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The review of dissertation
written by Aref Shayganmehr entitled *New Technology Adoption of Internet of Things in Iranian Healthcare Centres,*
Warsaw 2022.

The formal basis for the preparation of the review is a letter from prof. Grzegorz Karasiewicz, Chairman of the Scientific Council for the Discipline of Management and Quality Science, University of Warsaw (8.03.2022), dissertation written by Aref Shayganmehr under supervision of dr hab. Mariusz Trojanowski, prof. UW, Faculty of Management, University of Warsaw, Poland and dr Gholamreza Malekzadeh, Faculty of Economics and Administrative Sciences, Ferdowsi Univeristy of Mashhad, Iran.

Doctoral dissertation is in the field of management and quality studies.

The requirements set for doctoral dissertation are indicated in legal regulations – Act on Scientific Degrees and Scientific Titles in the Field of Arts (14 March 2003) and Regulation of the Ministry of Science and Higher Education (26 September 2016) along with later changes.

General information

The adaptation of new technologies, implicitly ICT, is one of the important issues accompanying the development of modern society. ICT is affecting every sphere of life and operations of organisations, including healthcare. IoT, as a part of ICT, is already present in the patient-doctor relationship, and given the expansion of ICT and its strengths, it is to be expected that the intensity of this relationship will increase. This is because it allows, on the one hand, a direct and fast and thus valuable exchange of information in the case of health and, on the other

hand, it relieves professionals of administrative matters and uses the best of their knowledge and competences. Hence, I regard the dissertation topic undertaken as timely and important.

The doctoral thesis on *New Technology Adoption of Internet of Things in Iranian Healthcare Centres* was prepared under the supervision of Dr hab. Mariusz Trojanowski, Prof. UW and Dr Gholamrez Malekzadeh from Ferdowsi Univeristy of Mashhad. The work is theoretical and empirical. Its findings provide a deeper understanding of the adaptation of ICT by users of the health system, i.e. doctors, experts and health providers. Aref Shayganmehr based his dissertation on the UTAUT2 model by Venkatesh et al. The choice of this model is fully justified.

The aim of the work as: *understand what factors can affect the behavioural intention to use health IoT technology, such as electronic healthcare records was achieved*. In my opinion, the goal has been achieved.

The PhD student correctly conducted the literature research, identified the research gap, designed the research and implemented it. In the empirical part, he used an approach combining quantitative and qualitative research. He implemented the research in 10 stages. As a result, he modified the model due to the selected sector and empirically verified the new version.

The paper is 199 pages long and consists of abstracts, an introduction, three chapters and a bibliography, lists of figures and tables and four appendices. Abstracts are in Polish and English. They contain a synthetic justification of the choice of topic, the aim of the dissertation, a description of the method and the results of the research. The substantive part begins with an introduction, which is fully correct, and which further describes the elements signalled in the abstract. Chapter one (56 pages) is theoretical in nature. It forms the basis for chapter two (30 pages) which is theoretical-empirical in nature and chapter three (60 pages) which is empirical. The paper does not include an important part, i.e. the conclusion. Appendix 1 contains a survey questionnaire. This tool was used to study the acceptance of ICT among doctors. Appendix 2 contains a list of 8 questions that were asked during the interviews. Appendix 3 contains the modified survey questionnaire used earlier. Appendix 4 contains a copy of the research ethics certificate issued by Ferdowsi Univeristy of Mashhad, Iran.

In the bibliography, Mr Aref Shayganmehr has listed more than 300 sources, including both academic articles and scholarly books, textbooks and reports. The literature is related to the dissertation topic. Many of the items used by the author were published before 1999. The scientific literature used consists of items mainly in the field of ICT adaptation including health,

and research methodology. Considering the topic of the dissertation, such a selection of literature should be evaluated positively.

Evaluation of the content of the work

As mentioned, the topic is both timely, forward-looking and important for both service users and health service providers. However, the theme of the paper is broader than its content, which is particularly true of the research carried out.

Chapter one focuses on technology acceptance models. The author correctly provided an overview of the models and the process of their development. Then, he rightly referred to the technologies described in the literature that have applications in health care. Since the thesis deals with the problem of ICT adaptation in this sector in the selected country (Iran), the next part of the chapter was devoted to a literature review on the adaptation of EHR - Iran's electronic health record system. Based on the research conducted, the doctoral student identified a research gap as:

- 1: Adoption of health IOT and EHR is challenging despite its benefits and it is an international problem.
- 2: Technology adaption model (UTAUT2) need to be modified for more accurate and specific for different contexts such as electronic healthcare record.
- 3: There is a lake of studies on the adoption of the Internet of Things in healthcare systems and EHRs systems.
- 4: Most studies have been quantitative and hypothetical while qualitative study is important to discover more factors and deeper investigation.
- 5: Due to its complexity and differences in the type of technology application, the health system requires different factors in the admission models for example: patient-physician relationship be one of the effective factors in technology acceptance

In chapter one, the author rightly highlights the importance of culture as a key element shaping the construction of the ICT adaptation model and the dynamics of the processes it describes. This raises the question: does health occupy a similar or different place in the hierarchy of importance of different societies? And consequently, to what extent does this element influence the construction of the UTAUT2 model for the adaptation of health solutions?

Chapter two describes in paragraphs the successive stages of the research methodology - from the formulation of the research problem to the collection of data. The author formulated three research questions, to which he assigned three objectives. They are correctly structured. He then formulated seven hypotheses indicating the direction of the influence of a given variable on the behavioural intention to adapt IOHT (hypothesis 5 and 6 are mixed).

This part of the work gives the impression of a handout on empirical research design. Individual sections of the chapter refer to the concept of, for example, research approach and its types or research methods. The author confines himself here to quoting these concepts, but neither undertakes a discussion in this area nor justifies the choice made. There is also a section in this chapter containing, among other things, definitions of the terms i.e. technology acceptance and IoT. In my opinion, this information should definitely be found earlier in the work, i.e. in chapter one or already in the introduction of the dissertation. Especially since, as Aref Shayganmehr writes, IoT is not used in Iran, so it is important to indicate the connection between IoT and the EHR system under study. So what does IoT, whose very name indicates that it connects things and not people, have in common with IOHT and EHR. And - what is the relationship between telemedicine, e-health and m-health? To what extent do these solutions relate to IoT?

Chapter three contains the results of the self-reported research carried out in the form of quantitative and qualitative research (individual and group interviews). The author obtained 417 complete questionnaires. Respondents came from 20 cities in Iran. The condition that respondents had to meet was their experience with IoT. He used PLS method to explain the research model's variance and identify critical structures and Cronbach's alpha coefficient to evaluate the reliability of the model. In the qualitative research, in addition to having to meet the condition of having experience with IoT, the respondents (24 health providers) had to have a clinical experience with patients at least three years, age between 28 to 60 years old. The results of this stage are presented in the form of examples of quoted statements. It should be noted that the author ensured that these statements accompanied the assessment of the impact of specific variables on behavioural intention. By using the approach, he revised the number and type of variables - hedonic motivation was discarded, while authority, trust and confidentiality and relations between physician and patient were added. Several stages of research led to the construction of a structural model that has both theoretical and practical value. Unfortunately, its readability is relatively low.

The chapter concludes with reflections on the limitations of the research, which is valuable both for evaluating the results obtained and for future research in the area of IoT acceptance in the healthcare market.

Formal and editorial content of the work

The work takes the form of a synthetic description of the literature research carried out and the author's own empirical research. In my opinion, in particular, the content of Chapter 2 directly refers more to reports than to a scientific paper. Chapter 3, by its nature, most closely relates to a scientific discussion. First of all, it contains a broad description of the research results. However, I would like to point out that by changing the very formatting of the text of the dissertation, the author would have gained more space for critical reference to the presented content and a broader description of his own conclusions. In many places, the proportion between the space occupied by key and less important content is distorted. For example, the diagram (p. 149) showing Structural model testing results, which is the most important achievement of the work, is not very clear. On the other hand, it is unnecessary in my opinion to illustrate simple results such as fig. 17 Gender ratio, with a pie chart taking up almost half the page.

I also draw attention to the compilation of the literature. Many of the items indicated are incorrectly described, which made them very difficult to evaluate (e.g. Morse, J. M. J. N. r. (1991). Approaches to qualitative-quantitative methodological triangulation. 40(2), 120-123). Inappropriate references are also numerous (e.g.. [Record #264 is using a reference type undefined in this output style.]).

Conclusion

The final evaluation of the dissertation is positive, although the weaknesses identified have reduced its value.

In my opinion, M.Sc. Aref Shayganmehr's dissertation entitled *New Technology Adoption of Internet of Things in Iranian Healthcare Centres*, prepared under the scientific supervision of dr hab. Mariusz Trojanowski, prof. UW and dr Gholamreza Malekzadeh, fulfils the requirements for doctoral dissertations.

I move that the dissertation of Aref Shayganmehr MA be accepted and admitted to public defence.

Konkluzja

Ocena końcowa pracy doktorskiej jest pozytywna, choć wskazane słabości obniżyły jej wartość.

W mojej opinii rozprawa doktorska mgr. Aref Shayganmer pt. *New technology adoption of Internet of Things in Iranian Healthcare centres*, przygotowana pod kierunkiem naukowym dr. hab. Mariusza Trojanowskiego, prof. UW oraz d.r Gholamreza Malekzadeh spełnia wymagania stawiane rozprawom doktorskim.

Wnoszę o przyjęcie rozprawy doktorskiej Arefa Shayganmehra i dopuszczenie jej do publicznej obrony.

Ewa Fuzdrińska