigated in this study. Second, this study investigated the intention to use EMRs as the dependent variable. Further research should consider hospitals where EMRs are already mature technologies, thus allowing the investigation of the actual use and which factors might facilitate/inhibit the translation of the intention to use into actual use.

Supporting information

S1 Table. Questionnaire.

S2 Table. Perceived Usefulness.

S3 Table. Perceived Ease of Use.

S4 Table. Intention to Use.

S5 Table. Normative Factors (Peer Influence).

S6 Table. Regulative Factors (Adhesion to the Management Objectives).

Acknowledgments

Federica Segato gave important comments in all phases of the study.

References

1. Gastaldi L., Lettieri E., Corso M., Masella C. Performance improvement in hospitals: leveraging on knowledge asset dynamics through the introduction of an electronic medical record. *Measuring Business Excellence*. 2016; 16(4):14-30.
2. Shahmoradi L., Darrudi A., Arji1 G., Nejad AF. Electronic Health Record Implementation: A SWOT Analysis. *Acta Medica Iranica*. 2017; 55(10).
3. Ash JS, Gorman PN, Lavelle M, Payne TH, Massaro TA, Frantz GL, Lyman JA. A cross-site qualitative study of physician order entry. *J Am Med Inform Assoc*. 2003 Mar-Apr;10(2):188-200.
4. Poon Eric G. Overcoming Barriers To Adopting And Implementing Computerized Physician Order Entry Systems in U.S. Hospitals. *Health Affairs*. 2004; 4. DOI 10.1377/hlthaff.23.4.184.
5. McGinn CA, Grenier S, Duplantie J, Shaw N, Sicotte C, Mathieu L, Leduc Y, Legare F, Gagnon MP: Comparison of use groups perspectives of barriers and facilitator to implementing EHR – a systematic review. *BMC Med* 2011, 9:46.
6. Boonstra A, Versluis A, Vos JF. Implementing electronic health records in hospitals: a systematic literature review. *BMC Health Serv Res*. 2014 Sep 4; 14:370.
7. Struik Marjolijn et al. The preferences of users of electronic medical records in hospitals: quantifying the relative importance of barriers and facilitators of an innovation. *Implementation Science*. 2014; 9:69.

8. Inokuchi R, Sato H, Nakamura K, Aoki Y, Shinohara K, Gunshin M, Matsubara T, Kitsuta Y, Yahagi N, Nakajima S. Motivations and barriers to implementing electronic health records and ED information systems in Japan. *Am J Emerg Med.* 2014 Jul;32(7):725-30.
9. Cucciniello et al. Understanding key factors affecting electronic medical record implementation: a sociotechnical approach. *BMC Health Services Research.* 2015; 15:268.
10. Boonstra A, Broekhuis M. Barriers to the acceptance of electronic medical records by physicians from systematic review to taxonomy and interventions. *BMC Health Serv Res.* 2010; 10:231.
11. Mura, M., Lettieri, E., Radaelli, G., Spiller, N. Behavioural operations in healthcare: a knowledge sharing perspective. *International Journal of Operations and Production Management.* 2016; 36(10):1222-1246.
12. Keshavjee K, Bosomworth J, Copen J, Lai J, Kucukyazici B, Liani R, Holbrook AM: Best practices in EMR implementation: a systematic review. In *Proceed of the 11th International Symposium on Health Information Mangement Research – iSHIMR.* 2006; 1–15.
13. Biruk S., Yilma T., Andualem M., Tilahun B. Health Professionals' readiness to implement electronic medical record system at three hospitals in Ethiopia: a cross sectional study. *BMC Medical Informatics and Decision Making.* 2014; 14.
14. Scott J Tim, Rundall Thomas G, Vogt Thomas M, Hsu John. Kaiser Permanente's experience of implementing an electronic medical record: a qualitative study. *BMJ.* 2005; 331: 1313-1316.
15. Noblin A., Cortelyou-Ward K., Cantiello J., Breyer T., Oliveira L., Dangiolo M. et al. EHR implementation in a new clinic: a case study of clinician perceptions. *Journal of Medical Systems.* 2013; 37(4):9955. doi: 10.1007/s10916-013-9955-2.
16. Venkatesh V, Morris MG, Davis GB, Davis FD. User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly.* 2003;27(3):425-478.
17. Tate M., Evermann J. & Gable G. An integrated framework for theories of individual attitudes toward technology. *Information & Management.* 2015; 52(6): 710-727.
18. van Dijk S., Berends H., Jelinek M., Romme A.G., Weggeman M. Micro-Institutional Affordances and Strategies of Radical Innovation. *Organization Studies.* 2011; 23(11):1485-151.
19. Scott W.R. *Institutions and Organizations.* 1995; Thousands Oaks (CA): Sage.

20. Butler T. Compliance with Institutional Imperatives on Environmental Sustainability: Building Theory on the Role of Green IS. *Journal of Strategic Information Systems*. 2011; 20(1):6–26.
21. Davis F. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*. 1989;13(3):319–340.
22. Scott WR. The Adolescence of Institutional Theory. *Administrative Science Quarterly*. 1987;32(4):493–511.
23. Scott WR. *Institutions and Organizations*. 2nd ed. Thousands Oaks (CA): Sage; 2001.
24. Scott WR. Lords of the Dance: professionals as institutional agents. *Organization Studies*. 2008; 29:2(219–238).
25. Moore, G., & Benbasat, I. Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*. 1991;2(3):192–222.
26. Agarwal R, Prasad J. Are Individual Differences Germane To The Acceptance Of New Information Technologies? *Decision Science*. 1999;30(2):361-391.
27. Morris MG, Venkatesh V. Age Differences in Technology Adoption decision: Implications for a Changing Work Force. *Personnel Psychology*. 2000;53(2):375-403.
28. Venkatesh V & Davis FD. A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. *Management Science*. 2000;46(2):186-204.
29. Venkatesh V. Determinants of Perceived Ease of Use: Integrating Control, Intrinsic Motivation, and Emotion into the Technology Acceptance Model. *Information Systems Research*. 2000a;11(4):342–365.
30. Venkatesh V, Morris MG, Davis GB, Davis FD. User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly*. 2003;27(3):425-478.
31. Venkatesh V, Zhang X, Sykes TA. Doctors ‘Do Too Little Technology’ A Longitudinal Field Study of an Electronic Healthcare System Implementation. *Information Systems Research*. 2011;22(3):523–546.
32. Scott WR. Institutionale Carriers: Reviewing Models of Transporting Ideas over Time and Space and Considering Their Consequences. *Industrial and Corporate Change*. 2003;12(4):879-894.
33. Or C., Tong E., Tan J., Chan S. Exploring Factors Affecting Voluntary Adoption of Electronic Medical Records Among Physicians and Clinical Assistants of Small or Solo Private General Practice Clinics. *Journal of Medical Systems*. 2018; 42(7):121. doi: 10.1007/s10916-018-0971-0.

34. Gastaldi L., Radaelli G., Lettieri E., Luzzini D., Corso M. Professionals' use of ICT in hospitals: the interplay between institutional and rational factors. *International Journal of Technology Management (IJTM)*. 2019; 80(1/2) <https://doi.org/10.1504/IJTM.2019.099768>.

Figure 1. Research framework

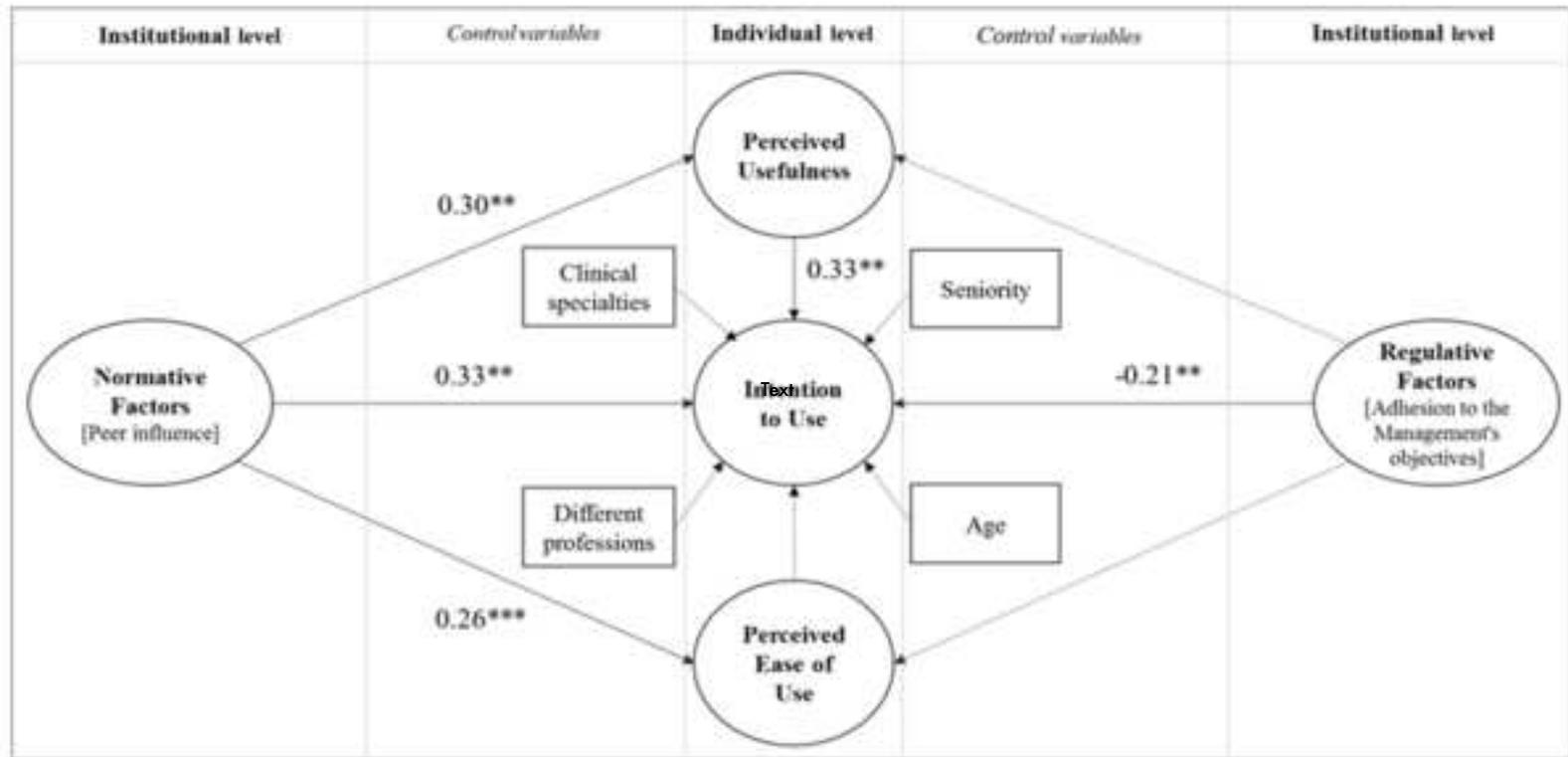


Figure 2. Determinants of current behaviours

