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Analysis of the use of the UTAUT model for modeling the information technology acceptance process

Analiza wykorzystania modelu UTAUT do modelowania procesu akceptacji technologii informacyjnych

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Abstract
The article is devoted to the issues of UTAUT (the Unified Theory of Acceptance and Use of Technology) models, which are currently the most commonly used tools of IT acceptance assessment. The aim of the article was to characterize the structure and stages of evolution of the above-mentioned models, to analyze the practical use of these models and to perform a bibliometric analysis of publications on UTAUT. The method of literature analysis and the SciVal Scopus and Google Trends tools were used to analyze UTAUT content search trend statistics. The described models are useful for testing technology acceptance by users with different characteristics in different organizations. The flexibility of the models in terms of extending and modifying them for the needs of various areas of IT technology implementation was demonstrated.

Keywords: information technologies acceptance models; UTAUT

Streszczenie
Artykuł jest poświęcony problematyce modeli UTAUT (Uogólnionej Teorii Akceptacji i Użytkowania Technologii) które są obecnie najczęściej wykorzystywanymi modelami akceptacji technologii informacyjnych. Celem artykułu było scharakteryzowanie struktury oraz etapów ewolucji wyżej wymienionych modeli, przeprowadzenie analizy praktycznego wykorzystania tych modeli oraz dokonanie analizy bibliometrycznej publikacji dotyczących UTAUT. Zastosowano metodę analizy literatury oraz narzędzia SciVal Scopus i Google Trends do analizy statystyki trendów wyszukiwania treści dotyczących UTAUT. Udowodniono, że opisane modele są przydatne do badania akceptacji technologii przez użytkowników o różnych cechach w różnych organizacjach. Wykazano elastyczność modeli w zakresie ich rozszerzania i modyfikowania na potrzeby różnych obszarów wdrażania technologii IT.

Słowa kluczowe: modele akceptacji technologii informacyjnych; UTAUT

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1. Introduction

Research on the various aspects of IT use is necessary as the IT technologies are spreading worldwide. The widely understood determinants of processes related to the adoption, implementation, management and effectiveness of technologies are the subject of scientific research. Whether a specific technology will be adopted in practice depends on many factors of various nature - technical and technological solutions are important here, but also infrastructural, economic and legal conditions. It turns out that the process of technology acceptance by potential users is equally important, as it has a direct impact on the actual use of the implemented solutions.

One of the research trends is the analysis of the relationship between the adoption of technology and the variables that influence it. Technology acceptance models UTAUT are an example of this.

Information technology acceptance models are used to explain and forecast the behaviour of Internet users regarding various manifestations of their online activity - searching for information, using websites, online shopping, activity in social media and using health information available on the Internet. They help to understand the factors influencing the acceptance of information technologies.

The UTAUT model [1] is not the first information technology acceptance model. It appeared in 2003 as a uniform version of the repeatedly modified TAM models (Technology Acceptance Model - TAM [2], Extension of the Technology Acceptance Models - TAM2 [3] and TAM3 [4]). It was another step in the improvement of technology acceptance research tools. It was developed to provide a more complete picture of the acceptance process. It has integrated key elements from eight models (Theory of Reasoned Action - TRA [5], Theory of Planned Behaviour - TPB [6], Technology Acceptance Model - TAM [7], Model of PC Utilization - MPCU [8], Motivational Model - MM [9], Social Cognitive Theory - SCT [10], Extension of the Technology Acceptance Model - TAM2 [11] and Diffusion of Innovation Model - DOI [12]). It assumes that the direct determinants of the intention and behaviour of use are four key determinants (expected performance, expected effort, social impact and facilitating conditions).

The effect of these four constructs depends on age, gender, experience, and voluntary use [13] as shown in Figure 1.

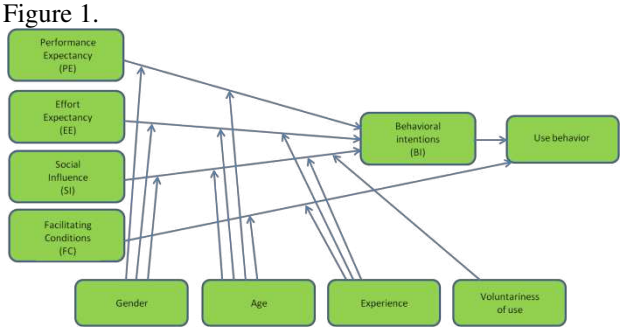


Figure 1: UTAUT model

Its authors quickly saw the need for further modifications, as a result of which the UTAUT2 model was created in 2012 [14]. It added three new determinants of technology acceptance (hedonic motivation, price value and habit) and redefined the previous constructs [15], which is presented in Figure 2.

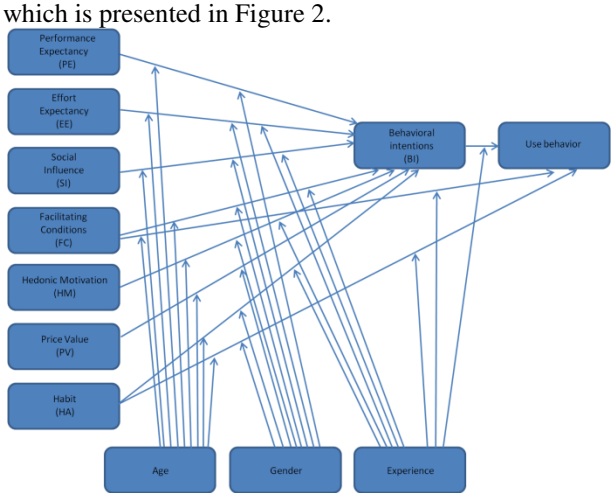


Figure 2: UTAUT2 model

Work on UTAUT modifications is still ongoing. In 2015, V. Venkatesh, J.Y.L. Thong and X. Xu [16] published an article in which they reviewed and synthesized the literature on UTAUT from September 2003 to December 2014. They conducted a theoretical analysis of UTAUT and its extensions and developed a plan for further research.

2. Research methodology

As part of the own research, an analysis of the practical use of these models and a bibliometric analysis of publications on UTAUT were carried out. The literature analysis method and the SciVal Scopus and Google Trends tools were used to analyze UTAUT content search trends statistics.

3. Results of research

The UTAUT model, due to its simplicity and versatility, is used to test the acceptance of various technologies related to information and communication systems, general-purpose systems, office systems and specialized business systems. The material scope covered by UTAUT's applications is very wide and varied. Examples include the application of the UTAUT model to research: factors influencing IT services in healthcare [17], acceptance of Healthcare wearable devices (HWDs) [18], determinants of using mobile learning (m-learning) [19], determinants of high school students' educational use of YouTube [20], online airline ticket purchase [21], the use of interactive whiteboards in education [22], social robotics [23], rehabilitation technologies [24], the use of electronic medical records [25], understanding the patients and clinicians behavioural intentions to use telemedicine equipment [26], understanding and learning about the factors that influence the intention of the end-user to use a new technology in the form of cloud-based mHealth services [27], researching e-marketing services in developing countries [28], mobile banking systems [29], acceptance and use of big data techniques in services companies [30].

Data for the analysis the research of topic UTAUT was collected from Google Trends (https://trends.google.com/trends) and was standardized. The greatest interest in the searched keywords is expressed by 100, while the lack of interest or insufficient data is expressed by 0. Google Trends presents data from different geographic locations in the selected time range settings. Queries are collected from five specialized search engines: Internet, Graphics, News, Google Shopping, and YouTube Search. As the first articles on UTAUT appeared in 2003 (in September), the data for the study was collected from the beginning of Google Trends, i.e. from 2004.

The first approach was to collect data on the search for the following terms: TAM, Technology Acceptance Model, UTAUT and UTAUT2. Figure 3 shows the worldwide interest (in search results) from January 1, 2004 to November 2020. Data from Google Trends was downloaded on November 20, 2020 (November data is incomplete). Interest in the UTAUT term began in November 2004.

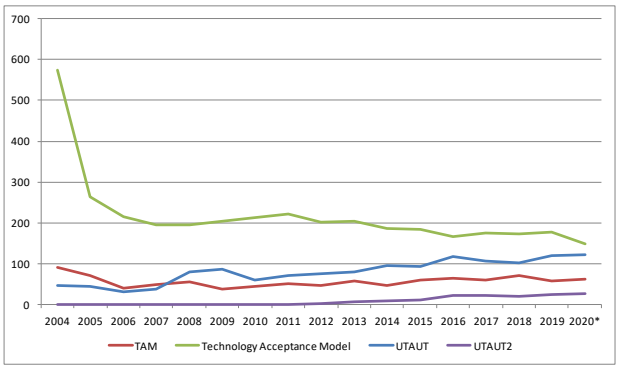


Figure 3: Worldwide interest over time for TAM, Technology Acceptance Model, UTAUT i UTAUT2; source: Google Trends

While Figure 3 shows changes in interest over time, Figure 4 illustrates where the term UTAUT was most popular during the period considered. The saturation of yellow in the drawing indicates the level of interest, with the more intense the colour the more interest. The greatest interest in UTAUT was expressed by Internet

users in Malaysia, Ghana, Indonesia, South Africa and the Netherlands. This is reflected in scientific articles on UTAUT. Table 1 shows the most prolific countries and regions publishing research in the research area.



Figure 4: Compared breakdown by countries in period from 1 January, 2004 to 20 November, 2020 for the search term: UTAUT; source: Google Trends (most active countries mark with different levels of yellow colour)

Table 1: The most prolific countries and regions publishing research in the research area – UTAUT

Top countries/regions

Entity: UTAUT - keywords · Year range: 2010 to 2019 · Data source: Scopus, up to 18 Nov 2020 ·

Countries & territories	Scholarly Output	Views Count
Malaysia	187	10,638
United States	151	12,161
Indonesia	95	3,455
China	93	5,022
United Kingdom	92	6,663
Taiwan	74	4,771
India	58	2,599
Germany	53	1,958
Australia	48	2,591
South Korea	47	2,583

Over the last decade, the number of scientific publications in the UTAUT area indexed in the Scopus database has also increased (52 publications were indexed in 2010, 320 in 2019) (Figure 5).

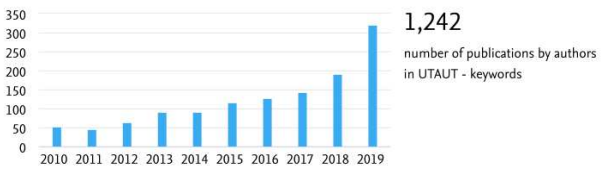


Figure 5: Number of UTAUT publications indexed in Scopus in period from 2010 to 2019; source: SciVal

The Keyphrases SciVal tool was also used in the work. It allows a more detailed analysis of the 50 most important key phrases related to a topic or research area.

The bibliometric analysis using Scopus, the largest database of peer-reviewed literature, and SciVal shows that the scientific output related to UTAUT is strong and growing in recent years. The key topics in this field are presented in Figure 6, where united theory, acceptance, technology acceptance and UTAUT are the fastest growing in recent years.



Figure 6: UTAUT key topics; source: SciVal

4. Conclusions

An analysis of the literature on information technology acceptance models, especially the UTAUT model, provided evidence about the usefulness of these models for testing technology acceptance by users with different characteristics in different organizations. These models are widely used. Their flexibility in terms of extending and modifying them for the needs of various areas of IT technology implementation has been demonstrated. Many of the analyzed articles contained extensions to the original UTAUT version, which indicates that no single optimal version of the model has been identified so far. Diversification of the research area forces modifications of the model to a specific research situation. There are still open possibilities to expand and improve the model in order to make it more useful.

Data from Google Trend shows that the interest in the UTAUT model still has strong regional differentiation.

Similarly, the analysis carried out with the use of Scopus and SciVal leads to the conclusion that the scientific achievements in this field also come mainly from selected locations.

The development of the Internet and the emergence of new types of online services give rise to the need to explain ever new areas of human activity in this area. The use of ICT concerns various human behaviours, the Internet is not a homogeneous environment, providing only information, the spectrum of its applications is becoming wider. All this implies the necessity of creating more and more advanced theoretical models to explain network behaviour. The more so as it should be remembered that online activity and the use of ICT take place in a diverse environment and it is very important to take into account the aspects of the environment in which the entity using ICT is located. The virtual and real world interpenetrate and condition each other.

It seems, therefore, that work on information technologies acceptance models should be directed towards creating their holistic versions, covering the broadest possible set of behaviour determinants of entities using ICT.

References

[1] V. Venkatesh, M.G. Morris, G.B. Davis, F.D. Davis, User acceptance of information technology: Toward a unified view, MIS quarterly (2003) 425-478.

[2] F.D. Davis, A technology acceptance model for empirically testing new end-user information systems: Theory and results, PhD Thesis, Massachusetts Institute of Technology, 1985.

[3] V. Venkatesh, F.D. Davis, A theoretical extension of the technology acceptance model: Four longitudinal field studies, Management science 46(2) (2000) 186-204.

[4] V. Venkatesh, H. Bala, Technology acceptance model 3 and a research agenda on interventions, Decision sciences 39(2) (2008) 273-315.

[5] M. Fishbein, I. Ajzen, Understanding attitudes and predicting social behaviour, 1980.

[6] I. Ajzen, From intentions to actions: A theory of planned behavior. In: Action control, Springer, Berlin, Heidelberg 1985, p. 11-39.

[7] F.D. Davis, A technology acceptance model for empirically testing new end-user information systems: Theory and results, PhD Thesis, Massachusetts Institute of Technology, 1985.

[8] R.L. Thompson, C.A. Higgins, J.M. Howell, Personal computing: toward a conceptual model of utilization, MIS quarterly (1991) 125-143.

[9] F.D. Davis, R.P. Bagozzi, P.R. Warshaw, Extrinsic and intrinsic motivation to use computers in the workplace, Journal of applied social psychology 22(14) (1992) 1111-1132.

[10] A. Bandura, Social cognitive theory of personality, Handbook of personality 2 (1999) 154-196.

[11] V. Venkatesh, F.D. Davis, A theoretical extension of the technology acceptance model: Four longitudinal field studies, Management science 46(2) (2000) 186-204.

[12] E.M. Rogers, Diffusion of innovations, Free Press, New York 2003, p. 551.

[13] M. Alshehri, S. Drew, T. Alhussain, R. Alghamdi, op. cit.

[14] V. Venkatesh, J.Y.L. Thong, X. Xu, Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology, MIS quarterly 36(1) (2012) 157-178.

[15] T. Escobar-Rodríguez, E. Carvajal-Trujillo, Online purchasing tickets for low cost carriers: An application of the unified theory of acceptance and use of technology (UTAUT) model, Tourism Management 43 (2014) 70-88.

[16] V. Venkatesh, J.Y.L. Thong, X. Xu, op.cit.

[17] N. Phichitchaisopa, T. Naenna, Factors affecting the adoption of healthcare information technology. EXCLI journal 12 (2013) 413.

[18] H. Wang, D. Tao, N. Yu, X. Qu, Understanding consumer acceptance of healthcare wearable devices: An integrated model of UTAUT and TTF. International Journal of Medical Informatics (2020) 104156.

[19] C. M. Chao, Factors determining the behavioral intention to use mobile learning: An application and extension of the UTAUT model, Frontiers in psychology 10 (2019) 1652.

[20] S. Bardakcı, Exploring High School Students' Educational Use of YouTube. International Review of Research in Open and Distributed Learning 20(2) (2019).

[21] T. Escobar-Rodríguez, E. Carvajal-Trujillo, op.cit.

[22] K.T. Wong, T. Teo, S. Russo, Interactive whiteboard acceptance: Applicability of the UTAUT model to student teachers, The Asia-Pacific Education Researcher 22(1) (2013) 1-10.

[23] G. Wolbring, L. Diep, S. Yumakulov, N. Ball, D. Yergens, Social robots, brain machine interfaces and neuro/cognitive enhancers: Three emerging science and technology products through the lens of technology acceptance theories, models and frameworks, Technologies 1(1) (2013) 3-25.

[24] L. Liu, A. Miguel Cruz, A. Rios Rincon, V. Buttar, Q. Ranson, D. Goertzen, What factors determine therapists' acceptance of new technologies for rehabilitation–a study using the Unified Theory of Acceptance and Use of Technology (UTAUT), Disability and rehabilitation 37(5) (2015) 447-455.

[25] J. Tavares, T. Oliveira, Electronic health record patient portal adoption by health care consumers: an acceptance model and survey, Journal of medical Internet research 18(3) (2016) e49.

[26] A. Kohnke, M.L. Cole, R. Bush, Incorporating UTAUT predictors for understanding home care patients' and clinician's acceptance of healthcare telemedicine equipment, Journal of technology management & innovation 9(2) (2014) 29-41.

[27] F. Khatun, M.J.U. Palas, P.K. Ray, Using the Unified Theory of Acceptance and Use of Technology model to analyze cloud-based mHealth service for primary care, Digital Medicine 3(2) (2017) 69.

[28] P.A. Nuq, B. Aubert, Towards a better understanding of the intention to use eHealth services by medical professionals: the case of developing countries, International Journal of Healthcare Management 6(4) (2013) 217-236.

[29] E. Purwanto, J. Loisa, The intention and use behaviour of the mobile banking system in Indonesia: UTAUT Model. Technology Reports of Kansai University 62(06) (2020) 2757-2767.

[30] J.P. Cabrera-Sánchez, Á.F. Villarejo-Ramos, Acceptance and use of big data techniques in services companies. Journal of Retailing and Consumer Services 52 (2020) 101888.