Jolanta Kowal (Ed.) Anna Kuzio (Ed.) Juho Mäkiö (Ed.) Grażyna Paliwoda-Pękosz (Ed.) Piotr Soja (Ed.) Ralph Sonntag (Ed.)

ICT Management for Global Competitiveness and Economic Growth in Emerging Economies (ICTM)

International Conference on ICT Management for Global Competitiveness and Economic Growth in Emerging Economies Wrocław, Poland, October 22-23, 2018 Proceedings

University of Wrocław, Poland Polish Chapter of Association for Information Systems (PLAIS), USA - Poland The College of Management "Edukacja", Poland University of Applied Sciences Emden / Leer, Germany University of Zielona Góra, Poland Polish Association for Analytical Psychology (PTPA), Poland Hochschule für Technik und Wirtschaft Dresden, Germany AIS Special Interest Group on ICT and Global Development (SIG GlobDev), USA

ICT Management for Global Competitiveness and Economic Growth in Emerging Economies (ICTM)

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ICT Management for Global Competitiveness and Economic Growth in Emerging Economies (ICTM)

International Conference on ICT Management for Global Competitiveness and Economic Growth in Emerging Economies Wrocław, Poland, October 22-23, 2018

Conference title:

Innovation Capability for Socioeconomic Development

Proceedings

University of Wrocław, Poland

Polish Chapter of Association for Information Systems (PLAIS)

The College of Management "Edukacja", Poland

University of Zielona Góra, Poland

Polish Association of Analytical Psychology (PTPA)

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ICTM 2018

Proceedings of the International Conference on ICT Management for Global Competitiveness and Economic Growth in Emerging Economies

Conference Theme: Innovation Capability for Socioeconomic Development

Wroclaw, Poland, October 22-23, 2018

Organizers:













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Proceedings of the International Conference on ICT Management for Global Competitiveness and Economic Growth in Emerging Economies (ICTM) is indexed in: Web of Science, ISI REUTERS, JCR since 2012, PBN

International Conference on ICT Management for Global Competitiveness and Economic Growth in Emerging Economies (ICTM) comes out once a year as an e-book and on-line publication. The articles are avalaible from http://ictm.edukacja.wroc.pl/

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1. From the Conference Co-Chair

New information and communication technologies have imposed a dynamic on the contemporary world that is inducing transformational change within economic, social and cultural realms, resulting in synergy and convergence effects that are difficult to predict. To put it simply, within the growing complexity and unpredictability of the ambient conditions, there is no defined, closed repertoire, strategy, or solution, whether business oriented or institutional, that provides both effective and innovative approaches to the increasing structural problems of the global stage. The only existing solution to maintain a sustainable competitive advantage within today's world of permanent and endogenous change is the involvement of human capital (potential): its creativity and innovative approaches which alone can become a source of Schumpeter's creative destruction.

This implies even more, in the case of emerging economies, which still lag behind the more mature, developed countries both in economic, social and cultural standards of living. To truly close this gap, an interdisciplinary approach to human capital (human resources) is more than required, especially in reference to the transformational potential of information and communication technologies (ICTs) and any associated new management techniques, new business models, and new regulatory policies. Thus, the objective of this conference is to provide a forum for interested researchers and practitioners to exchange their experiences and creative ideas related to ICT management for global competitiveness and economic, social and cultural growth in emerging economies. Possible topics may include but are not limited to the following aspects of innovation:

- Economical, psycho-social and legal frameworks as they relate to ICT and ICT Management
- Social psychological aspects of functioning in the organization
- Unique ICT management techniques for emerging and transition economies
- Methods for measuring the benefits and costs of projects involving the adoption of ICT
- The role of human and social capital
- Gender and other socio-demographic factors in human and social capital and in innovations processes
- Innovative ways for generating revenues and creating commercial knowledge products
- Educational systems and training as they relate to ICT and ICT Management
- Tradition and contemporaneity of pedagogical thought
- ICT innovations to support small and medium enterprises
- ICT innovations as a path to economic growth
- ICT productivity with specific reference to the prevalent social and business conditions
- Global supply chain management in emerging and transition economies
- Country specific case studies, with specific reference to the prevalent psychosocial and business conditions
- ICT off-shoring/outsourcing into emerging and transition economies
- ICT project management, with specific reference to the prevalent social and business conditions
- Digital divide in emerging and transition economies
- E-commerce impact in emerging and transition economies
- E-government in emerging and transition economies
- Healthcare and ICT Management

- Psychological, social, and economic aspects of Internet use in emerging and transition economies
- Virtual reality in psychological treatment and psychotherapy
- Analytical psychology and psychotherapy in the era of new technology
- Information and communication technologies in personnel recruitment, assessment and development
- Leadership and new technologies
- Psychological aspects of working in a virtual team
- Information and communication technologies in an ageing society
- Quantitative methods and information technology in management

Note:

Proceedings of the ICTM are indexed in Web of Science, ISI REUTERS, JCR since 2012.

Contributions to any of the directions within the spectrum of the *ICTM2018* paradigm are welcome.

The four categories for proposals are (1) abstracts, (2)individual papers, (3) posters and (4) *e*-posters.

Three kinds of publications are planned, the first one - a monograph, in which the papers with up to 20000 characters in English be will be included; the second one, in which the articles in a smaller volume will be published. The monographs will be submitted for inclusion in the Citation Index by Thomson Reuters. The paper should also be accompanied by a summary in English. Those papers which are top rated by reviewers when submitted to the ICTM 2018 conference will be published in a special special sections of the journal of international scope: *Information Systems Management*, *ICT Management for Global Competitiveness and Economic Growth in Emerging Economies (ICTM)*, as also *Economy Market Education* and *Polish Journal of Applied Psychology*. The best articles will be published in *Information Technology for Development (25points, A)*.

Track 1

Psycho-social, economic and educational aspects of ICT innovation

Track Chairs: Jolanta Kowal, University of Wroclaw, Poland Piotr Soja, Cracow University of Economics, Poland Grażyna Paliwoda-Pękosz, Cracow University of Economics, Poland

Emerging economies with their dynamic development and rapid growth are often considered the engines of the global marketplace. Unfortunately, despite vigorous economic growth, most emerging economies still lag behind the mature, developed countries in economic output and standards of living. To truly close this gap, new management techniques, new business models, and new regulatory policies, among other factors may be needed. Moreover, information and communication technologies (ICTs) will likely play a vital role in this development process. Thus, the objective of this section is to provide a forum for interested researchers and practitioners to exchange their experiences and creative ideas related to ICT management for global competitiveness and economic growth in emerging economies. Possible topics may include but are not limited to the following:

- Social, political and legal frameworks as they relate to ICT and ICT Management
- Unique ICT management techniques for emerging and transition economies
- Methods for measuring the benefits and costs of projects involving the adoption of ICT
- The role of human and social capital
- Innovative ways for generating revenues and creating commercial knowledge products
- Educational systems and training as they relate to ICT and ICT Management
- ICT to support small and medium enterprises
- ICT as a path to economic growth
- ICT productivity with specific reference to the prevalent social and business conditions
- Global supply chain management in emerging and transition economies
- Country-specific case studies, with specific reference to the prevalent social and business conditions
- ICT off-shoring/outsourcing into emerging and transition economies
- ICT project management, with specific reference to the prevalent social and business conditions
- Digital divide in emerging and transition economies
- E-commerce impact in emerging and transition economies
- E-government in emerging and transition economies
- Psychological, social, and economic aspects of Internet use in emerging and transition economies
- Quantitative methods and information technology in management

Track 2

Tradition and Contemporaneity of Pedagogical Thought

Track Chairs:

Marek Lewandowski, Wyższa Szkoła Zarządzania "Edukacja", Poland Janusz Czerny, Wyższa Szkoła Zarządzania "Edukacja", Poland Piotr Jarco, Wyższa Szkoła Zarządzania "Edukacja", Poland

We offer the following thematic blocks:

- Problems of education and training in a reformed school
- Innovation in education between tradition and modernity
- Pre-school and early-school education looking for alternative solutions
- A child with special educational needs theory and practice
- Teacher as a guide between nature and culture
- Communication in education

Track 3 Communication in Education

Track Chairs:

Ralph Sonntag, Hochschule für Technik und Wirtschaft Dresden, Germany Jolanta Kędzior, University of Wrocław, Poland

Possible topics may include but are not limited to the following:

- New technologies and trends in education and social communications
- New Technologies in education in the global educational space, e-learning platforms, exchanging of ideas, experiences, creating joint study programs, e-publications, virtual libraries, virtual campuses, the use of e-learning and communication mediated by modern media in scientific research and teaching (conference rooms, voice chat, diagnosis, skills, problems with the use of new means of communication), e-learning in Professional development, creating and popularising the use of knowledge
- Educational function of computer games
- Edutainment (entertainment education)- knowledge, competences, attitudes, entertainment, social change
- Media competences of different social groups (diagnosis, developing of key competences), new technologies and child development
- New forms of communications in social communications
- New technologies in interpersonal communications in different social groups (family, education, labour market institutions, NGOs, civic movements, social environment in the internet, social conflicts)
- Wiki technology- wikinomy (openness, partnership, cooperation, global collaboration, expert communities), E-inclusion

Track 4

Language in Communication

Track Chairs: Anna Kuzio, University of Zielona Góra, Poland

Language is essential to everyday human interaction. We use language to inform other people of what we feel or desire, and how we understand the world. We communicate effectively using words, gestures, and tone of voice in a multitude of situations, and for a variety of purposes. The capacity for articulate discourse is what makes us distinct from other living species. The objective of this section is to provide a forum for interested researchers and practitioners to exchange their experiences and creative ideas related to linguistics in its broadest sense. We especially welcome papers which re-examine existing frameworks for critical discourse research and/or which highlight and apply new methodologies sourced from anywhere across the humanities, social and cognitive sciences. Possible topics include but are not limited to the following:

- Discourse analysis
- Political and media discourse

- Advertising
- Discourses about war and terrorism
- Discourses about discrimination and inequality
- Power, ideology and dominance in institutional discourse
- Identity in discourse
- Education discourse
- Environmental discourse
- Health communication
- Language and the law
- Translation
- Applied linguistics
- Language teaching
- Lexicography
- Corpus linguistics
- Intercultural communication

2. Biographies

Jolanta Kowal



Jolanta Kowal, pHd. of economic sciences, certified Jungian analyst, a tutor and researcher at the Institute of Psychology of Wroclaw University. She is a President of PLAIS (Polish Chapter of Association for Information Systems) and President of PTPA (Polish Association of Analytical Psychology), Individual member of IAAP, a member of scientific associations AIS, PTS and PTPA accredited by IAAP. A researcher and lecturer, Jolanta is the author of over 100 scientific publications and delivers lectures and seminars on methodology of management, applied statistics in socio-economic, psychological and multicultural research. Her interests and research specializations are: organization and management, information technology in organization, methodology, quantitative and qualitative research, analytical psychology, cross-cultural research. Jolanta acted as the conference c0-chair and track-chair for many international conferences (ECMLG, CMEP, ICTM AMCIS). She is also a member of editorial board of scientific journals: GRE and PJAP.

Ali Reza Afshari



Manal Assaad

Ali Reza Afshari is a professor at Islamic Azad University in Iran, and a visiting lecturer in State universities in Iran and Novi Sad University, Serbia. He holds Ph.D. on Industrial Engineering (Project Management) from UPM University in Malaysia; long consulting experience from both private and public sectors in Project Management. He has reviewed numerous scientific paper for Elsevier and Springer publishers. He reviewed also papers for more than 10 scientific publishers. His research interests include Fuzzy linguistic decision making, Personnel selection, Delphi method, ICT Project management, and construction management. He has published in more than 50 journals and conferences including: Journal of Construction Engineering and Management (ASCE), Journal of Intelligent and Fuzzy Systems (IOS), Arabian Journal of Science and Engineering (Springer), Australian Journal of Multi-Disciplinary Engineering, Journal pf Applied Science & Agriculture, KSCE Journal of Civil Engineering (Springer), Journal of Applied Mathematics (Hindawi), among many other journals, as well as in numerous conference proceedings such as IEOM, EMC, and IEEE.

Manal Assaad holds a bachelor degree in Management and a master's degree in Marketing, and has over 8 years of experience in Social Media marketing, digital training, and teaching. She is currently a Scientific Research Associate at the University of Applied Sciences Emden/Leer in Emden, Germany, where she is a work package leader in the EU-funded project STIMEY (grant

11



agreement 709515). Her role in the project focuses on the design and development of social media components, creating and overseeing the overall theme of STIMEY, and the technical development and integration within the e-learning platform. Additionally, she is a member of the pedagogical advisory board and visibility team, providing consultation and advice on online learning, and project marketing and dissemination. Her research interests include the pedagogical, social or psychological aspects of social media use in knowledge management, education, and marketing.

Graduated in Management with specialization in Marketing and Entrepreneurship from Escola Superior de Propaganda e Marketing (ESPM-SP), São Paulo, Brazil. Post-graduated in Master in Business Administration in Business Management from Fundação Getúlio Vargas (FGV). Post-Graduation in Higher Education Teaching by the Faculty of Rondônia (FARO). Post-Graduate in MBA in Financial Management, Controllership and Audit at Fundação Getúlio Vargas (FGV). Master in Management from the Federal University of Rondônia (UNIR), Brazil. Graduating in Biology at Centro Universitário São Lucas (UNISL).

Alecia Adelaide May Reid

Raul Afonso Pommer

Barbosa



Alecia Adelaide May Reid born in Jamaica and presently living in Southern Spain, Andalusia, Cadiz. She studies Computer Science Software Systems Engineer at the Faculty of Engineering at the University of Cadiz. She is project Manager and Assistant Coordinator for the European Commission Research Programme -Horizon 2020 Project, STIMEY (Science, Technology, Innovation, Mathematics, Education for the Young).

Małgorzata Biedroń



M. Biedroń is an author of 4 monographs in the field of interpersonal communication and social pedagogy (Tutelary function of the urban family, Theoretical and practical aspects of contemporary tutorial pedagogy (co-ed.), Communication- accordsocial presence (co-ed.), The experience of post-modernism in intimate family relationships (co-author) and more than 40 articles in scientific journals (national and foreign) and chapters in peerreviewed publications. Editor of 19 consecutive edition of "Handbook of publications in the field of social pedagogy". Member of Program Council of quarterly "Auxillium Sociale

Novum"

Марія Вовк



Was born in Lvov area. Education:Drogobichchsky State Pedagogical University named I.Franko (2004); National Pedagogical University named M.P.Dragomanova,Institute of Sociology,Psychology and Management,Graduate (2009), dissertation topic "Psychological consequences of exeperiences of frustration situations in adolescence",(19.00.07-pedagogical and age psychology). Over 8 years of experience in teaching activities.

Valentina Bogatyrova



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2006–2012 Professor of Peter the Great Saint Petersburg Polytechnic University, 1989–2006 Director for Training and Research Programs of Center for Management and Marketing "Progress" under Government of Russian Federation, 1980–1989 Assistant, Associate professor, St. Petersburg State Polytechnical University

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Bianka Lewandowska



Bianka Lewandowska - PhD with a specialization in psychology. She graduated from the Institute of Psychology at the University of Wroclaw. In the years: 1993 - 2003 Bianka worked at the Institute of Economic and Social Sciences University of Technology, and since October 2003, in the Department of Clinical and Health Psychology, Institute of Psychology at the University of Wroclaw. Her professional activities outside the university: to design and conduct workshops and individual counseling psychology in supporting personal development and communication. Current area of her research interest is psychology of the body - the experience of corporeality, identity processes and emotions and somatic health, the possibility of psychological support prevention and treatment of diseases. Research: Determinants of psychological adaptation to chronic illness for example endometriosis.

Dag Lindskog is a doctor in Economics from the University of Stockholm, Sweden. His dissertation is primarily about exchange rate policy, which is tested in econometric models of four of the Nordic countries. He has also published a book on the dollar as well as numerous debates in specialized and the general press. Furthermore, he was a member of the popular Swedish weekly radio program "The Economists' Club" for twenty years. Dag has spent most of his working life in the financial sector in Stockholm, London and Luxembourg. He started his career with SwedBank, moved on to the Swedish insurance company Skandia as Chief Economist and ended with the Norwegian bank DNB. After retirement from DNB, he continues his work as an economist with his own consulting company.

with a special focus on public procurement at Department of Management and Engineering, Linköping University, Sweden. Engineer on electronics from Technical University in Warsaw, Bachelor of Arts in languages, comparative religion, history and literature from Stockholm University; long experience from both private (responsible for market introductions and training at Ericsson, as adviser, expert and consultant at HelDag AB) and public sectors (technical director and secretary in governmental commissions), PhD in Technology at Linköping Technical University.

Adjunct professor in industrial marketing and industrial economy

Author of several scientific articles, reports, technical specifications, debates and columns in the Swedish press. Fluent in Polish, Swedish, English, Spanish, Russian and French.

Dag Lindskog

Helena Lindskog



Marek Lewandowski



Marek Lewandowski - A graduate of the Academy of Physical Education in Wroclaw, specializing in teaching. In the 1986-2012 academic teacher at the Academy of Physical Education in Wroclaw. The College of Management in Wroclaw industry since 2012, author of over 70 scientific peer-reviewed publications, including two books, editor of nine monographs. He has research and teaching internships at the Hochschule für Musik und Darstellende Kunst "Mozarteum" Abteilung Orff Institute in Salzburg, Austria, Deutsche Sporthochschule - Institut für Sportdidaktik in Cologne, Germany, the University of Olomouc -Czech Republic, Academy of Physical Education in Warsaw Academy of Physical Education in Gdansk.

Work experience: developing a theory of physical education in the context of the culture of health behavior, recreational and aesthetic man. Research activity is focused on the study of the role of the environment: the school and the family in the child's acquisition of cultural competence and psychomotor.

Interests: listening to music, collecting records, drawing and painting, hiking.

Zbigniew Łoś – psychologist, PhD in human sciences, works in Institute of Psychology, Faculty of Historical and Pedagogical Sciences at the University of Wrocław.

Zbigniew Łoś



He has developed his own theory assuming that the psychological organisation of human beings consists of four evolutionarily shaped functional layers which may be subject to progressive development throughout four periods of human life. He is engaged in research aiming to falsify this theory. His main publication is "Rozwój psychiczny człowieka w ciągu całego życia" [Life-long psychological development of human beings] (2010, a monograph).

He developed (with Alicja Senejko) theoretical model of attitudes to globalization (MAG). She is a coauthor (with A. Senejko) The World and I Questionnaire (WIQ), which is a measure of this attitudes.

Maria Mach-Król

Maria Mach-Król is the associate professor in the Dept. of Business Informatics at the University of Economics in Katowice,



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Since 2008 she has been working at the position of associate professor at the University of Economics in Wroclaw, Poland, and then at the University of Economics in Katowice, Poland. She is the author and co-author of more than 50 journal and peerreviewed papers, three books, and has written several book chapters. Her current research interests include artificial intelligence, big data and knowledge-based systems. She is the member of the Polish Artificial Intelligence Society and of the Business Informatics Scientific Society – NTIE (Naukowe Towarzystwo Informatyki Ekonomicznej).

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perspective of advanced digital transformation and related

epistemic project, 2012, Internet Pragmatics. Web 2.0 As an Environment, 2013, Towards the Civilization of the Internet. The

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Rafał Maciąg

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Prof. Dr. Juho Mäkiö joined the Department of Electrical Engineering and Industrial Informatics at the University of Applied Sciences Emden-Leer and became Full Professor of programming in 2013. He received the Doctor degree in Economics from the University of Karlsruhe, Germany, in 2006. From 2006 to 2010 he was first project manager (till 2007) and then department director (2007-2010) in the department of Software Engineering at the research centre of information technology at the University of Karlsruhe (FZI). From 2010 to 2012 he was deputy professor for software engineering and programming in the University Heilbronn at the department of e-Business. From fall 2012 to summer 2013 he was lecturer at the Technical Teacher Collage (TTC), Riadh, KSA. Besides the current position at the University of Applied Sciences Emden-Leer, he is visiting professor at the Polytechnic University of St. Petersburg, Russia. Prof. Mäkiö has participated in leading position in German research projects, e.g. as coordinator of the project "OUTSHORE"

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Janusz Martan was born 1 April 1950. in Wroclaw. In 1973 he completed a degree in electronics at the Technical University of Wroclaw. In 1977 he received his PhD ("Investigation of ion extraction conditions on the parameters of ion beam."). In 1997, obtained post-doctoral degree ("Modeling of the concentration distribution of implanted ions in solid-state"). In 2004, transfers from the Faculty of Microsystem Electronics and Photonics to the Department of Computer Science and Management. Since 2005, the exercises the function of the vice-dean.. His research covers the field of the production of molding and applications of ion beams, ion implantation and fractal calculus applications in various fields of science and knowledge.

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Anna Mitrega, Institute of Pedagogy, University of Wroclaw, Poland

Area of study: Elementary School Pedagogy, Social Pedagogy and Communication, Pedagogy of Family, Life - coaching. 1999 - University of Wroclaw - PhD degree with specialty in Pedagogy, since 01.10.2004 – assistant professor of Institute of Pedagogy, University of Wroclaw.

Participation in research: own R&D work – issue Chances and Threats of Educational Function Accomplishment within Postmodern Family. The research includes: parents' narratives and also educational-classes meetings carried on within Academy of Parents framework.

Over thirty publications /also in English, German and Russian/

Anna Oleszkowicz



Anna Oleszkowicz (born in 1956), psychologist, professor at the Institute of Psychology at the University of Wroclaw. Her research interests focus on developmental issues of adolescence, adolescent rebellion, criteria and forms of adulthood. The author of numerous scientific and popular works in this field, including the monograph crisis youthful - the essence and process (1995), youthful rebellion. Conditions, forms, effects (2006), How to truancy (2010) coauthor, psychology of adolescence. Developmental changes in the age of globalization (2013), co-author. Since 2008 he has been the Director of the Institute of Psychology. PhD 1989, habilitation in 2007.

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Krystyna Ostapiuk



Eduard Pavlysh, born 20/10/1980 in Donetsk. In 2002 obtained Master Degree in International Economics from Donetsk National Technical University. In 2007 completed Ph.D. degree in Regional Economy at the Institute for Economic and Legal Studies of National Academy of Ukraine (Donetsk), with Ph.D. thesis on Economic and Organizational Provision of Regional Competitiveness. From 2002 till 2007 had been working as assistant lecturer, and from 2007 till 2014 as associate professor at the International Business Administration Department, Economics and Management Faculty of Donetsk National Technical University. From September 2014 till April 2018 had been working as associate professor at the Department of Finance, Finance and Economics faculty of Polotsk State University (Belarus). Since April 2018 is working as associate professor at the department of Civil Law and Civil Process, Faculty of Law of Vitebsk State University named after P.M. Masherov (Belarus). Scientific interests: Regional and National Competitiveness, Innovationdriven Development of the Economy, Innovational Potential as a Factor of Economic Growth. Married, has two children.

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Kamil Roman



Kamil Roman: PhD student at the Maria Curie-Skłodowska University in Lublin. In my research work, Im interested in issues related to logistics problem and urban development according to the Smart City concept. My research interests are also focused on public transport, Intelligent Transport Systems and contemporary problems related to sustainable urban development.

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Richard Sharp



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Richard Sharp is a full-time teacher at the university of Zielona Góra, Poland. At the moment he is in the process of doing a PhD. His research interests include computer-assisted language learning (CALL), mobile-assisted language learning (MALL) and the impact of new technologies on the classroom and language acquisition process.



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Anton F. Tikhomirov

Anton F. Tikhomirov, was born in September 26, 1952, married, one child. Education: 1976 - Diploma of Engineer (Physics), Leningrad Polytechnic Institute (LPI); 1983 - PhD degree, LPI, Materials Sience (15 Publications); 1997 – Diploma of Russian-American Graduate School of Management in SPb Polytechnic University. Since 1992 I have been interested in the Russian securities market. Collaborated with Russian investment companies. Since 1996 I have been teaching in SPbPU as an Associate Professor courses related to financial markets, securities market, corporate management. Now my area is the problems of evaluating intellectual capital, its impact on market value and company performance (40 publications).

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- The "Symob" projective method and its possible applications in the labour market: the basis for the method's construction / Krystyna Węgłowska-Rzepa, Jolanta Kowal // W: Functioning in the workplace: quantitative and qualitative psychological research / ed. by Barbara Mróz. - Warszawa: SCHOLAR Publishing House, 2012;

Femininity and masculinity in the course of social and mental changes / Krystyna Węgłowska-Rzepa, Jolanta Kowal, Aleksandra Szczepaniak // W: Ona w XXI wieku: interdyscyplinarny obraz kobiety / red. nauk. Magdalena Baranowska-Szczepańska. -Poznań: Instytut Naukowo-Wydawniczy MAIUSCULA, 2011;
W poszukiwaniu swojego miejsca w życiu: spojrzenie z perspektywy narracyjnej i analitycznej / Krystyna Węgłowska-Rzepa // W: Psychologia narracyjna: tożsamość, dialogowość, pogranicza / red. nauk. Elżbieta Dryll, Anna Cierpka. - Warszawa: Eneteia - Wydaw. Psychologii i Kultury, 2011. - (Seria Akademicka).

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- Xth European Conference on Information Systems ECIS 2002
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4. Papers

Keynote address

ICT for Active and Healthy Ageing: Comparing Value-based Objectives between Polish and Swedish Young Adults

by

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ABSTRACT

Population ageing, a typical phenomenon for developed nations, requires implementation of strategies for active and healthy ageing. Information and communication technology (ICT) plays an important role in the implementation of these strategies. To elaborate ICT-supported strategies for active and healthy ageing, it is necessary to involve multiple stakeholders, such as decision-makers, caregivers, social workers, and representatives of various generations, e.g., the elderly, the middle-aged, and young adults. This qualitative study focuses on the generation of young adults as these people usually reveal substantial ICT experience and will play an important in the future as caregivers and users of upcoming solutions. By applying Value-focused thinking approach, this qualitative and exploratory study investigates what objectives are important for successful implementation of ICT for active and healthy ageing according to young adults in Sweden and Poland. The study shows both differences and similarities between the objectives identified and discussed possible underlying reasons. Keywords: ICT, Active and healthy ageing, Value-based thinking, Poland, Sweden

INTRODUCTION

To cope with the challenges arising because of the growing number of elderly people in the population, most of the developed countries are currently implementing strategies for active and healthy ageing. Information and communication technology (ICT) plays an important role in the implementation of these strategies. To elaborate ICT-supported strategies for active and healthy ageing, it is necessary to involve multiple stakeholders, such as decision-makers, caregivers, social workers, and senior users. Although most of the stakeholders emphasize that ICT solutions have a potential to prolong active and healthy life, seniors are the ones who eventually need to accept the technology and decide whether to use or install it at their homes. Today's seniors are still not familiar with the modern ICT solutions and do not use it to the same extent as other generations do (e.g., Wagner *et al.*, 2010). In particular, older employees appear to experience more difficulties with learning new business software (Soja and Soja, 2017; Soja *et al.*, 2016). Also, older users have special needs as regards content distributed via mobile devices (Stal and Paliwoda-Pękosz, 2018). In general, in everyday life, acceptance of the new ICT solutions by older users is necessary for a successful implementation of strategies for active and healthy ageing based on ICT.

Previous research indicates that intergenerational relationships might be crucial for technology acceptance by the elderly (Soja, 2017a). Family members play a key role in technology acceptance by seniors (Peek *et al.*, 2014). Also, Luijkx *et al.* (2015) argue that the young generation (grandchildren) is especially important in the process of adoption of ICT by seniors, because of their enthusiasm and knowledge of the new technology. Thus, this qualitative study focuses on the generation of young adults (grandchildren) as they usually reveal substantial ICT experience and will play an important role in the future as developers, policy-makers and caregivers.

By applying Value-focused thinking approach, this qualitative and exploratory study investigates what is important for the successful implementation of ICT for active and healthy ageing according to young adults in Sweden and Poland. Value-focused thinking (VFT) approach (Keeney, 1992) is a way of improving decision-making in a specific context by grounding strategic decisions in values identified in that context. This study focuses on values held by young adults in Poland and Sweden, as these countries demonstrate significant differences with respect to various technology-related and socio-economic considerations (Kolkowska *et al.*, 2018). In particular, Sweden reveals a higher level of digital development and demonstrates a more developed policy of active and healthy ageing as compared to Poland (Soja, 2017b; Zaidi *et al.*, 2017). Furthermore, Swedish and Polish elderly care systems are organized differently. In Poland, the welfare system strongly relies on informal support provided by family members (Kurkiewicz and Soja, 2015) and the majority of services are rendered by families and private service organizations. The Swedish system, in turn, is built on state responsibility model with strong emphasis on redistribution, social inclusion, and universality of public services (Klimczuk, 2016). Prior research suggest that seniors in Poland and Sweden differ as regards objectives perceived as important for successful implementation of ICT for active and healthy ageing (Kolkowska *et al.*, 2018).

The current study seeks to answer the following research questions:

- What objectives are important to include in strategies for implementation of ICT for active and healthy ageing according to young adults in Sweden and Poland?
- What are the differences and similarities between the identified objectives in these two countries?

The paper is organized as follows. In the next section, we describe our research method, which is followed by the presentation of results. We then discuss our findings and close the paper with concluding remarks.

METHOD

According to VFT (Keeney, 1992), we started the study by interviewing concerned people who in our case were young adults in Poland and Sweden. We conducted 30 in-depth interviews (15 in Poland and 15 in Sweden), following Keeney (1994) procedure. At the beginning of each interview, we clarified the purpose and scope of the interview. During the interview we used suggested by Keeney (1992) words such as trade-offs, consequences, impacts, concerns, fair and balance, to trigger questions to make implicit values more explicit. To ensure relatively good representativeness and diversity of samples for both countries, we have chosen respondents of both genders (8 men and 7 women), aged 20-30,

with different places of residence and varied experience in helping seniors to cope with activities in everyday life.

To identify the value-based objectives, we first searched for values in the collected material. In line with Keeney's suggestion, we looked for statements expressing problems, consequences, better or worse alternatives, or goals. The analysis resulted in a list of statements that were numbered, written as values, and input into a database. Second, we structured the values and converted them into objectives. All objectives were then categorized in groups, dealing with similar issues. The groups (categories) were then labeled. The objectives identified in the Polish and Swedish contexts were categorized separately. Then, the categories were discussed in a group of researchers involved in this study and changed if needed. Third, we categorized the categories of objectives into fundamental and means. Fundamental objectives are essential objectives in a given decision context, while means objectives help to achieve the fundamental objectives. The classification was done separately for Poland and Sweden.

RESULTS

In the following sections, we present value-based objectives essential for the implementation of ICT for active and healthy ageing in Sweden and Poland. Based on the interviews conducted with Polish young adults, six fundamental and twelve means objectives were identified as important for the implementation of ICT for active and healthy ageing in the Polish context. In the Swedish context, we found five fundamental and fourteen means objectives.

Fundamental and Means Objectives in Poland

In the following, there are objectives elicited on the basis of the interviews conducted with Polish young adults. The fundamental objectives include the following issues:

- *F1: Increase seniors' life quality.* The solution should foster self-dependence of seniors and should help them to improve their health condition.
- *F2: Maximize mental comfort of seniors.* Seniors should have a sense of security, should be satisfied and not feel anxiety.
- *F3: Maximize solution's economic profitability*. The cost of healthcare service should be reduced, the solution's cost and profitability should be evaluated.

- *F4: Ensure help for the family.* The solution should be helpful for the family; they should be relieved of some duties and have more spare time.
- *F5: Enhance economic development.* The solution should help the national economy to develop; private companies and organizations should be established and benefit from the solution.
- *F6: Increase social awareness.* The society should be aware of the problems of ageing and empathy for the elderly should be promoted.

There are several means objectives elicited from the respondent answers and listed in the following.

- *M1: Ensure acceptance by seniors*. Seniors need to develop confidence in the solution and should know how to operate the solution. M1 supports F1 and F5.
- *M2: Ensure alignment with seniors' needs*. The solutions should be convenient for seniors and easy to use. M2 supports M1.
- *M3: Maximize solution availability.* The solution should be available for everyone, which might be particularly achieved by securing Internet access. M3 supports F6, M1, and M4.
- *M4: Improve quality of care.* Access to various kinds of care, health-related information availability, and better health prevention should be established. M4 supports F1, F2, and F4.
- *M5: Improve work quality of care personnel.* The solution should satisfy the care personnel and support their work. M5 supports M4.
- *M6: Ensure quality of the solution.* The solution should be reliable, easy to operate, and constantly monitored and optimized. M6 supports M1, M2, and M4.
- *M7: Support interpersonal relationships*. The solution should help the elderly to maintain personal contact with family and other people. M7 supports F1, F2, and M4.
- *M8: Ensure various sources of the solution's financing*. The private sector and families should be involved in financing the solution; appropriate taxation policy should be worked out. M8 supports F3, F5, F6, and M3.
- *M9: Ensure support for seniors in system use.* Seniors should be helped during the learning process and while operating the solution. M9 supports M1.

- *M10: Support care system and its reorganization.* The solution should be helpful for medical and care services and help them to operate efficiently. M10 supports F4, M4, and M5.
- *M11: Ensure care personnel availability*. A sufficient number of competent care personnel should be available on the market. M11 supports M4 and M6.
- *M12: Ensure privacy*. The solution should ensure people's privacy and the seniors should not be kept under surveillance. M12 supports F4 and M1.

Fundamental and Means Objectives in Sweden

The following text summarizes the fundamental and means objectives elicited from interviews with Swedish respondents. The identified fundamental objectives are:

- F1: *Maximize senior's quality of life*. The ICT solutions should support independence, sense of safety and security, ensure social inclusion, and minimize loneliness.
- F2: *Maximize social contact*. Digital solutions should facilitate communication with family and friends and also allow homecare personal to spend more quality time with seniors.
- F3: *Minimize burden for the family and other caregivers*. The new solutions should support the family and other caregivers, reduce their concerns and workload.
- F4: *Provide possibility for ageing in place*. ICT solutions should allow seniors to live longer in their homes, in familiar settings, close to their family and friends.
- F5: *Enhance seniors' physical and mental activity*. With technical support, seniors can activate themselves by going out and meeting people, playing online games, etc.

The means objectives elicited from the respondent answers are listed in the following:

- M1: *Ensure acceptance of technology by seniors*. Seniors need to develop confidence in the solution and should know how to operate the solution. M1 supports F1-F5.
- M2: *Ensure alignment with seniors' needs*. The solutions should address seniors' diverse needs. M2 supports F1-F5 and M1.
- M3: *Improve quality of care*. Quick access to various kinds of care, health-related information availability, and better health prevention should be established. M3 supports F1-F4.
- M4: *Improve work quality of homecare personnel*. Reduce stress by decreasing their workload, time-pressure, and concerns for the seniors. Increase their competence and IT skills. M4 supports F1, F2, F4, and M3

- M5: *Support seniors in performing every-day activities*. ICT solutions should help seniors to cope with every-day activities such as cleaning, cooking, shopping, hygiene, etc. M4 supports F1, F3, F4, and M2.
- M6: *Ensure privacy and data security*. Privacy of seniors needs to be considered, and the collected data need to be protected during communication, using and storage. M6 supports M1, M2, and M3.
- M7: *Ensure equal access to digital solutions*. The solution needs to have an affordable price; new payment models need to be developed, governmental support is necessary. M7 supports F1-F5, M2, and M3.
- M8: *Create pre-conditions for digitalization*. New roles and responsibilities, relevant skills and competencies (seniors, family, and personnel), a positive attitude and trust need to be established. M8 supports F1-F5, M1, M2, M3, M4, and M6.
- M9: *Ensure development of diverse high-quality products*. ICT solutions must be reliable, usable, and not obtrusive, also support different areas of life. M8 supports F1-F5, M1, M2, M3, M4, M11, and M13.
- M10: *Ensure ethically sustainable digitization*. Digitalization cannot be driven solely by economical aspects; it must be done gradually with seniors' needs and capabilities in mind. M10 supports F1-F5, M1, and M3.
- M11: *Promote digitalization of home care*. Digitalization of care is the only way to ensure sufficient quality of homecare and more efficient use of the available resources. M11 supports F1-F4, M3, M4, M5, and M6.
- M12: *Maximize reliability of the solution*. The solution needs to work without failures and data provided by the solution needs to be correct. M12 supports F1-F5, M1, M3, and M8.
- M13: *Ensure senior's security*. Monitoring of health status, fall detection, emergency alarms. M13 supports F1-F5 and M1.
- M14: Ensure a balance between digital and traditional homecare. ICT solutions should complement traditional healthcare and not replace it. M14 supports F1-F5, M1, M2, M3, M4, M5, and M4
- M15: *Ensure seniors' autonomy*. Seniors have a right to make their own decision about the level of digitalization, where they would live, etc. M15 supports F1, F2, F3, M1, M3 and M6.

DISCUSSION

In general, young adults in both Sweden and Poland see the huge potential of ICT for improving quality of care, support for caregivers, and seniors' quality of life. At the same time, they emphasize that modern technologies are not able to replace the traditional care and that personal contact with people is necessary. Nevertheless, there are some differences in the perception of elderly care, stemming mostly from differences in functioning of welfare systems and different levels of digital development. The most important differences are discussed in the following.

- 1. Sweden is trying to improve home care because its quality dropped in recent years due to demographic changes. Swedish young adults perceive digitalization as the only option to improve care. Swedish seniors are often very lonely because homecare is reduced to helping elderly with the most important things at home and there is no time for socializing. This is why Swedish young adults emphasize the importance of social contact. They perceive using of digital solutions as a possibility to create more time for personnel to socialize, keep the seniors company. They recognize technology as a complement and not a replacement for traditional (professional) home care.
- 2. Polish young adults recognize the long-lasting problems affecting the Polish healthcare system (financial and personnel-related) and are aware of the potential high costs of digitalization of care. Hence they emphasize the importance of reorganization of the Polish care system as an essential condition for improving the quality of care. They also emphasize the need for controlling the financial effectiveness of new solutions and their actual usefulness for seniors.
- 3. Many public services in Sweden are already fully digitalized and traditional ways of doing things do not exist anymore, forcing elderly people to use digital services. Because elderly people often lack adequate knowledge and IT skills, such a solution makes them often more dependent on other groups. Because of these experiences, young adults in Sweden emphasized the importance of ethical digitalization of elderly care, taking into consideration those risks. Polish young adults, on the other hand, recognize great potential in digital solutions applied mainly for supporting health and elderly care. To a smaller extent they perceive the role of ICT in maintaining social contact, which is associated with the significantly lower level of digital development of Poland.

4. Negative legacy of centrally-planned economy and past political system in Poland, such as wasting common goods, careless management, and lack of trust in state organizations, might explain why Polish young adults emphasize the importance of the involvement of the private sector, companies development, and evaluation of the solution's cost and profitability. Swedish young adults, in turn, recognize the risk associated with privatization and commercialization of home care, which might negatively influence the seniors' access to equal care.

CONCLUSION

By applying Value-focused thinking approach, this qualitative and exploratory study investigated what is important for the successful implementation of ICT for active and healthy ageing according to young adults in Sweden and Poland. The study shows that young adults in both countries see a great potential of ICT to improve the quality of care and seniors' quality of life. The study also reveals significant differences between Polish and Swedish young adults' views on the implementation of ICT for active and healthy ageing. The differences have their origin in socio-economic differences between the two studied countries and should be taken into consideration in system analysis and design as well as in decision-making when ICT-based strategies for active and healthy ageing are formulated and implemented.

Acknowledgements

This research has been financed in part by the funds granted to the Faculty of Management, Cracow University of Economics, Poland, within the subsidy for maintaining research potential.

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Skills needed in the ICT Project Manager Selection

by

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ABSTRACT

One of the key challenges in ICT projects is the efficient allocation of human resources to ICT development tasks. To achieve this challenge, proper project manager evaluation and selection is an important step. Similar to many decision making problems, the choice of ICT project managers in real life is very complicated. Although a good number of researches have examined these problems, no detailed and sound procedures have been stated to specify the required skills. This paper presents a framework to help decision makers define and clarify the hierarchy of hiring skills. The main objective of this paper it is to develop a structural method to identify skills for ICT project manager selection by modifying the Delphi method and as well as draw out the hierarchical skills. In this model, after investigating previous studies about ICT project manager skills, a modified Delphi technique was used to validate the models for the selection of ICT project manager in a project based company. The results showed that the proposed model was satisfactory in choosing skills needed and is capable of improving the effectiveness in the decision making processes.

Keywords: ICT Project Manager Selection, Soft Skills, Criteria Selection, Delphi, Project Management, Decision Making.

INTRODUCTION

Please Information and Communication Technologies (ICT) projects continue to suffer from a high rate of failure (Keil, Lee, & Deng, 2013). In a study of ICT project risks conducted by Schmidt et al. (2001), the "lack of required knowledge/skills in the project personnel" was ranked as one of the top five risks that can affect the success of an ICT project. Poor ICT project management can not only impact a firm strategically, economically, or culturally; but may also jeopardize client relationships, result in project cost overruns and tarnish the project team's spirit (Langer, Slaughter, & Mukhopadhyay, 2008). Wateridge (1997) argued that the skills of ICT project managers (PMs) are critical to the success of ICT projects and that organizations should focus on developing these skills for the successful execution of ICT projects (Keil et al., 2013). Because particular ICT PM Skills appear to be highly correlated with project outcomes, it is critical to understand the skills required to be an effective ICT PM. Having a ranked list of these skills, in order of their relative importance, would be beneficial in several ways:

• It would help companies to hire or select effective PMs who demonstrate higher competence in the skills that are viewed to be the most critical for ICT projects,

• It would help companies and educators to tailor their career development and training to address the most important ICT PM skills, and

• It would help ICT PMs to prioritize their own training and development given limited time and resources.

While the need for selecting a suitable ICT project manager is well recognized, there is relatively little knowledge about how to best fit project managers to ICT projects. What skills should a PM bring to the ICT project, and how do these skills affect project success? We examine one of these questions in our study. The aim of this study is to identify the kinds of skills needed for effective ICT project manager. Our study brings together two strands of research: literature related to ICT project manager skills and ICT personnel skills; and a systematic method of extracting skills based on the consensus of experts. To date, there have been only a handful of studies that have examined ICT PM Skills [5–7]. Moreover, there has been no systematic method to extract these skills. Thus, there is still a need for more

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exploratory work not only to identify the ICT PM skills. The purpose of our research is to address this gap in the literature by conducting a Delphi study, which will allow us to identify the most important ICT PM skills. The remainder of our paper is organized as follows. First, we review the prior research on identifying important skills for information systems professionals in general and for ICT PMs in particular. Then, we discuss the research methodology used in this study. Next, we present and discuss our findings, and compare our results to previous studies that sought to identify ICT PM Skills. Finally, we conclude with a

discussion of the implications for research and practice. The skill requirements for project managers in ICT projects have not been widely studied in the past. We addressed this gap in the literature by conducting a Delphi study with 19 ICT project managers (PMs). Among the list of 48 skills identified, our panelists selected 19 skills as being the most critical for ICT PMs and then ranked them based on their relative importance. Follow-up interviews were conducted with selected panelists to gain insights into the importance of the top-ranked ICT PM skills. We compare our results with two previous studies of ICT PM Skills and discuss the implications for research and practice.

In the present study, detailed methodology was put forward for consideration to determine the level of skills of structural arrangement for the selection of ICT PMs. A qualitative approach was used in this study to identify the skills that is best suited for ICT PM Selection in a project based organization. Panels are made up of experts with experiences in project based companies. A total of 14 standards for judgment were singled out in a structural order. The remainder of the paper was arranged thus: after introduction, section 2 presents a general survey for ICT project managers' skills for selection. Section 3 discusses the methodology and research design; Section 4 showed a case study, which explained the methodology of this research. Discussions are presented in section 5 which centered on the effectiveness of proposed method as well as conclusions and suggestions for further research in Section 6.

LITERATURE REVIEW

The importance of Information and Communication Technologies (ICT) is well established in organizations today. Not only does ICT help to improve the efficiency of a

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multitude of work processes, but it can also enable workgroups and organizations to radically redesign work processes by leveraging ICTs communication and coordination capabilities. ICT supports all critical front and back office functions (Gallivan, Truex III, & Kvasny, 2004) and, due to adoption of new technologies, such as wireless communication, its influence is expected to grow tenfold in the near term. Recent research has underscored the fact that ICT does not exist in a social vacuum, but that the only sustained competitive advantage to using ICT derives from the human capital of talented employees who know how to fit technology to the organizations needs and who can skillfully partner with business users to manage organizational change. Firms that are best able to recruit and retain qualified ICT professionals will gain a decisive edge over their competition (Aggarwal, 2013). Several studies published over the past decade have examined the changing nature of ICT professionals jobs, including changes in job roles, required skills, and the personal attributes required for successful ICT employees (Keil et al., 2013). Building upon this literature, our study examines using a systematic method for required job skills for ICT project manager. Normally, choosing a project manager for projects is one great consequence and difficult decisions that can be made. As a result of the fact that majority of the decisions are made by the project managers, this however, highlights the need for the choice of a highly experienced person for such a position. Choosing a project manager is a decisive decision to be taken in a project. The processes of selection include different criteria and should be in line with the company's ideologies, rules and specific projects. Under a normal circumstance interested applicants should be examined orally and the best and most qualified candidate be selected in line with the companies requirements for the project (Torfi & Rashidi, 2011).

While many studies have been conducted on the skill sets required in the information systems (IS) field, they have tended to focus either on IS professionals as a general group or on subspecialties other than ICT PMs. For example, based on a content analysis of job advertisements in four major newspapers over a 20 year period, Todd et al. (1995) examined how job requirements changed over time for programmers, ICT managers, and system analysts. They found that the requirements for programmers and ICT managers were quite stable over time, but the requirements for system analysts had shifted toward a greater emphasis on technical knowledge. Lee et al. (1995) investigated the critical skills required for ICT professionals including programmers, technical specialists, system analysts, operators

and data entry clerks. They found that organizations placed more emphasis on management skills, business functional knowledge, and technology management knowledge as opposed to technical knowledge. In a subsequent study, Gallivan et al. (2004) conducted a content analysis of ICT job advertisements posted in Computerworld and the Atlanta Journal Constitution to analyze the trends in skill set requirements for ICT professionals. Consistent with the results reported by Todd et al. (1995), they found that there was still a strong demand for ICT professionals with technical skills.

While the above studies have contributed to our understanding of what skills some ICT professionals are expected to have, they do not provide any real insight into the specific skills sets required by ICT PMs. Starting in the late 1990s, however, a few studies have emerged that either specifically focus on ICT project managers or include ICT PMs in their sampling process. Drawing upon a questionnaire developed by Green (1989), which was designed to assess the importance of 18 behavioral skills for system analysts, Jiang et al. (1998)

conducted a survey of 118 ICT PMs. While a ranked list with the relative importance of these skills was obtained, there were two important limitations to this study. First, the study was designed around a list of skills associated with system analysts and not ICT PMs. Second, the study only investigated behavioral skills and did not consider other skills that might be important for ICT PMs. El-Sabaa (2001) conducted a two stage study focusing on project managers. In the first stage, based on interviews with 85 PMs from various public and private organizations, he identified 18 skills that are important to project managers. These skills were clustered into three categories: (1) human skills, (2) conceptual and organizational skills, and technical skills. In the second stage of the study, 126 project managers from information systems projects, electricity projects, and agricultural projects rated each of the 18 skills, and these were converted into percentile scores for the three main categories. The results were consistent across all three sectors: human skills were identified as the most important, followed by conceptual and organization skills, and then technical skills. A key limitation of the El-Sabaa study, however, is that the skills and skill categories were based on project managers in general, rather than on ICT PMs in particular. Thus, despite the fact that some ICT project managers were included in the pool of respondents, it does not provide a comprehensive list of skills specific to ICT PMs. Using the Repertory Grid Technique, Napier et al. (2009) interviewed 19 practicing ICT PMs and elicited 46 ICT PM skills grouped into 9 skill categories, which were believed to be associated with successful ICT PMs. The nine skill categories included the following: planning and controlling, general management, leadership, communication, team development, client management, system development, problem solving, and personal integrity. In addition, four different ICT PM Archetypes were identified based on the different combinations of skill categories that the participants used to describe the ideal ICT PM. One major strength of the Napier study was that it focused specifically on ICT PMs and the researchers began with a clean slate, allowing them to provide the first comprehensive list of skills associated with successful ICT PMs. However, due to the limitations of the repertory grid approach, they were not able to systematically rank the relative importance of the skills identified in their study. Most recently, Skulmoski and Hartman (2010) conducted a study on the "soft competencies" of ICT PMs. Two rounds of qualitative interviews were conducted with 21 participants including technical and supervisory project team members and senior management. Seven competency categories with 61 individual skills were obtained after the first round of interviews. During the second round, 15 subjects were asked to allocate 25 points across the skills listed in each of the skill categories. The points allocated were intended to indicate the relative importance of each skill by project phase. The primary contribution of Skulmoski and Hartman's study was the insight that different skills are needed for each phase of an ICT project: effective questioning/generating feedback for the initiation phase; project management skills and knowledge along with consensus building for the planning phase; ability to get along/ being a team player for the implementation phase, and writing skills, sharing information and credit for the closeout phase. By the authors' own admission, "the ranking survey results are not the principal output" of their study. Indeed, because the number of skills varied across the seven skill categories identified by Skulmoski and Hartman and the same number of points were allocated to each category, two skills that obtained the same number of votes but belonged to different categories cannot be assumed to be of equal importance. This limitation is significant and may have biased their ranking results, indicating the need for further research to rank the importance of ICT PM Skills in a more rigorous fashion. Because as Lent and Pinkowsa (2012) in their study found out both groups, scientists and practitioner, emphasize the importance of communication skills in successful project management. One such recent study was performed by Keil, Lee, and Deng (2013), who identified 19 skills that ICT project manager should have; they consider software projects a subset of ICT projects. Furthermore, they also call for more exploratory studies about what is needed to be a good project manager and argue that new studies need to consider other perspectives than only project managers. This is also in line with what Napier, Keil, and Tan (2009) recommended some years earlier in their study of ICT project manager skills. Keil et al. (2013) performed a study ranking the skills of ICT project managers. The Delphi method has been used in ICT project research by Keil et al. (2013). This is the first study that not only identifies ICT PM Skills but also employs a systemic method to rank order these skills in terms of their importance using a rigorous group decision-making approach (i.e., the Delphi method).

METHODOLOGY

The selection of criteria is very important in the decision making process of the ICT project manager selection problem. Decision makers with different backgrounds, experience and knowledge in the organization are working. It seems more logical that a group of experts to define criteria rather than by a single person. Usually it is better that experts from different departments participate in the selecting suitable criteria. Each expert thinks about set of criteria with own perspective. The new extension from modified Delphi method (Murry & Hammons, 1995) is used to extract the suitable criteria for ICT project manager selection.

The primary reason for the using and modifying Delphi for use in this study is that it has been used successfully for similar purposes within the criteria selection (Okoli & Pawlowski, 2004). The suggestion was made that group members working independently might be able to generate more innovative ideas; and such a process could reduce the diminution of the assessment capabilities of group members when there are face to face interactions. Then, a general consensus among experts can be reached to establish a hierarchical structure for criteria. Based on requirements of the specific job position and decision makers opinions criteria should be defined.

The systematic Delphi method is an approach that uses panel experts for elicit experts' opinion in a special subject (Landeta, 2006). This method is done by written communication

only and without face to face grouping discussion. This method includes an iterative process that usually needs three or four rounds of survey with the panel experts. By the end of every round, the data are analyzed and sent for next round. The procedure will be finished while reach to group consensus. As a contribution on the work of Murry and Hammons (1995) in current study it was suggested that instead of open ended questionnaire in first round which is used in classic Delphi method, one additional task must be include. Thus, before sending form for collecting experts' opinions, it is necessary that by investigating the previous studies and expert interview make a draft list of criteria. Therefore, this modified method will be led to do the process faster than the main Delphi method with more quality. In the next sections, the necessary steps for this stage will describe. Afshari (2015) developed a systematic method in order to determine the best candidate for construction project manager selection by applying Delphi method and fuzzy linguistic evaluation and also validated the method using a case study of construction project manager selection in a project based company. In current study, the first part of the previous study is to be developed in the field of ICT project management.

CASE STUDY

To validate the criteria selection model, a case study was conducted in an ICT Iranian company. There is a Telecommunication Company in each province of IRAN. They are all controlled by the Telecommunication Ministry. There is also a Telecommunication Office located in each city controlled by the main Telecommunication Company in its own province. The Telecommunication office of Bojnord, Iran, was started with 30 electromagnetic lines in 1935 and it was enlarged to 810 electromagnetic lines in 1975. In 2003, after increasing the demand for lines, the third telephone center with 10,000 lines was installed so the capacity reached around 35,000 lines. This section discusses the results, analysis and finding of the using systematic method for developing selection criteria hierarchy for the ICT project manager selection.

A group of nine experts were chosen to form an expert panel. Then these experts were asked to specify the ICT project manager selection criteria. The respondents were all among the company managers with relevant knowledge and more than five years of experience in ICT project administration. Management had selected a panel consisting of IT deputy, engineering deputy, executive deputy, administrative and financial deputy, planning deputy, quality and systems deputy, contracts manager, and the HR Department. The expert panel was responsible to elicit the most relevant criteria for an ICT project manager position. The experts were asked to give their supposed selection criteria in an anonymous confidential form. Investigating existing studies for project manager selection demonstrate some criteria which need to be evaluated by the organization experts. Most of the times, a project is confined by limited resources which result in the rising of ICT project manager selection importance. For different projects, project managers with different skills and capabilities are needed. Based on discussion with the experts, this selection criteria were defined and presented from Delphi rounds:

Education: Academic achievement always provides a platform for measurement in candidates' selection process. It can give an overview of candidate's talents and performance.

Experience: Job experience reviews the candidate jobs background and this may help candidates to perform well in his works. Job background may have made candidates familiar with working environment and the skills and method needed to improve their performance.

Computer Knowledge: Explanation: Computer skills involve the ability of the project manager to use related software to project management.

Foreign Language: A foreign language is a language originally from another country. It is also a language not spoken in the native country of the person referred to, i.e., an English speaker living in Spain can say that Spanish is a foreign language to him or her.

Computer Knowledge: Computer literacy is the ability to use computers and related technology efficiently, with a range of skills covering levels from elementary use to programming and advanced problem solving.

CONCLUSION

The purpose of this case study was to capture the decision maker's knowledge and experience for ICT project manager's selection criteria to identify the criteria that should be

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considered in ICT project manager selection process. Findings from this survey, will provide an even more structured approach and assist in formulating guidelines for selection of an ICT project manager in ICT project based company. This study has demonstrated that ICT project manager selection can be improved in several ways by implementing the Delphi method.

In further works may be researcher provides another effective mechanism in modeling the decision maker's preference and to effectively handle the imprecision of the human decision making process in ICT project manager selection problem. Second, according to popularity and the availability of the Internet, researchers must develop a decision support system (DSS) in order to solve the ICT project manager selection procedure in the Internet environment. The use of World Wide Web infrastructure is one part of this study, and a client/server computing architecture is another part of this model. Third, sometimes in the real world, in a group of decision makers, there is a condition that every decision maker has a different weight in decision. The current methodology must be able to solve these types of problems. Forth, because in the real world there are crisp and fuzzy data together, it is recommended that these methods develop in the state variables containing both crisp and fuzzy data. Fifth, in other areas of decision making problems, the methodology that is presented in this study can also be applied and compared with other methods. Decision problems such as material selection, project selection, and strategy selection problems can be put in this set.

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Towards team-oriented immersive learning: new ideas for ICT-based educational systems

by

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ABSTRACT

Since the advent of easy-to-use virtual reality computer hardware, new teaching and learning environments are conceivable, possibly advancing current educational methods. However, despite its alleged advantages, "immersive learning", based on virtual or augmented reality environments is still not an established method within university or school courses. As reported previously, experiences of such new teaching formats in the University of Applied Sciences (HTW) Dresden proved the applicability and showed positive first results. Key applications were learning environments for engineering know-how like materials and welding. Based on these ongoing developments and their use within obligatory university courses, the current publication presents new evaluation results as well as new ideas on advanced future applications. The goal is to further enhance the learning effect while overcoming cost, time or visualization boundaries of current non-immersive teaching methods. One of the new approaches is "VR-assisted" team learning, where experiments are designed as a mix of real and virtual tasks. Here not all participants wear head mounted displays, instead, all interact via a shared learning system and have to coordinate specific VRand non-VR tasks to achieve a common learning goal. So the students can practice and build their competencies with the learning-methods problem-oriented learning and peer-to-peer.

As first tests within the HTW Dresden VR-Labs show, while avoiding excessive hardware efforts this nonetheless achieves higher immersion (and thus sustained learning effects) for typical student group sizes. Such properties make the approach especially

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interesting for larger educational institutions with limited resources and typically higher student numbers. Application examples as well as a general outlook on the design and challenges of VR-assisted team learning will be presented.

Keywords: Education, Innovation, Virtual Reality, Teaching, Immersion

Session: Innovative ICT Economies

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Measuring the pro-innovation behavioural profile of organizations

by

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ABSTRACT

Pro-innovation behaviour in organizations is directly related to the source of their innovative approaches, encouraging team members to develop ideas and new projects, and planning and detecting opportunities in a dynamic context. It should be emphasized that the functional body of an organization is the basis of its innovation processes. Therefore, it must be aware of the potential of its human resources, as well as of its incentives which help to awaken and develop the potential of each individual. Hence, the question is: What may be considered evidence of an organization's pro-innovation behavioural profile? The Institutionalist Theory of Development and Planned Behaviour sheds light on this. The general objective of the present work is to analyze evidence of the pro-innovation behavioural profile in organizations; its specific objectives are (1) to identify measurable constructs of pro-innovation; (2) to elaborate the analytical consistency of this work; and (3) to develop a valid measurement tool to measure pro-innovation behaviour. To this end, a qualitative and quantitative study was carried out with a sample of 90 employees working in stores in the jewellery industry. Data were treated using descriptive frequency statistics, together with Cronbach's Alpha and Confirmatory Factor Analysis. Together, these were sufficient to construct a valid and reliable instrument to measure pro-innovation behaviour. In addition, the steps necessary to validate a measurement scale were shown. This work is directed to researchers in the area of the measurement and the development of scales.

Keywords: Innovation. Behaviour. Measurement. Constructs. Validity. Reliability.

1. INTRODUCTION

The development of organizations demands a corresponding human contribution from those willing to contribute to the achievement of organizational goals. Precisely for this reason, we seek committed collaborators, who perceive their work as a challenge to overcome and who seek the best results for corporations in conjunction with their particular interests. Their collaboration influences the current organizational context in which organizations focus on intellectual capital as a major investment: it is characterized as the sum of the immaterial values in an entity that guarantee its continuity and development. This gives the management of this capital strategic importance and underlines the performance of leadership in influencing the organizational commitment of all other employees, and stimulating their proinnovation behaviour, since innovation emerges from changes in individual and organizational behaviours, and the stimulus of creativity is one of the elements conducing to its presence.

In addition, for innovation to be constant, an organization's employees should be engaged in pro-innovation behaviour. From this point of view, individual innovation begins with the discovery of a problem, the creation of ideas or solutions, whether new or newly adapted, and the implementation of these innovative ideas. It should be emphasized that the

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functional body of an organization is responsible for its innovation processes. An organization probably needs to be aware of the potential of its human resources, and equally aware of ways to support and incentivize their development, since it must create conditions in which each worker's potential is awoken and developed.

These reflections lead to the following question: What can be considered evidence of an organization's pro-innovation behavioural profile? In response, the general objective of the present paper is to analyze evidence of an organization's pro-innovation behavioural profile; correspondingly, its specific objectives are (1) to identify measurable pro-innovative constructs; to elaborate the analytical consistency of this work; and (3) to develop a valid tool for measuring pro-innovation behaviour. This work is made up of topics and sub-topics, in turn discussing a theoretical-conceptual revision, a methodological tracing of the preparation andthe results, treated in accordance with the proposed objectives, before drawing some conclusions.

2. THEORETICAL REVIEW

This chapter identifies the conceptual parameters that define the main terms referring to innovation and the environment conducive to innovative behaviour, as well as the concepts of constructs and measurement. The basis of this study comprises Institutional Theory, supported by the Theories of Organizational Development and Planned Behaviour. Its concepts are approached via a topic which provides guidance for interpreting the scenario investigated.

Institutional Theory was developed by Meyer in 1977 and attracted more attention in 1983 with the publication of DiMaggio and Powell's article, entitled "The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields." The Theory of Planned Behaviour was developed in 1985 by Icek Ajzen to supplement the limitations of the Theory of Rationalized Action developed by Martin Fishbein in 1960 in collaboration with Ajzen. Organizational Development Theory, according to Chiavenato (2014), is an evolutionary, practical and operational behavioural theory, emphasizing individuals in the organizational context.

2.1 Concept of Innovation in an environment conducive to pro-innovation behaviour

Innovation is the complex result of accumulated learning, which provides the development of new knowledge or the significant modification of something that already exists. One of the first studies on innovation was led by Joseph Schumpeter, who made his contribution to economic development through technological progress. Since Schumpeter (1997), the concept of development has been linked to innovation; for this author, there is simultaneously distinction and complementarity between the terms 'invention' and 'innovation'. In his view, 'invention' refers to the simple creation of new technical or organizational artefacts, whereas innovation comprises the whole process to do with an invention and its effective incorporation into the economic system, thus transforming it.

The OECD (the Organization for Economic Co-operation and Development) through the Oslo Handbook (2005), conceptualizes organizational innovation as the implementation of a new or improved product or process, or an innovative marketing method, or a new approach to organization in business standards, in ordering the work environment or in external interactions. It posits four main types of innovation, namely, (I) product innovation, the insertion of a new or significantly improved good or service; (II) process innovation, the implementation of a new or significantly better form of production or method of delivery; (III) organizational innovation, addressing the implementation of a new organizational method in business practices, the work environment or external relations; and (IV) marketing innovation, which concerns new marketing methods involving significant changes in product design or packaging.

Bessant and Tidd (2009) note that the factors of innovation can vary anywhere between incremental and radical. Incremental innovation consists of small improvements in existing products or processes. At the other extreme, radical innovation consists in the generation of a new product or process, that is, the creation of something completely different.

Tidd and Bessant (2015) define innovation as based on a process of transformation and offer the concept of the 4 Ps of innovation, namely, product, position, process and paradigm. Product innovation encompasses transformations in the products or services that an organization offers; innovation in position changes the scenario in which the products or services are inserted; process innovation consists of changes in the means by which products or services are generated and made available; the innovation of paradigms is denoted by transformations in the mental models that guide what is done in organizations.
For Pedro Filho (2015), innovation is a process that results from a configuration that prompts creative friction, from which inventiveness issues in order to systematically solve problems and thereby acquire knowledge; the process generates mental constructs from practical and theoretical experiences, both structural and functional. For this author, creativity must be stimulated before the proactive behaviour for innovation can emerge.

For Scott and Bruce (1994), leadership can influence the work environment by allowing subordinates greater autonomy and breadth of decision, both of which are indispensable to innovative behaviour. Amabile (1997) points out that all individuals have in one way or another the possibility of being creative, but it requires a medium that welcomes and sustains creativity. Thus, the work environment is also relevant to an organization's creativity and, consequently to the pro-innovation behaviour of its teams. In Amabile's view, individual and environmental factors interact with one another and influence creativity and innovation.

The process of change dealt with in Brandão (2012) occurs when a leader interferes significantly in the organizational culture, allowing the evolution of new concepts to generate innovation. This is how Damanpour and Schneider (2006) deal with leaders who are responsible for policy making, resource control and environmental analysis – such activities may from time to time be seen as possible forces against or in favour of innovation, especially when decision-making is in view. Therefore, they fall into the province of Scott and Bruce (1994), who believe that when a work team supports and collaborates with an individual in a way that allows innovations to emerge, this individual tends to view the organization, in general, as favourable to innovation.

2.2 Concept of constructs and measurement

The definition of a construct falls within a certain theoretical framework, being conceptualized in a way that can be translated into observable and measurable premises. It refers to a scientific resource that can synthesize and create complex theoretical concepts. On the one hand, Abbagnano (1970) indicates that the constructs or constructions are elements of an organization's systemic existence; that is to say, an existence that can be described analytically as a system of propositions found in specific organizations. They are known by experience as attributed to an organization to which a true synthetic premise may be referred. On the other hand, Costa (2011) defines 'construct' as something with the features of an object of interest that shows variations capable of quantification or

classification, which are delineated in relation to other features of the same object. The expression 'construct' is used to refer to something with measurable characteristics. In order to measure a construct, one needs a tool that will be called in this paper a measurement scale.

Measurement activities are required at the time that the data are collected. For Costa (2011), measuring the data is an indispensable part of the process; the focus on them is a way of generating measures which clarify the nature and peculiarities of the phenomenon under review. Hence, a measuring tool with design flaws can relate to inconsistency in the generation of knowledge. In addition, a context of reasoning and a context of procedure are both important for visualizing the way in which the measurement studies are carried out.

Regarding the context of justification, Costa (2011) observes that the measurement theory in Administration is based on theories that have been studied in Psychology and Education, in particular, the philosophical foundations of measurement, validity, the reliability of measures, the general process of development, decisions about answers, factorial analysis and the formative and reflective nature of constructs, among others. In the procedural context, there are several streams of research, ranging from applicable methods of instrument construction to the development of specific scales. Most of the scales used in Brazil are scales published abroad and revalidated for the Brazilian context.

A study by Nick Lee and Graham Hooley (2005), tracing the evolution of the measurement and development of scales from the classic theory by Churchill (1979), indicates the danger that marketing students will deceptively cite classical theory in order to evade a series of critical considerations. In addition, the continuing failure to attend to these issues has encouraged the misapplication and misuse of the techniques of analysis to give unreliable conclusions. The main purpose of this paper is to raise fundamental questions about the development of classical measurement techniques in a non-technical way that most marketing students would find accessible.

2.3 Institutionalist Theory, Theory of Organizational Development and Planned Behaviour

The survey by Silva, Junqueira and Cardoso (2016) states that Institutionalism emerged as a tool for studying the dynamic media and cultural evolution in institutions.

Institutional forms are transmitted by a range of carriers, including symbolic systems, relational systems, routines, and artefacts. Adding to this premise, Tolbert and Zucker (1999) show that, in the processes of institutionalization, the behaviours developed by an actor or group of actors to solve recurrent problems become habitual practices. DiMaggio (1988, investigating the birth of new institutions, is responsible for coining the term 'institutional entrepreneur'. In his definition an institutional entrepreneur, whether an organization or an individual, is an agent whose unusual or innovative deployment of resources creates or transforms an institution.

Bedani and Veiga (2015) find that Institutional Theory focuses on the study of social and cultural pressures in organizational life and the influence of these pressures on organizational practices and structures. The process of constant innovation within a complex organizational environment has to be institutionalized before it will allow individuals as agents of innovation to increase competitive advantage through the development of new products or services.

Chiavenato (2014), working within the behavioural sciences, indicates that Organizational Development (OD) works to improve the institution's capacities. The object of this improvement is the solution of impasses in the institution and the development of its capacity to adapt. OD originates in the confrontation between the institution and the external environment and in the use of methods oriented towards programmed organizational change in its four dimensions: the environment, the organization, the social group and the individual. These dimensions are understood in light of their interdependence, allowing diagnosis and intervention in the cultural and behavioural spheres of the organization and the individual. Through the Theory of Organizational Development, according to Souza (2017), it is possible to understand innovation as conducive to positive results due to the achievement by the functional body of the organization of a common and collaborative goal.

The Theory of Planned Behaviour, according to Ajzen (2011), holds that intentions grounded in individual control and the strength of the link between intention and behaviour can be predicted. The basic dimensions of behavioural intention, as studied in Souza (2017), are Attitudes, Subjective Norms and Perceived Behavioural Control. According to Ajzen (2011), attitudes are based on beliefs about behaviour; that is, they refer to the fact that analysing the probable results from the performance of a behaviour can be confidently verified. Subjective norms are influenced by the normative beliefs of the people who take part directly in the behaviour, that is, by the influence and social pressure exerted on individuals to take up certain attitudes. Behavioural control is understood as the infrastructure on which the behaviour depends. For Ajzen and Klobas (2013) and Martins, Serralvo and João (2014), the belief system influences these elements.

Next, Figure 1 is presented as a representation of the inferences made in the approaches of the Institutionalist Theory supported by the Theories of Organizational Development and Planned Behaviour that are planned to form part of the present study of pro-innovation behaviour.



Figure 1: Relationship between the theories addressed.

Source: Prepared by the authors.

3. METHODOLOGY

The approach taken by this research is mixed, that is, it is both qualitative and quantitative. In Creswell's discussion (2010), the qualitative approach interprets phenomena according to the context to which they belong and is dynamic in character; it is used when a researcher, through detailed in-depth data collection involving multiple sources of

information and data processing, explores a problem or question affected by a contemporary real-life delimited system. The quantitative approach, according to Siena (2011), in its search for precise results, prefers to classify the relationships between the variables. This use of two methods in the present research is based on the links between the characteristics of the two approaches concerned and tries to interpret the causal relationship between the variables whenever this phenomenon occurs.

The object of the present research is a descriptive one, because, according to Siena (2011), it is one of those which aim to describe the characteristics of a certain population or phenomenon or to establish relationships between variables, thus making possible a survey of the opinions and attitudes of a given population. Its method is that of a case study, because according to Yin (2015), this method is used when the researcher does not control the behavioural events and when the subject of the research is current, because this allows the analyses to be original. Figure 2 shows the flow of interactions between the instruments used for collecting data in this research, the chosen methodological approaches and the statistical tests undertaken by the researchers. Table 1, below, describes the elements of the diagram.



Figure 2: Diagram of the Methodology Applied **Source:** Prepared by the authors.

Elements	Description
Profile of pro-innovation	Massurament of the pro-innovation behavioural profile in
behaviour	organizations.
Quali-quanti	Qualitative and quantitative research
Descriptive	Description of the characteristics of a certain population to establish the relations between the variables
Case study	Method of an approach to research in the Social Sciences involving multiple procedures.
Survey	Denoting a quantitative or numerical description of trends, opinions or attitudes of a population, by studying a sample of this population
Data collect	Process of searching for information related to the theme.
Bibliographic research	Process of consulting texts to form the basis of an investigation.
Form	Structured form for completion by the employees of companies
	Tests for analysing statistics: Cronbach's alpha to analyze reliability, Factorial Analysis for validation.
Statistical tests	
Target Audience	Population to which the form will be applied in the investigation.

Table 1: Specifications for the Methodological Diagram representing the present research.**Source:** Prepared by the authors.

The source of the data for this research was identified as the employees of three medium-sized companies in the jewellery/accessory business located in the municipality of Porto Velho, capital city of the State of Rondônia, Brazil. In the investigative procedures, non-probabilistic sampling was used for convenience; stakeholders were selected from the internal population of these organizations. The accessibility and ease of application of the Respondent Consultation Form were designed to follow the precepts of Creswell (2010).

To analyze evidence of the pro-innovation behavioural profile in organizations we formulated three hypotheses:

- H1 The measurable constructs of pro-innovation cover following dimensions:
 - Organizational environment (Q1, Q2, Q3)
 - Creativity (Q4, Q5, Q6)
 - Planned behaviour (Q7, Q8, Q9)
 - Innovative Culture (Q10, Q11, Q12)
 - Transforming Leadership (Q13, Q14, Q15)
- H2. The analytical consistency of the instrument manifests through high level of Cronbach's alfa, greater than 0,7
- H3. The validity of the instrument manifest through high level of explained variance extracted AVE greater than 0,9;chi/df <5; RMSEA less than 0,05; AFI, and AGFI greater than 0,9. These results confirm The Pro-Innovation Behaviour as valid instrument.

Our research framework can be seen below on the Figure 3.



Figure 3: The Research Framework

Source: Prepared by the authors.

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The data collection instrument was a structured form applied through surveymonkey.com.br (an online organization specializing in online surveys and access link disclosure). The answers on the form supplied analysable evidence of the pro-innovation behavioural profile of organizations. This instrument contained 15 statements, which could generate a response using a 5-point Likert scale, graduated as follows: totally disagree (TD); partially disagree (PD); indifferent (I); partially agree (PA); totally agree (TA). In addition to objective statements six further questions about socio-demographic data were included.

The sample to whom this form was distributed consisted of 173 individuals; 90 sets of answers were received and analyzed. The form was distributed electronically, by a link that was sent via email to a list of contacts of the researchers, and also to such social media as WhatsApp. Table 2 shows the relationship between the collection instruments chosen in this research and the categories of questions submitted in the research on the perceptions of the selected population. The categories refer to the dimensions of the organizational environment: creativity, planned behaviour, innovative culture and transformative leadership.

General	Collection	Categories of	Source					
objective	instrument	analysis						
Analyze the	Form							
evidence of the	1 st part		Q1. My work environment is comfortable					
pro-innovation	Socio-demographic		enough to encourage me to generate ideas.					
behavioural	data		Q2. The organization is open to change,					
profile in		Organizational	aiming at innovation in its various sectors.					
organizations		environment Q1, Q2, Q3	Q3. There is time available for the development of creative ideas at work.					
			Q4. I would rather propose a process of change than maintain the current state of things.					
		Creativity	Q5. I try to solve the same problem in different ways.					
	Form Likert Scale	Q ¹ , Q ³ , Q ⁰	Q6. I am recognized in the company for being creative and innovative.					
	2nd part		Q7. The necessary support for the development of new ideas is readily available.					
	N.º of forms distributed 173	Planned behaviour 07, 08, 09	Q8. My personal achievement is directly related to the innovations that I propose and develop in the company.					
			Q9. I'm interested in finding solutions to the					
	N.º of forms		organization's various problems on a daily basis.					
	received 90	. .	Q10. I look at opportunities to improve existing processes, technologies used, products, services or interpersonal relationships.					
		Culture	Q11. I am inclined towards innovation by my co-workers.					
		Q10,Q11,Q12	Q12. I have resources at my disposal that allow me to innovate.					
			Q13. I am a visionary and I seek to innovate					
		Transforming	constantly.					
		Leadership Q13,Q14 Q15	Q14. I influence my co-workers to solve					
			Q15. I respect the innovative ideas of my team.					

Table 2 - Methodology for data collection and analysis.

Source: Prepared by the authors.

Techniques described in the literature were used to validate both the form and the differentiation of the groups. In the view of Hair et al. (2005) and Costa (2011), validating the form is an indispensable part of the measurement process, which focuses on the data as a way of generating measures that clarify the nature and specificities of the phenomenon initially observed. Hence a poorly elaborated measurement can result in inconsistent knowledge generation. For this reason, the Cronbach's Alpha technique was used to analyze the reliability of the instrument and Confirmatory Factor Analysis was used to validate this

reliability by verifying how closely the items adhered to the proposed constructs. The software used was IBM SPSS version 24.

EVIDENCE OF THE BEHAVIOURAL PRO-INNOVATION PROFILE IN ORGANIZATIONS.

This study was carried out in three medium-sized companies in the jewellery/accessory business located in the municipality of Porto Velho. The interviewees' profile comprised 10 male respondents (11.11%) and 80 female respondents (88.89%). In the age-group from 18 to 25, there were 42 respondents (46.67%); in the group from 26 to 39 were 47 respondents; (52.22%), and in the group from 40 to 52 years old was 1 respondent (1.1%). No respondents were in the age-group from 53 to 64 years old or in the group of 65 years and above. It may be inferred, then, that the organizational segment from which the sample was collected is predominantly composed of female individuals (88.89%) whose ages ranged from 18 to 39 years old, corresponding to 98.89% of the total of respondents, as shown in Graph 1.

Over 65 years old. 0,00%			
From 53 to 64 years old. 0,00%			
From 40 to 52 years old. 1,11%			
From 26 to 39 years old.			52,22%
From 18 to 25 years old.			46,67%
0,00% 10,00%	20,00% 30,	00% 40,00%	50,00% 60,00%

Graph 1: Age of respondents

Source: Prepared by the authors.

Regarding the level of schooling, 5 respondents had completed elementary education (5.56%), 65 respondents had completed High School (72.22%), 16 respondents had graduated from higher education (17.78%), 4 respondents had a postgraduate degree (4.44%). No respondent was described as illiterate. It is possible to infer that the sample consisted mainly of high school graduates (72.22%), as described in Graph 2:



Graph 2: Degree of schooling of respondents.

Source: Prepared by the authors.

Income indicators indicated that 64 respondents earned an average monthly income of up to 2 minimum wages (71.11%). 22 respondents earned between 2 and 4 minimum wages (24.44%), 3 respondents received from 4 to 10 minimum wages (3,33%) and 1 respondent's income totalled between 10 and 20 minimum wages. No respondent exceeded this average monthly income. It can be concluded that the sample was mainly composed of people whose salary in an average month totalled up to 2 minimum wages (71.11%), as illustrated in Graph 3.



Graph 3: Percentage responses regarding the average income.

Source: Prepared by the authors.

4.1 Identification of the measurable constructs of pro-innovation.

The fifteen assertions included in the data collection instrument were divisible into five categories, namely, I - The respondents' perception about the organizational environment; II - The perception of the respondents in relation to creativity; III - The perception of the respondents in relation to planned behaviour; IV - The perception of the respondents regarding their firm's Innovative Culture; V - The perception of the respondents regarding transformative leadership. Table 3 below shows the figures relating to these perceptions on the part of the stakeholder respondents, when the results were tabulated and treated.

Affirmative	TD	PD	Ι	PA	TA	Total
Q1. My work environment is comfortable enough						
to encourage me to generate ideas.	7,78%	18,89%	8,89%	37,78%	26,67%	100%
Q2. The organization is open to change,						
aiming at innovation in its various sectors.	6,67%	14,44%	7,78%	47,78%	23,33%	100%
Q3. There is time available for the development						
of creative ideas at work.	12,22%	11,11%	12,22%	41,11%	23,33%	100%
Q4. I would rather propose a process of change						
than maintain the current state of things.	6,67%	10,00%	12,22%	36,67%	34,44%	100%
Q5. I try to solve the same problem in different						
ways.	4,44%	4,44%	6,67%	42,22%	42,22%	100%
Q6. I am recognized in the company for being						
creative and innovative.	10,00%	8,89%	18,89%	43,33%	18,89%	100%
Q7. The necessary support for the development						
of new ideas is readily available.	10,00%	21,11%	10,00%	40,00%	18,89%	100%

Q8. My personal achievement is directly related						
to the innovations that I propose and develop in						
the company.	7,78%	8,89%	12,22%	46,67%	24,44%	100%
Q9. I'm interested in finding solutions to the						
organization's various problems on a daily basis.	3,33%	1,11%	5,56%	46,67%	43,33%	100%
Q10. I look at opportunities to improve existing						
processes, technologies used, products, services or						
interpersonal relationships.	1,11%	4,44%	10,00%	45,56%	38,89%	100%
Q11. I am inclined towards innovation by my co-						
workers.	12,22%	16,67%	13,33%	32,22%	25,56%	100%
Q12. I have resources at my disposal that allow						
me to innovate.	10,00%	12,22%	13,33%	37,78%	26,67%	100%
Q13. I am a visionary and I seek to innovate						
constantly.	0,00%	3,33%	5,56%	50,00%	41,11%	100%
Q14. I influence my co-workers to solve problems						
creatively.	0,00%	3,33%	5,56%	46,67%	44,44%	100%
Q15. I respect the innovative ideas of my team.	0,00%	1,11%	2,22%	23,33%	73,33%	100%

Percentage of Totally Disagree (TD); Percentage of Partially Disagree (PD); Percentage of Indifferent (I); Percentage of Partially Agree (PA); Percentage of Totally Agree (TA);

Table 3: Percentage responses.

Source: Prepared by the authors.

4.1.1 Measurable constructs of pro-innovation regarding the Organizational Environment

In order to adequately demonstrate the results obtained, a radar chart was used to compare the data obtained from the respondents. Graph 4, below, indicates the respondents' perceptions about the organizational environment.



Graph 4: Percentage responses regarding the Organizational Environment. **Source:** Prepared by the authors.

Graph 4 presents the indications of the measurable constructs of pro-innovation in the organizational conditions as matters of importance for generating a pro-innovation environment. The elements which it presents point to the importance of a comfortable

environment for the generation of ideas, since 64.45% of respondents agree partially or totally with the fact that their work environment is comfortable enough to promote the generation of ideas (Q1); only 7.78% were shown as disagreeing completely. A high percentage of agreement is observed when respondents were asked about the need for an organization to be open to changes (item Q2). 71.11% agreed partially or totally that this was necessary, thus supporting the survey by Silva, Junqueira and Cardoso (2016). This indicates that change creates Institutionalism, which emerges as a tool for studying the dynamic media and cultural evolution in the institution. Finally, most respondents (64.44%) agreed totally or partially that they had enough time to develop creative ideas at work.

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4.1.2 Measurable Constructs of Pro-Innovation as Creativity

Individuals can exercise their creative abilities more intensely if they can count on a medium that conduces to and sustains the externalization of creativity. In this way, the work environment is also relevant to creativity in the organization and, therefore, to the proinnovation behaviour of its teams. For Amabile (1997), individual and environmental factors interact with one another and have an impact on creativity and innovation.



Graph 5: Percentage responses regarding Creativity.Source: Prepared by the authors.

Graph 5 illustrates the indications of the constructs of pro-innovation that are measurable from creativity. These indications imply the relevance of their encouragement to change juxtaposed with the current status, since 71.1% of the respondents agree partially or totally with the fact that change influences the pro-innovation context (Q4); only 6.67% totally disagreed. With regard to the search for diversified solutions to address a problem, the study revealed that respondents tend to apply varied approaches to overcoming the same or similar challenges, which shows that they value creative solutions to problem solving. However, despite the fact that they support creativity in this context, the answers also suggest

that a proportion of respondents agreed in some way that their collaborators are also recognized as creative and innovative (18%).

4.1.3 Measurable constructs of pro-innovation regarding Planned Behaviour

Planned behaviour has an impact on pro-innovation behaviour, since, according to Ajzen (2011), it consists in the prediction of intentions based on individual control and the strength of the link between intention and behaviour, in this case, the intention to propose innovative developments or ways of solving everyday problems. Therefore, the survey found that, although 58.8% of the respondents agreed in whole or in part that their organization provided the necessary support for the development of new ideas, a substantial percentage (31.1%) disagreed in whole or in part. Graph 6 shows the perceptions of the respondents regarding the behaviour predicted in the pro-innovation profile.



Graph 6: Percentage responses to Planned Behaviour.Source: Prepared by the authors.

Nonetheless, most employees are aware that their personal fulfilment is directly linked to having opportunities to propose or develop something new in the organization: more than 70% of them agreed totally or partially with this. However, 12.2% were indifferent and 16.6% disagreed partially or totally, showing no concern about this aspect. Nevertheless, almost 90% of employees prioritize resolving the issues that companies face daily.

4.1.4 Measurable constructs of pro-innovation regarding Innovative Culture

An innovative culture requires leaders who understand that the main impacts on culture begin with their own performance. As a rule, innovation can arise from a small idea or improvement, generated at any level of the organizational structure, and carried out until it is exhausted, through a disciplined approach and in an environment where it is safe to question current processes. To implement steady innovation, firms should consider investing in a leading-edge portfolio of projects and in targeting customers and core operations. Graph 7, below, indicates the respondents' perception of the organizational environment.



Graph 7: Percentage responses to innovative culture.Source: Prepared by the authors.

As shown in Graph 7, 84.4% of respondents are aware of the opportunities to improve existing processes, and of ways to use technologies, products and services for this. In addition, they perceive the opportunity to improve their relationship with the work team, thus generating an empathic and innovative environment. The findings denote excellent prospects for the organizational environment that is the object of the present research, since only 1.1% were totally opposed to it.

Although 57.78% were shown to be inclined towards innovation by their co-workers, a significant percentage was still opposed or indifferent to it. Although employees perceive

the opportunity to improve existing processes, as well as interpersonal relationships, 44.15% chose the options of being indifferent, or of disagreeing partially or totally, implying that their creative processes were not influenced by those of their co-workers.

Asked about the organization's provision of resources that enabled respondents to collaborate, 64.3% agreed totally or partially that the organization had provided them, while 22.2% disagreed totally or partially.

4.1.5 Measurable constructs of pro-innovation regarding Transformational Leadership

A transformative leadership focused on a pro-innovation culture must, in constructing the organization, must be the articulator in charge of change so as to develop the ability in employees to work as a team, as well as supporting and assisting the leaders to take advantage of the new opportunities for action and exploit them decisively in the process of change.

Agents of change should thus foster the implementation of the organization's learning process and the development of systemic thinking; moreover, this role must be creative and visionary, that is, it must take a different look at an emerging future and the scenario to be constructed. To this end, the perception of respondents about transformative leadership is presented in Graph 8.



Graph 8: Percentage responses to transformative leadership.

Source: Prepared by the authors.

It is easy to see that 91.4% of the respondents considered themselves visionary and constantly in search of innovation; that is, they have a vision for the future as it emerges and try to be prepared for the uncertainties of the corporate world. It is noteworthy that no respondent denied totally that s/he possessed vision.

As for the influence of respondents in relation to co-workers to solve problems in a creative way, more than 90% considered themselves influential in this process. In addition, 96.6% confirmed that they respected the innovative ideas of their team. From this, it can be inferred that the collaborators of the researched organizations were aware that they could indeed be agents of change and, consequently, influencers of a pro-innovation culture.

4.2 Elaboration of the consistency analysis of this work

In this section, we analyze the results obtained to examine the consistency of the proposed measurement scale. The reliability analysis of the validated measurement instrument for measuring pro-innovation behaviour showed a Cronbach Alpha coefficient of 0.850. This indicates the optimum reliability of the results and ensures that no item need be excluded to significantly increase the reliability of these constructs, as described by Costa (2011) and indicated in Table 4, below.

Reliability Statistics										
Cronbach's Alpha N° of Items										
	0.850	15								

Table 4: Cronbach's Alpha.**Source:** Prepared by the authors.

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Costa (2011) speaks of the need in the Factor Analysis (FA) procedures to verify the adherence of the items in the outputs of the process of factor extraction, in order to check for signs of convergent validity in the measurement instrument. With the aid of the IBM SPSS software (version 24), a resulting KMO (Kaiser-Meyer-Olkin) test was carried out, which evaluated the suitability of the sample size for the factor analysis. Its results may vary between 0 and 1, with zero being an indication of inadequacy for factor analysis, and greater than 0.5 being the lowest acceptable result. This is still recommended to be above 0.800, according to Hair et al (2005), and if the factorial loads are greater than 0.400, it is considered a good adherence of the items to the factors, which is indicative of convergent validity. Initially, the KMO test presented a value of 0.805, indicating the comfortable adequacy of the sample regarding the degree of partial correlation between the values; according to Hair et al. (2005), this should be small. Of the 15 items initially proposed for measuring the proinnovation profile in organizations, 13 presented factorial loads ranging from 0.408 to 0.811, demonstrating the adherence of the items to the proposed instrument and indicating convergent validity. Only items Q14 (Influence my co-workers to solve problems creatively) and Q15 (Respect for my team's innovative ideas) had low factor loads, indicating the need to exclude these items from the measurement instrument, as in Costa (2011). This is shown in Table 5.

Component Matrix								
Q1. My work environment is comfortable enough to encourage the generation of ideas.	0,595							
Q2. The organization is open to change, aiming at innovation in the various sectors.	0,811							
Q3. There is time available for the development of creative ideas at work.	0,723							
Q4. I would rather propose a process of change than maintain the current state of things.	0,408							
Q5. I try to solve the same problem in different ways.	0,450							
Q6. I am recognized in the company for being creative and innovative.	0,589							
Q7. The necessary support for the development of new ideas is readily available.	0,765							
Q8. My personal achievement is directly related to the innovations that I propose and develop in								
the company.	0,706							
Q9. I'm interested in finding solutions to the organization's various problems on a daily basis.	0,520							
Q10. I look at opportunities to improve existing processes, technologies used, products, services								
or interpersonal relationships.	0,635							
Q11. I am inclined to innovate by my co-workers.	0,511							
Q12. I have resources at my disposal that allow me to innovate.	0,718							
Q13. I am a visionary and I seek to innovate constantly.	0,444							
Q14. I influence my co-workers to solve problems creatively.	0,079							
Q15. I respect the innovative ideas of my team.	0,320							

Table 5: Component Matrix of factorial loadings.

Source: Prepared by the authors.

4.3 Development of a valid measurement instrument to measure pro-innovation behaviour

For the development of a valid measurement instrument to measure the pro-innovation behaviour, the above items were pointed out in the previous sessions, where from radar graphs it was possible to report item indications to compose the measurement instrument, and subsequently, to test it statistically with tests described in the existent literature on the measurement and development of scales.

Continuing the exclusion of items with low factor loads, we analyzed the reliability of the new proposed model, now with 13 items, for composing a valid measurement instrument to measure pro-innovation behaviour analysis, and found an increase in Cronbach's Alpha. This now indicated a coefficient of 0.859, considered an optimum level of reliability, and it was not found necessary to exclude any item in order to increase the reliability significantly, as described by Costa (2011) and indicated by the table below.

Reliability Statistics									
Cronbach Alpha N° of items									
	0,859	13							

 Table 6: Cronbach's Alpha.

Source: Prepared by the authors.

Next, the proposed model was tested for the final composition of the instrument to measure pro-innovation behaviour. The new Kaiser-Meyer-Olkin test showed an increase in

value to 0.817, indicating a good sample adequacy for the degree of partial correlation between the values. As noted above, Hair et al recommend that the degree should be small, based on their analysis values. The 13 items presented a relative increase in factor loads, that varied from 0.450 to 0.812, demonstrating the adherence of items to Costa's proposed instrument model (2011) (see Table 7, below).

Component Matrix

Q1.	My work environment is comfortable enough to encourage me to generate ideas.	0,597					
Q2.	The organization is open to change, aiming at innovation in the various sectors.	0,812					
Q3.	There is time available for the development of creative ideas at work.	0,728					
Q4.	I would rather propose a process of change than maintain the current state of things.	0,412					
Q5.	I try to solve the same problem in different ways.	0,450					
Q6.	I am recognized in the company for being creative and innovative.	0,589					
Q7.	The necessary support for the development						
of new ideas is readily available.							
Q8.	My personal achievement is directly related to the innovations that I propose and develop in						
the cor	npany.	0,715					
Q9.	I'm interested in finding solutions to the organization's various problems on a daily basis.	0,516					
Q10. I produ	look at opportunities to improve existing processes, technologies used, cts, services						
or inte	rpersonal relationships.	0,641					
Q11.	I am inclined to innovate by my co-workers.	0,503					
Q12.	I have resources at my disposal that allow me to innovate.	0,725					
Q13.	I am a visionary and I seek to innovate constantly.	0,428					

Table 7: Component Matrix of factorial loads in the proposed model.

Source: Prepared by the authors.

We verified the empirical results by verifying the concept model using confirmatory factor analysis of CFA. The data are presented in the Table 10 – Table 11 below, which indicated very good results regarding the discriminatory power, accuracy and transparency of individual test items as well as subscales.

We examined the discriminatory power of particular test items using the Student's T test (Table 8) and using Pearson's linear correlation coefficients (Table 9).

	Means	Means	Student's	df	р	р	Quantitity	Quantitity	STD.	STD.	F ratio	р
	low results	high	Т		two-	one-	low	high	low	high	variance	variance
		results	Statistics		tailed	tailed	results	results	results	results		
Q1	2.13	4.38	-5.29	25.47	0.000	0.000	15.00	13.00	1.13	1.12	1.01	1.00
Q2	1.87	4.54	-10.32	23.77	0.000	0.000	15.00	13.00	0.83	0.52	2.58	0.11
Q3	1.80	4.62	-9.00	20.44	0.000	0.000	15.00	13.00	1.08	0.51	4.57	0.01
Q4	3.07	4.69	-4.00	17.28	0.001	0.000	15.00	13.00	1.49	0.48	9.57	0.00
Q5	3.13	4.85	-4.53	16.27	0.000	0.000	15.00	13.00	1.41	0.38	14.05	0.00
Q6	2.27	4.46	-6.09	19.02	0.000	0.000	15.00	13.00	1.28	0.52	6.08	0.00
Q7	1.67	4.46	-11.85	25.19	0.000	0.000	15.00	13.00	0.72	0.52	1.95	0.25
Q8	2.40	4.77	-6.91	17.88	0.000	0.000	15.00	13.00	1.24	0.44	8.02	0.00
Q9	3.60	4.85	-3.70	16.89	0.002	0.001	15.00	13.00	1.24	0.38	10.94	0.00
Q10	3.13	4.69	-4.88	19.50	0.000	0.000	15.00	13.00	1.13	0.48	5.49	0.01
Q11	2.13	4.69	-7.66	19.00	0.000	0.000	15.00	13.00	1.19	0.48	6.11	0.00
Q12	2.20	4.69	-6.81	18.11	0.000	0.000	15.00	13.00	1.32	0.48	7.55	0.00
Q13	3.87	4.92	-3.96	16.49	0.001	0.001	15.00	13.00	0.99	0.28	12.75	0.00
Q14	4.33	4.69	-1.73	25.74	0.096	0.048	15.00	13.00	0.62	0.48	1.65	0.39
Q15	4.33	5.00	-2.87	14.00	0.012	0.006	15.00	13.00	0.90	0.01	0.00	1.00

Table 8. Student's T Test Results for extreme groups of low (less than mean minus standard deviation) and high results (less than mean plus standard deviation)

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Sum
Q1	1.00	0.51	0.31	0.10	0.27	0.35	0.49	0.31	0.20	0.34	0.15	0.40	0.22	-0.03	0.17	0.59
Q2	0.51	1.00	0.57	0.19	0.31	0.36	0.70	0.53	0.39	0.46	0.31	0.55	0.34	0.03	0.23	0.78
Q3	0.31	0.57	1.00	0.17	0.32	0.34	0.56	0.60	0.25	0.28	0.37	0.57	0.21	-0.08	0.18	0.71
Q4	0.10	0.19	0.17	1.00	0.31	0.33	0.18	0.16	0.16	0.44	0.21	0.27	0.16	0.14	0.03	0.46
Q5	0.27	0.31	0.32	0.31	1.00	-0.03	0.32	0.29	0.06	0.25	0.28	0.23	0.25	0.09	0.11	0.48
Q6	0.35	0.36	0.34	0.33	-0.03	1.00	0.34	0.38	0.47	0.44	0.19	0.33	0.24	0.01	0.17	0.59
Q7	0.49	0.70	0.56	0.18	0.32	0.34	1.00	0.43	0.24	0.29	0.39	0.65	0.24	0.04	0.19	0.75
Q8	0.31	0.53	0.60	0.16	0.29	0.38	0.43	1.00	0.40	0.45	0.28	0.46	0.22	-0.01	0.10	0.68
Q9	0.20	0.39	0.25	0.16	0.06	0.47	0.24	0.40	1.00	0.56	0.16	0.11	0.18	0.06	0.20	0.50

Q10	0.34	0.46	0.28	0.44	0.25	0.44	0.29	0.45	0.56	1.00	0.25	0.28	0.17	-0.01	0.11	0.62
Q11	0.15	0.31	0.37	0.21	0.28	0.19	0.39	0.28	0.16	0.25	1.00	0.39	0.13	0.11	0.23	0.55
Q12	0.40	0.55	0.57	0.27	0.23	0.33	0.65	0.46	0.11	0.28	0.39	1.00	0.31	-0.04	0.13	0.71
Q13	0.22	0.34	0.21	0.16	0.25	0.24	0.24	0.22	0.18	0.17	0.13	0.31	1.00	0.29	0.27	0.45
Q14	-0.03	0.03	-0.08	0.14	0.09	0.01	0.04	-0.01	0.06	-0.01	0.11	-0.04	0.29	1.00	0.19	0.15
Q15	0.17	0.23	0.18	0.03	0.11	0.17	0.19	0.10	0.20	0.11	0.23	0.13	0.27	0.19	1.00	0.33
Sum	0.59	0.78	0.71	0.46	0.48	0.59	0.75	0.68	0.50	0.62	0.55	0.71	0.45	0.15	0.33	1.00

Table 9. Pearson's Correlation Coefficients Matrix (N=90, p<0.05)</th>

We used CFA that enabled us to simultaneously examine a series of interrelated dependence relationships (Figure 3, Table 10-11) among the measured variables (concrete answers in numbers to questionnaire items computed as sums of scores, for instance Q11,..., Q15, and latent constructs – directly unobservable variables (variates, dimensions like PIB, OE, CREA, PB, IC, TL) (Kowal, Keplinger,&, Mäkiö, 2018).

Construct	AVE	α	r	χ^2/df	RMSEA	Р	GFI	AGFI
PIB - The best global model (Fig.	0.98	0.86	0.31	1.88	< 0.095	< 0.001	0.82	0.75
1) with 14 questions								
DIM1. Organizational	0.96	0.72	0.47	n. r. (df=0)	→ 0	→ 1	→ 1	→ 1
environment								
OE→[Q1, Q2, Q3]								
DIM2. Creativity	0.99	0.43	0.2	n. r. (df=0)	→ 0	→ 1	→1	→ 1
$CREA \rightarrow [Q4, Q5, Q6]$								
DIM3. Planned behaviour	0.94	0.63	0.3	n. r. (df=0)	→ 0	→ 1	→1	→ 1
PB→(Q7, Q8, Q9)								
DIM4. Innovative Culture	0.94	0.57	0.3	n. r. (df=0)	→ 0	→ 1	→1	→ 1
IC→[Q10, Q11, Q12]								
DIM5. Transforming Leadership	0.90	0.42	0.27	n. r. (df=0)	→ 0	→ 1	→ 1	→ 1
TL→ [Q13, Q15]								

 Table 10. Model Fit in SEM – Indicators for Model and Scales.

Source: Own elaboration

AVE - average variance extracted, α – Cronbach's α ,

 $r-mean\ correlation\ between\ items,\ p-observed\ probability,$

 χ^2 / df, RMSEA, GFI – indicators of model fit

n.r. - no residuals

df-degress of freedom

Dependent	Independent	Symbols	Factor	Residuals	Examples of	Pearson's
variable in	variable in	for	loadings		Equations	linear
the equation	the equation	factor	aij			correlation
		loadings	(values)			coefficients
		aij				
DIM1 OE	PIB	a11	0,855	d1	DIM1=a11×PIB+d1	0.86
DIMI2	PIB	a12	0,625	d2	DIM2=a12×PIB+d2	0.74
CREA						
DIM3 PB	PIB	a13	0,876	d3	DIM3=a13×PIB+d3	0.87
DIM4 IC	PIB	a14	0,787	d4	DIM4=a14×PIB+d4	0.84
DIM5 TL	PIB	a15	0,401	d5	DIM5=a15×PIB+d5	0.50

Table 11. The Analysis of Latent Variable Structural Equation Modelling (SEM) to Correctfor Measurement Errors and Improve Tests of Mediation and Moderation.

On the basis of our analyses we decided to undertake following decisions.

Hypothesis	Suppotred	Comments			
1	Yes	H1: The measurable constructs of pro-innovation cover			
		following dimensions:			
		Organizational environment (Q1, Q2, Q3)			
		Creativity (Q4, Q5, Q6)			
		Planned behaviour (Q7, Q8, Q9)			
		Innovative Culture (Q10, Q11, Q12)			
		Transforming Leadership (Q13, Q14, Q15)			
2	Yes	H2. The analytical consistency of the instrument manifests			
		through high level of Cronbach's alfa, greater than 0,7			
3	Yes	H3. The validity of the instrument manifest through high level			
		of explained variance extracted AVE greater than 0,9;chi/df <5;			
		RMSEA less than 0,05; AFI, and AGFI greater than 0,9. These			
		results confirm The Pro-Innovation Behaviour as valid			
		instrument.			

 Table 12. The results overview

5. CONCLUSION

The objective of this work was to analyze evidence of the pro-innovation behavioural profile in organizations. For this the subcategories Organizational Environment, Creativity, Planned Behaviour, Innovative Culture and Transformational Leadership were used to analyze the construct of Pro-innovation Behaviour. The research was based on an assessment of the perceptions of employees who worked in jewellery/accessory stores and who had responded to the questions on the survey form. It highlights the fact that pro-innovation behaviour in organizations is directly related to the source of new ideas, encouraging team members to develop ideas and new projects, and to plan and detect opportunities in a dynamic context.

From the 15 items originally listed, 2 were excluded: item Q14 (I influence my coworkers to solve problems creatively) and item Q15 (Respect the innovative ideas of my team) because they did not present sufficient factorial loads to compose the measurement instrument, but had low factor loads of 0.079 and 0.320 respectively. This research went on to present the construction of an instrument that possessed convergent validity when tested by Factor Analysis, demonstrating the adherence of the items to the measurement scale by the analysis of factorial loads.

The scale items, in general, showed satisfactory results. However, new items should be considered because the constructs may vary according to the environment under scrutiny and variations over time. The meanings that the constructs have at certain moments can change as time passes, due to the breaking of paradigms and behavioural changes in society. For future studies it is suggested that structural equation modelling should be used to evaluate the reliability and validity of the instrument chosen for measuring the pro-innovation behavioural profile in organizations. Finally, this study is directed to researchers in the area of measurement and the development of scales, specifically, those concerned with studies on the pro-innovation behaviour in organizations.

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Dynamics of technological posthumanization: Distinguishing the anticipated paths of developed and emerging economies

by

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ABSTRACT

The processes of "posthumanization" can be understood as those dynamics by which a human organization or society comes to include members other than "natural" biological human beings who contribute to the structure, activities, or meaning of that organization or society. In the world of business, such posthumanization is commonly identified with the growing use of social robots, autonomous AI, and joint human-computer systems to perform work that in earlier eras would have been performed by human beings acting alone. Such "technological" posthumanization is often presented as a new phenomenon occurring largely in those developed economies that are pioneering Industry 4.0 paradigms (e.g., by expanding workplace automation) and that are uniquely positioned to harness such forces to drive economic growth. Here, however, we contend that such emphasis on the novelty of technological posthumanization overlooks forms of non-technological posthumanization that have been at work in human societies for millennia. Such dynamics of non-technological posthumanization have weakened significantly in many developed economies since the mid-20th century; however, they remain relatively strong in emerging economies. In this study, a conceptual framework is developed for identifying and comparing phenomena through which processes of technological or non-technological posthumanization manifest themselves in developed and emerging economies. It is argued that the ongoing and robust experience with non-technological posthumanization possessed by many of the world's emerging economies may offer them unique and underappreciated psychological, social, and cultural mechanisms for integrating effectively into their enterprises, organizations, and institutions those novel forms of non-human agency that are at work in key Industry 4.0 technologies, like those relating to social robotics, autonomous AI, and advanced human-computer interfaces.

Keywords: Technological posthumanization, anthropocentrization, emerging economies, Industry 4.0, robotics, artificial intelligence, Internet of Things.

INTRODUCTION

There is much interest in the growing impacts on organizations, economies, and societies generated by social robotics, autonomous AI, advanced human-computer interfaces (HCIs), and other types of emerging technologies that augment, complement, or replace natural biologically-based forms of human agency. Such technological change has been conceptualized using a number of paradigms, including those of cyber-physical systems (Wang et al., 2008), the Internet of Things (Atzori et al., 2010), and Industry 4.0 (Gorecky et al., 2014). Another paradigm through which such changes can be analyzed is that of *posthumanization*, which is the focus of this text.

The processes of "posthumanization" can be understood as those dynamics by which a human society comes to include members other than "natural" biological human beings that contribute to the structure, activities, or meaning of that society (Gladden, 2018, p. 19). Here the prefix "post-" refers to the situation that exists after certain conceptual and practical boundaries separating the "human" from the "non-human" have been at least partially dissolved; a posthumanized society (or organization within such a society) has expanded its membership to incorporate intelligent social actors beyond just "ordinary" human beings.

Within the spheres of contemporary organizational management and economics, such posthumanization is frequently identified with the growing use of social robots, autonomous AI, and cybernetic systems incorporating sophisticated HCIs to perform types of work that in earlier decades or centuries would have been performed by human beings acting alone. Such "technological" posthumanization (Gladden, 2018, pp. 135-36) is often presented as a new phenomenon occurring largely in those technologically advanced, developed economies that are pioneering the adoption of Industry 4.0 paradigms and are seen as being uniquely positioned to harness such forces to drive economic growth. However, such analyses overlook an equally significant (and far older) form of *non-technological* posthumanization that has been the subject of much study in the fields of philosophy, sociology, anthropology, and critical and cultural studies (Graham, 2002; Badmington, 2006; Herbrechter, 2013, pp. 2-3, 106) but which – as a concept – has so far received little attention from contemporary management studies or economics. Such processes of non-technological posthumanization

might be understood as the "original" form of posthumanization, which from ancient times has expanded the boundaries of human organizations and societies outward to encompass members other than "natural" biological human beings.

This study's hypothesis is that while the dynamics of non-technological posthumanization have weakened during recent decades in many developed economies, they remain relatively strong in many countries with emerging economies – and this ongoing familiarity with operating in *non-technologically* posthumanized environments may provide emerging economies' participants with alternative (and perhaps unexpectedly robust) psychological, social, and cultural mechanisms for adapting to the rise of social robotics, advanced AI, sophisticated HCIs, and other manifestations of *technological* posthumanization.

METHODS

Identifying and understanding that which is "posthumanized" requires some coherent concept of the "human"; this study's perspective is informed especially by the phenomenological account of the human being as a multilayered "relatively isolated system" developed by philosopher Roman Ingarden (1987), which is grounded in modern theoretical biology and systems theory in a manner that readily lends itself to an investigation of posthumanization.

Within the range of research methodologies delineated by Wilson (2010), this study constitutes an exploratory investigation employing an inductive approach and qualitative methodology. It relies on the collection, analysis, and synthesis of secondary data in the form of published scholarly texts. Data collection employed a purposive non-probability sampling method and cross-sectional time horizon; secondary data analyzed included works addressing posthumanism and posthumanization (Hayles, 1999; Graham, 2002; Badmington, 2006; Birnbacher, 2008; Ferrando, 2013; Herbrechter, 2013; Gladden, 2018); cyber-physical systems (Wang et al., 2008); the Internet of Things (Atzori et al., 2010); the Industry 4.0 paradigm (Gorecky et al., 2014); artificial and artificial general intelligence (Gunkel, 2012; Yampolskiy and Fox, 2012); swarm robotics and autonomous robots (Bekey, 2005; Barca and Sekercioglu, 2013; Brambilla et al., 2013); social robotics and human-robot interaction (Breazeal, 2003; Kanda and Ishiguro, 2013); virtual reality (Koltko-Rivera, 2005; Bainbridge, 2011); HCIs and neuroprosthetic enhancement (Clark, 2004; Fleischmann, 2009; Fairclough,

Gladden

2010); and genetic engineering and synthetic biology (Cheng and Lu, 2012; Bera, 2015; De Melo-Martin, 2015); and biological computing (Lamm and Unger, 2011; Church et al., 2012). Through analysis and synthesis of information found in such sources, it was possible to create a conceptual framework for use in documenting and comparing the divergent types and degrees of technological and non-technological posthumanization possessed by countries with emerging or developed economies; this framework is the study's primary product.

RESULTS

	POTENTIAL MEMBERS OF POSTHUM	ANIZED ORGANIZATIONS OR SOCIETIES		
	IN SCENARIOS OF TECHNOLOGICAL POSTHUMANIZATION	IN SCENARIOS OF NON- TECHNOLOGICAL POSTHUMANIZATION		
	"Normal" cases	"Normal" cases		
	 Human beings who are not supported, modified, or linked by technology 	Conscious, healthy, educated adult human beings		
	Liminal cases	Sleeping or comatose human		
"Natural" biological human beings	Human beings wearing clothing Users of eyeglasses or hearing aids	 beings Infants and children The alderly 		
	Users of automobiles, telephones, desktop computers, and other external devices	The enterly The mentally or physically disabled		
	Possessors of therapeutic neuroprostheses	Intoxicated or hallucinating individuals		
	Patients who have undergone somatic cell gene therapy			
Artificially augmented	Persons genetically engineered to possess superhuman capacities	Priests or shamans believed to possess supernatural powers Political or military loaders with		
indinan benigo	persons (e.g., military cyborgs)	great social influence or authority		
Epihuman beings	Neuroprosthetically facilitated collective human "hive minde"	• Families, clans, or tribes		
"built upon" human beings)	conective numary nive minus	Religious communities		
Metahuman beings	Transgenic GMOs or chimeras with	Deceased human beings		
(with origins in a human ontic fundament, but transformed)	limited human genetic material	• Ghosts		
Parahuman beings	Androids with human-like artificial intelligence	Fictional or folkloric characters Angels		
(human-like beings possessing a type of ontic fundament that	Artificial agents existing in virtual	• Demons		
differs from that of the human species)	worlds that resemble human beings or serve as autonomous proxies for real human persons	 Anthropomorphic monsters A personal deity 		
	Synthetic biological computers Nanorobotic swarms	Wild and domesticated animals Non-anthronomorphic monsters		
Nonhuman beings	Artificial general intelligences	Impersonal deities		
	(AGIs) with radically nonhuman cognitive structures and dynamics	• Abstract cosmic forces (fate, destiny, karma, etc.)		

Figure 1. Potential members of technologically and non-technologically posthumanized organizations or societies.

Analysis and synthesis of the gathered sources enable us to construct the schema depicted in Figure 1, which suggests that the types of artificially augmented human beings, epihuman beings, metahuman beings, parahuman beings, and nonhuman beings that become

incorporated into human organizations and societies (or which their human members come to *believe* are active elements of such organizations or societies) through processes of technological posthumanization differ significantly from those incorporated by processes of non-technological posthumanization – while simultaneously sharing certain similarities in their roles and characteristics.

To the extent that a contemporary society already incorporates members listed in Figure 1's left-hand column, it can be understood to have undergone technological posthumanization; to the degree that it is striving to incorporate further such members (i.e., by developing more sophisticated forms of AI or neuroprosthetics), it demonstrates processes of ongoing technological posthumanization. To the extent that a contemporary society includes (or is understood by its human members to include) members of the sort listed in Figure 1's right-hand column, it displays traits of non-technological posthumanization.

DISCUSSION

Drawing on Figure 1, it might be observed that the default condition of the world's political states, economies, and cultures over the last few thousand years has been one of considerable non-technological posthumanization. For example, the prosperity and survival of many historical civilizations depended on the use of domesticated animals like the chickens or cows that provided food, dogs that warded off predators, oxen that plowed fields and powered mills, and horses that drew wagons and carried soldiers into battle. Similarly, throughout much of human history, a belief in deities, angels, and spirits of the deceased connected with folk spirituality or organized religion has exerted a strong regulating force on the social expectations for and behaviors of persons and institutions. Historical societies that incorporated such elements were non-technologically posthumanized and partially de-anthropocentrized: while ordinary human beings played a key role in them, they were by no means the only members whose real or supposed existence and activities helped shape the conduct of those societies; human beings had to "share the stage" with other types of entities.

For millennia, the effective functioning of non-technologically posthumanized economies was thus based on human beings' successful collaboration with (or at least, openness to) such radically non-human intelligences and their effective inclusion in the structures and activities of commercial enterprises, state institutions, and other organizations.

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Many changes occurring in developed economies and societies beginning in the mid- 20^{th} century had the effect of temporarily and anomalously de-posthumanizing such societies and making them more anthropocentric. Indeed, the semi-automated assembly lines that characterized developed economies in the 1960s and 1970s – and later, the office suites of the 1990s full of cubicles equipped with desktop computers – arguably reflected the most anthropocentric and non-posthumanized workplaces in history: rather than being surrounded by domesticated animals that needed to be persuaded and cajoled, the human worker (and his or her intellect) was not only the supreme decision-making agent and actor but the *only* one. The human employee became the sole intelligent social actor within most enterprises, surrounded by highly effective (but passive) electronic tools that would do exactly – and only – what they were instructed to do by their human operators.

Simultaneously, beginning in the mid-20th century, nations with developed economies (on the whole) also became more secularized and less spiritual (McCleary and Barro, 2006; Johnson and Grim, 2013), their birth rates began to fall, and elderly family members increasingly came to reside in specialized facilities rather than in the home with their adult children (Rowland, 2012; McDaniel and Zimmer, 2016). Instead of involving extensive and diverse daily social interaction with (or, at least, social behaviors directed at) wild or domesticated animals, children, elderly relatives, deities, ghosts, or angels, the everyday life experience of the adult workforce in developed economies has in recent decades become more homogenized, anthropocentric, and de-posthumanized: it has now largely come to involve interaction with other adult human beings. That *status quo* now promises to be upended by a "re-posthumanization" of developed economies – this time brought about not by farm animals but by social robots, autonomous AI, and cyborgs.

The picture in many emerging economies is quite different. While there are numerous notable exceptions, *in general* contemporary emerging economies are associated with societies that have maintained a higher degree of non-technological posthumanization since the mid-20th century: in comparison to countries possessing developed economies, it is more likely in emerging economies that adults share a home with large numbers of children and with elderly relatives (Rowland, 2012; McDaniel and Zimmer, 2016); that individuals acknowledge some religious affiliation and a belief in ghosts, angels, deities, or other supernatural entities or forces (McCleary and Barro, 2006; Johnson and Grim, 2013); that wild animals are routinely encountered; that families raise their own animals for food; and
that domesticated animals are employed for farm work, transportation, and other forms of labor (Common and Stagl, 2005; Pingali, 2007).

This suggests (as reflected in Figure 2) that as ever more sophisticated technologies relating to social robotics, autonomous AI, and advanced HCIs are deployed worldwide, the resulting technological posthumanization of organizations and societies may unfold in distinct ways in developed and emerging economies, insofar as they begin from different starting points. In developed economies, the advent of such transformative technologies pushes human beings from their recently acquired position at the center of all organizational and societal decision-making and action; it forces organizations' human workers to develop means of collaborating successfully with the types of para- or nonhuman members that during the second half of the 20th century they had endeavored to exclude from their midst. On the other hand, participants in emerging economies are (on the whole) already more accustomed to living in a highly posthumanized society in which they must collaborate effectively with many augmented, meta-, para-, or nonhuman members. For them, the arrival of social robots, autonomous AI, and sophisticated BCIs might thus be more likely to be seen as just adding additional types of posthumanization to their already posthumanized world.



Figure 5. Differing paths to technological posthumanization in developed and emerging economies.

It may even be hypothesized that some countries with emerging economies likely possess unique psychological, social, and cultural resources in the form of deep reservoirs of ongoing experience with non-technological posthumanization that might give them a "head start" in grappling with, developing, and exploiting the forces of technological posthumanization in novel and creative ways. For example, the forms of epi-, meta-, para-, or nonhuman agency possessed by future generations of online communities, self-driving automobiles, companion robots, smart-home AIs, and web algorithms that are being pioneered by firms like Google, Facebook, and Amazon may appear alien or mysterious in anthropocentric societies with developed economies that – in recent decades – have employed paradigms based around the exclusivity and supremacy of human agency; however, they may be readily comprehensible using concepts and categories already present in non-technologically posthumanized societies of the sort associated with many emerging economies. It is hoped that the conceptual framework developed in this study can provide a tool for investigating such issues in more detail from both theoretical and empirical perspectives.

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User Wishes on the Integration of Social Media and ICT in a Hybrid Learning Environment: Comparing Focus Group Results from Emerging and Developed European Economies.

by

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ABSTRACT

The aim of this study is to compare the wishes of users from Belarus and Greece, as emerging economies, and Finland and Germany, as developed economies, concerning the integration of social media and information and communication technologies (ICT) in teaching and learning. Focus groups in each of these countries were conducted, following participatory co-design methodology, as part of the EU-funded project Science, Technology, Innovation, Mathematics, Education for the Young (STIMEY). The project's objectives center around developing a pedagogical framework that leverages social media and ICT, for Science, Technology, Engineering and Mathematics (STEM) education and careers. Findings from these focus group were then analyzed with a qualitative approach to identify the similarities and differences between these economies and discussed in terms of recognizing pedagogical design principles that are more suitable for the profile of each.

STATE OF THE ART AND PURPOSE

The paper will investigates the role that education and ICT play in economic growth and review relevant research on emerging and developed economies in Europe, mainly Belarus, Greece, Germany and Finland. It is already evident that education, especially science education, plays an important role in increasing the competitiveness of a market. Yet, it is quite hard to attain and retain the interest of the youths in Science, Technology, Engineering and Mathematics (STEM) education and careers. Science, Technology, Innovation, Mathematics, Education for the Young (STIMEY) is an EU-project that is researching and developing a hybrid learning environment with multiple components such as social media, web platform, robotics, radio and entrepreneurial tools, based on a pedagogical framework. While the project spans over 5 European countries with combined results on all those components, this paper will focus on the analysis of data on the use of ICT from the 4 countries, comparing their results in the context of emerging and developed economies to draw conclusions from similarities and differences that might exist among them.

METHODOLOGY

Participants in the focus groups represent the main stakeholder groups in the STIMEY project: 10 to 18 -year old primary, lower and upper secondary school students, school directors, teachers, parents and STEM professionals. Gender balance among participants was ensured in each co-design session. Table 1 displays the number of participants for each stakeholder group in the 4 countries and the total per economy group.

Table 1. Participants

	Belarus	Greece	Emerging Economies Total	Germany	Finland	Developed Economies Total
	<i>n</i> =	<i>n</i> =	<i>n</i> =	<i>n</i> =	<i>n</i> =	<i>n</i> =
Primary school students	2	2	4	11	4	15
Lower secondary school students	6	2	8	2	6	8
Upper secondary school students	2	2	4	7	2	9
Teachers	3	6	9	2	3	5
Directors	3	3	6	3	3	6
Parents	4	6	10	3	5	8
STEM professionals	2	3	5	-	2	2
University students	5	-	5	2	2	4
Total n =	27	24	51	30	27	57

The paper will focus on the analysis of the stakeholders' wishes related to social media, gamification, e-learning platform use and design, specifically with the following statements:

4.1 I wish social media...

4.2 I wish user profiles...

4.3 I wish social networks...

5.1 I wish learning games...

5.2 I wish gamification...6.1 I wish platform was used...

6.2 I wish platform appeared/looked...

These topics were introduced to the participating stakeholders as slides with inspirational images, and only brief introduction on the STIMEY project and its components, to get the discussion going, following a participatory design approach and focus group techniques. An online form was filled by the participants to answer each of the above statements in about 5 to 10 minutes; the discussions were also recorded. Finally, the data will be analyzed using the grounded theory approach, as the collected data was coded using open coding techniques and broken into meaningful conceptual themes. Experts in social media concepts and platform development as well as teaching and learning pedagogy will then analyzed these themes to find similarities and differences between these economies.

RESULTS

The results will identify the different themes that emerge in the data analysis of the participants' wishes and discuss their relevance to each group of countries in context of their economy type. Results will be investigated and explained in contrast with relevant existing research on education and ICT in emerging and developed economies in Europe.

LIMITATIONS

The results are not to be taken as statistically relevant to the overall population in either economies, given the sample size. Moreover, while there is gender balance between the two groups, the age balance was not ensured. Thus, results may be skewed by the major age group of stakeholders in each economy group.

RESEARCH IMPLICATIONS

The study can shed light on the pedagogical needs of emerging countries in contrast with developed economies, and aid in the adaptation of pedagogical frameworks and development of learning/teaching environments that are tailored to the needs of these economies. Future research can employ quantitative analysis to support the qualitative analysis in this paper.

VALUE

This study can aid in the personalization of the STIMEY platform to fit the profiles of the two economy groups, which can be easily achieved due to its multilingual nature. In

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principle, this can also aid in the development of other learning environments that are geared towards these economies. This can be especially valuable in emerging economies that aim to improve their quality of education and ICT and be able to compete with developed economies.

Keywords: Developed economies, E-learning, Emerging economies, ICT, Pedagogy, Social media.

IT Solutions Integration: Technical and Organizational Challenges

by

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ABSTRACT

Enterprises adopt more and more information systems in order to extend range of provided services and support more business processes – and ultimately improve the ability to compete in the market. Individual IT solutions are implemented in different timelines, and, in addition, technologies behind them often vary significantly. For this reason, data exchange between various systems requires additional coordination. The solution to automate system integration that might be considered is to adopt Enterprise Application Integration (EAI) middleware technology to convert data from among various IT solutions and enable flow of business processes between different systems. In this paper, we discuss the background for Multiple-Unit Case Study research which was initiated in order to highlight technical and organizational challenges in integration system environment.

Keywords: System Integration, Enterprise Application Integration, Enterprise Resource Planning, Model, Qualitative Research, EAI.

INTRODUCTION

The need to integrate different IT systems and applications is often prominent for satisfying business requirements. Enterprises integrate distributed applications due to the continuous mergers, acquisitions, joint venture, outsourcing as well as infrastructure upgrades and adoption of new technologies. However, distributed applications often have issues in communicating with one another due to inconvenience regarding different data formats, protocols or wrong adoption of business processes that are supported by non-integrated or poorly integrated IT systems. Additionally, the applications and devices may be developed or provided by different vendors with different operational systems and programming languages.

Continuous growth of distributed applications and demands to integrate them has become a challenging task.

Nowadays, the technical part of application integration seems to be relatively mature regarding both theory and practice. This is owing to the theoretical foundations that have been provided by researchers in recent years. However, we identify lack of theoretical background regarding the aspect of application integration that might be considered crucial for enterprise success: integration approaches that have been identified do not include an adequate delineation regarding how the integration of applications affects the execution of business processes. Therefore, some research questions arise:

- 1. How to design process integration and how to evaluate the fit of integration with business requirements?
- 2. What elements and factors of integration design cause that its implementation is recognized as a real technical and business success?

In order to fill this research gap, we are focused towards developing a theoretical model and its attributes to identify relevant factors that should be considered while implementing information system integration from business perspective. The proposed model shall contain new guidelines, such as application integration design and evaluation methods – both with project management backgrounds that need to be further adapted to ensure the reliability, fit to business, usability, and compatibility with expectations of integrated applications users. Thus, we hereby pose the following research hypothesis (H): *Boosting the efficiency and business usability of information systems in enterprises, while upholding deployment costs, requires the development of an implementation model. The model shall put particular emphasis on modeling the integration of systems being implemented with other IT solutions – including the stages of preparing the integration, executing it and verifying the agreed plan of bringing information systems together in the model.*

After the introduction, the research background is outlined in section 2. Subsequently, related research is discussed, followed by the research design and method. Finally, primary limitations of the study are identified and discussed, as well as the summary provided.

Gawin, Marcinkowski

RESEARCH BACKGROUND

Integrated IT solutions enable carrying out complex business processes (Hohpe & Woolf, 2004), exchanging documents and financial data, integrating with supplier-side systems to increase inventory turnover, and reducing inventory and procuring personnel costs (Hung et al., 2015). At some stage of its development, enterprises are typically comprised of numerous applications that are custom-built, acquired from a third-party, part of a legacy system, or a combination thereof, operating in multiple tiers of different operating system platforms (Hohpe Woolf, 2004). Such enterprises often integrate distributed applications due to the continuous mergers and acquisitions, joint ventures, outsourcing, corporate restructuring, infrastructure upgrades, wide-scale adoption of mobile devices, embedded devices, and wireless sensors (He Da Xu, 2014). Over time, growing companies are becoming complex, multi-functional and information-intensive, so integrating management information systems proves critical in ensuring that the correct information can be stored and accessed in real time (Stefanou & Revanoglou, 2006). Spreading business processes and functions across multiple applications provides the business with the flexibility to develop a set that meets the requirements (Hohpe Woolf, 2004).

Most industries implement distributed enterprise applications, such as distributed control systems in factory automation, e-manufacturing systems, distributed electronics production systems, and facility management (Chen, 2004; Delamer & Lastra, 2006; Xu et al., 2005; Gawin & Marcinkowski, 2017). The applications may be developed internally or delivered by different vendors (Xu et al., 2005) with varying programming languages, formats, and protocols. He & Da Xu (2014) point out that typically, software vendor's offer focuses on specific functions – so significant integration efforts are required to enhance and increase the interoperability of these several heterogeneous applications and devices. Should it be needed or requested, brand new functions can be added to existing IT tools. However, new business functions can also be acquired by integration heterogeneous applications with other existing solutions. As specific solutions behind integration are concerned, Addison Wesley indicates six types of integration projects (Hohpe & Woolf, 2004): Information Portals, Data Replication, Shared Business Functions, Service-Oriented Architectures (SOA), Distributed Business Processes and Business-to-Business Integration.

Enterprise Resource Planning (ERP) systems are one of the most popular integration hubs in today's enterprises. ERP vendors (e.g. SAP, Oracle, Peoplesoft) have had some success at creating larger-than-ever business applications. ERP brings together many functionalities – such as warehouse, stock inventory module, Business Process Management System (BPMS) and finances (Dumas et al., 2018) – but these Commercial Off-The-Shelf (COTS) systems have evolved from plain ERP toward more sophisticated application suites that include ERP, Customer Relationship Management, Business Intelligence, Workflow, Content Management, and other functionalities (Lech, 2016). The reality, though, is that even the modern, multifunctional solution that ERP might be regarded as, still require further integration with domain-specific systems (Hohpe & Woolf, 2004).

Some business process transactions require coordination of many separate systems. For instance, successful placing a new order into warehouse requires validating a customer's ID, verifying the customer's good standing, checking the inventory, fulfilling the order, getting a shipping quote, computing sales/added value tax, sending a bill etc. According to Hohpe & Woolf (2004), in order to support common business processes and data sharing across applications, these applications need to be highly integrated. Integration's dimensions include integration scope, integration points of view (views from users, designers and developers), integration layer and integration level (Izza, 2009). Furthermore, intra-enterprise integration can be broken down into horizontal and vertical integration (Kalogeras et al., 2006; Izza, 2009). Technical aspect of integration distinguishes four main approaches (Ritter, 2014; Hohpe & Woolf, 2004): File Transfer (one application saves a file that another one reads later), Shared Database (multiple applications share the same database schema, located in a single physical database), Remote Procedure Invocation (synchronously; a given application exposes some of its functionality so that it can be accessed remotely by other applications as a remote procedure) and Messaging (asynchronously; one applications publishes a message through a common message channel; other applications can read the message from the channel at a later time).

To address aforementioned integration problems, a dedicated IT solution named Enterprise Application Integration (EAI) has been developed (Linthicum, 2003; McKeen & Smith, 2002). EAI concerns with techniques to integrate distributed enterprise applications on different layers: user interface, communication, application processing, database and data integration (Hung et al., 2015; He & Da Xu, 2014). EAI technologies convert data from among various information systems to enable an efficient flow of data. Recent research on the technology integration of distributed application clearly indicates that middleware (such CORBA and DCOM) are typically used for Intranet applications (Hanes, Ahalt & Krishnamurthy, 2002; Izza, 2009), while XML Web Services have been created to support the integration of Internet application as WEB published functions. SOA (Service Oriented Architecture) integrates applications, enabling the use of not only published functionality, but also of dispersed applications as services (Baker & Dobson, 2005; Da Xu, 2011). Messaging as EAI is an asynchronous approach – when a given applications publishes a message to a common message channel. Other components of the integrated IT ecosystem can read the message from the channel at a later time (Hohpe & Woolf, 2004). Global software providers (SAP, Microsoft) create their own EAI tools (Ritter, 2015).

RELATED RESEARCH

System integration is not an easy task. Distributed applications often pose technical challenges, e.g. different formats and protocols in communicating with one another (He & Da Xu, 2014).

Variance between system structures, data formats, and exchange mechanisms makes it difficult to integrate systems successfully. As mentioned, software vendors offer EAI suites that provide cross-platform, cross-language integration as well as the ability to interface with numerous popular packaged business applications (Hohpe & Woolf, 2004) in order to increase operational efficiency of the information provision (Hung et al., 2015). However, Hohpe & Woolf (2004) stress that once legacy systems require some additional "functionalities" to integrate, IT staff is expected to make up for deficiencies inside the applications.

As a part of IT solution integration effort, it is becoming increasingly important to ensure Quality-of-Service (QoS) for effective integration (Farroha & Farroha, 2007) and processing high number and rate of incoming messages (Ritter, 2015). While developing an EAI solution is challenging in itself (He & Da Xu, 2014), operating and maintaining such a solution can be even more daunting (Hohpe & Woolf, 2004). The mix of technologies and distributed nature make deployment, monitoring, and trouble-shooting complex tasks that require a management process for integration. Thus, research on the integration reliability, including data and information reliability, is highly valued by all industrial enterprises (Du et al., 2011). New guidelines and methods, such as task load balance, fault-tolerance, message

scheduling and transaction mechanisms, required further development in order to ensure reliability, robustness, maintainability, and rapid diagnostics of integrated industrial applications and devices in various environments (Hohpe & Woolf, 2004).

It is not enough to consider information integration as an information systems issue (Zhang, Lu & Shou, 2017). In fact, the technical aspect of distributed enterprise applications integration plays only a small portion of the complexities. The true challenges for integration are business issues. Generally, enterprise applications support a specific functional area, such as Customer Relationship Management, Billing, Finance, Warehouse Management etc. Integration project not only needs to establish communication among multiple computer systems, but also between business units (Hohpe & Woolf, 2004). Since integrated systems process critical business functions, proper operation of "one big system" becomes vital to the overall business performance. Insufficient IS integration results, among others, in missing data and errors (Hung et al., 2015) that may affect decision-making processes (Khoumbati et al., 2006). The process of integrating and subsequently launching integrated IT solutions raises users' concerns. These stakeholders may resist the adoption of new tools – and serious problems can arise, just to mention poor communication and insufficient educational training; such problems can cause projects to fail (Mantzana et al., 2008).

RESEARCH DESIGN AND METHOD

Initiated research process is qualitative in nature. Qualitative inquiry employs different philosophical assumptions, strategies of inquiry and methods of data collection, analysis and interpretation (Creswell, 2013); qualitative researchers pose broad, general questions to allow the participants to explain their ideas. Given our objective to develop a model that would constitute the basis for pursuing integration of information systems as well as for verifying communication between integrated IT solutions, we had to choose a qualitative method for gathering and processing data that constitutes a good fit. Both different case study designs and action research were considered. However, while both aforementioned methods focus on contemporary events and enable discovering "how" or "why" some phenomenon works, we decided to focus on understanding a real-life phenomenon in-depth and to retaining the holistic and meaningful characteristics of real-life events.

In our case, the phenomenon being studied is the deployment of information systems – integration of newly introduced IT solutions with those that already work in the organization in

particular. Therefore, Multiple-Unit Case Study was selected as the primary qualitative research method. All of the companies that shall be covered the study require combining various IT solutions to support their business processes and data exchange. The Multiple-Unit Case Study method provides for analysis and explanation of a given phenomenon in numerous organizations, which makes it possible to confront the theoretical domain-specific fundamentals with various integration-oriented projects.

In order to obtain viable research material, we shall perform detailed analysis of documentation of IT projects/systems deployed and conduct a set of in-depth interviews based on a domain-tailored questionnaire. Based on the knowledge gained during already accomplished research initiatives, each of the interviews is expected to last between 80 minutes and two hours. A vast majority of the questions to be asked are open-ended, allowing the interviewees to describe and explain any stories related to modeling the integration of systems being implemented with other IT solutions. All the meetings shall be hosted at partners' premises. Research design assumes two researchers being involved in each interview to present individual semi-structured questions along with possible sub-questions in order to produce the best possible questionnaire feedback and detect missing/redundant content ad hoc. While the active interviewer will be responsible for asking the questions, acting as a neutral listener and maintaining respondent's engagement, the passive one will account for non-verbal behaviors and provide control of feedback completeness. No live transcription shall be attempted, since all the interviews will be digitally recorded.

The complete feedback shall be subsequently transcribed. Then, the narrative content will be coded using analytical software that is dedicated to conducting qualitative research, i.e. nVivo v11. The introduction of dedicated analysis software to the research process is dictated by its ability to enhance coding process (auto-coding and queries-related functionality), to provide flexibility regarding reorganizing coding and node structures as further research milestones are achieved and to enable efficient sharing processed data among research team. The interview-based feedback shall also be triangulated with secondary data: internal documents, official documentation and IT project reports. The initial categorization of research nodes shall be achieved through open coding (Böhm, 2004). In order to increase the robustness of the analysis (Soja & Soja, 2017), the initial structure of research nodes is decided to be elaborated by each of the research team members separately and a cross-checking process is

accounted for. Such an approach might be classified as investigator triangulation, as recognized by Denzin (1989).

LIMITATIONS OF THE STUDY

The overall research process is qualitative in nature. That might be regarded as a natural limitation. Having said that, Kaplan & Maxwell (2005) argue that the goal of understanding a phenomenon from the point of view of the participants and its particular social and institutional context is largely lost when textual data are quantified. Myers (2013) deftly summarizes the issue – all qualitative research methods and approaches have their limitations, but so do all quantitative ones; no research method is perfect. One of the potential directions regarding future research is introducing the Unified Theory of Acceptance and Use of Technology to assess the acceptance of models to be developed quantitatively by both practitioners and the scientific community.

Mayring (2014) suggests comparing the studies side-by-side (which could be done in case another research team launched a similarly-designed study outside Europe, which is not the case according to our best knowledge) and verify a number of Krippendorff's coefficients. Nature of the proposed study does not harmonize with verifying stability criteria or calculating Krippendorff's reproducibility coefficients. It should be noted though that semantic and construct validity shall be checked and neither sampling, correlational nor predictive criteria apply to the proposed research.

SUMMARY

This paper discusses research background, related contributions, research gap as well as the detailed method constituting early stages of the study oriented at developing a theoretical model and its attributes to identify relevant factors that should be considered while implementing information system integration from business perspective. Target artifacts of the overall research process are to provide assistance in avoiding problems with business process, data and documents sharing across different types of systems. While the issue of EAI was approached from multiple angles, to the best of our knowledge there has been limited research regarding aforementioned issues in EAI context and the model to be developed shall constitute an added value for companies in that respect, regardless of their size and specialization. Integrating information systems is critical to ensuring that the correct information and processes can be accessed real-time. In IT-intensive organizations, efficient execution of IT integration is likely to limit, if not discontinue, giving rise to frustrations of employees affected by arising integration-related issues and all other participants in processes that have been covered by computerization.

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Cultural impact on intention to use technology – UTAUT model validation in Poland

by

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ABSTRACT

A few studies have proven that technology acceptance determinants often relate to culture and sometimes even to ethnicity. Consequently, this study validates the Unified Theory of Acceptance and Use of Technology (UTAUT) model in Poland, a Slavic country, where similar research has not been found. In this respect, a structural equation modelling (SEM) approach was used to validate a model of m-learning acceptance on the basis of data collected via a survey of 710 students from two Polish universities. Research results proved that the general UTAUT model is valid in Poland, since the influence of all of the UTAUT variables on the behavioural intention to use technology (BI) has been confirmed. Such result is consistent with a few other studies and contrary to most of them. From a different angle, the study result highlighted that the strength of impact of particular variables, such as performance expectancy (PE) and social influence (SI), on BI differs a lot when compared to the classical UTAUT. Research results strengthen the study results of other researchers claiming that factors influencing technology acceptance and their importance are often culturally specific. Therefore, they contribute to the technology acceptance research filed.

Keywords: Technology acceptance, UTAUT, Culture, Slavic country, Mobile Learning, Students, Knowledge transfer.

INTRODUCTION

First models and theories connected with technology acceptance have not taken into account moderators. Such ones were: Theory of Reasoned Action (Fishbein and Ajzen, 1975), Technology Acceptance Model (Davis, Bagozzi and Warshaw, 1989), Theory of Planned

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Behavior (Ajzen, 1991), Model of PC Utilization (Thompson, Higgins & Howell, 1991), Motivational Model (Davis, Bagozzi and Warshaw, 1992); and Combined Model of TAM and TBP (Taylor and Todd, 1995). Moderators show variables significance and strength according to proposed category like age or gender. Moderators occurred to be important extensions that enhance the predictive validity of the technology acceptance models (Venkatesh and Davis, 2000; Sun and Zhang, 2006). Chin, Marcolin and Newsted (2003) empirically examined and confirmed the significant influence of moderating factors in existing models on technology acceptance. Moreover other studies prove that models that include moderators often provide a significantly better explanation of technology acceptance (Sharma, Ganpati and Kmar, 2013) or avoidance (Kim and Choi, 2018).

Technology Acceptance Model 2 (TAM2) was the first widely recognized model that broadly introduced moderators such as: experience and voluntaries (Venkatesh and Davis, 2000). Other subsequent, crucial theories or models in the field of technology acceptance also started to include moderators:

Unified Theory and Use of Technology (UTAUT): gender, age, experience and voluntariness of use (Venkatesh et al, 2003);

Technology Acceptance Model 3 (TAM3): experience and voluntaries (Venkatesh and Bala, 2008);

Unified Theory and Use of Technology 2 (UTAUT2): age, gender and experience (Venkatesh et al., 2012).

Interestingly UTAUT 2 decreases the number of moderators by one by omitting voluntariness of use that existed in the first version. However that could not be interpreted as a trend to decrease the number of moderating factors in technology acceptance models or theories.

Classical models or theories have not taken into account culture impact on technology acceptance determinants. Schein (1985) defines culture as a belief systems that shapes individuals' schemas about the world around them. Leidner and Kayworth (2006) noticed that culture has a powerful role in impacting peoples social behaviors. Such influencing role of culture on technology acceptance has been noticed in studies of King and He (2006) and Bandyopadhyay and Fraccastoro (2007) who revealed that factors impacting users' intention to use devices and applications might vary when applied in different cultural settings.

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Moreover ethnicity has been proven to be a significant determinant in moderating the adoption-perception-use behavior (Liew, Vaithilingam and Nair, 2014). As a result a number of studies have been conducted to validate technology acceptance theories and models in particular cultures and countries. It is convergent with Marchewka, Liu and Kostiwa (2007) that despite the high recognition of classical models like UTAUT their validity requires further testing.

Consequently, the aim of the article is to validate UTAUT, which with TAM is the most popular technology acceptance model, in Poland that is a Slavic country, where similar research has not been found in subject matter literature. As proven in several studies (Alshare and Mousa, 2014; Venkatesh and Zhang, 2010; Thomas, Singh and Gaffar, 2013) culture specificity especially exists for mobile solutions, such as: mobile payment systems, internet banking services and mobile learning (m-learning). Therefore study was carried in the context of m-learning utilization by students for knowledge transfer. M-learning can be defined as "the acquisition of any knowledge and skills through the use of mobile technologies, anywhere, and anytime" (Geddes, 2004). As a result, m-learning is unique in terms of time flexibility and location (Peters, 2007). Integration in mobile applications, aspects of social communication led to mobile learning 2.0 allowing for collaborative experience sharing, which is important in knowledge transfer process. Such features of m-learning and m-learning 2.0 with proven importance of user autonomy of their use (Kuciapski, 2017) allows to treat them as technologies where their intention to use potentially highly depends on culture.

The second point of the paper contains a review of subject matter literature in the context of culture role in technology acceptance models, also dedicated to mobile devices and applications. Afterwards research methods used for UTAUT model validation in Poland have been described. The fourth and fifth part of the paper present research results and their discussion from theoretical and practical perspectives. The article finishes with pointing out limitations and the conclusion.

RELATED RESEARCH

Analysis of subject matter literature of technology acceptance models based on TAM or UTAT, points out on the existence of a few studies concentrating on culture role in technology acceptance (Table 1).

 Table 1 Culture role in explaining technologies acceptance

Publication	Country	Target	Studied technology,	Key findings from culture perspective
		group	device or application	
Alshare and Mousa, 2014	Qatar	Consumers	Mobile payment devices	All UTAUT variables were confirmed to impact on the intention to use mobile payment devices.
Al-Gahtani and Hubona, 2007	Saudi Arabia	Employees	Computers use for desktop applications	Effort expectancy does not impact on the intention to use computers of employees.
Hong and Kang, 2011	South Korea and United States	Students, undergradua tes and employees	MP3 player and internet banking	Social influence impact on the intention to use technology depends on culture.
Venkatesh and Zhang, 2010	China and United States	Employees	New application	Subjective norm and social influence impact on the intention to use technology depends on culture. The effect of facilitating conditions on intention to use technology depends on culture with age and experience being its moderators.
Bandyopadh yay and Fraccastoro, 2007	India	Employees and decision makers	Prepayment metering systems	Social pressure for an individual to perform a behavior varies by culture.
Yuen et al., 2010	United States, Australia and Malaysia	Users	Internet banking services	Attitude toward using influence on intention to use technology depends on culture. Perceived credibility influence on IBS acceptance is relevant only in developed countries.
Thomas, Singh, and Gaffar, 2013	Guyana	Studens	M-learning	Performance expectancy and effort expectancy do impact on intention to use technology.

Culture has been confirmed to moderate variables impact on the behavioral intention to use a wide spectrum of technologies: desktop applications, mobile payment systems, web systems, internet banking services, prepayment metering systems and m-learning (Table 1). The impact of performance expectancy, facilitating conditions and effort expectancy on technology acceptance was proven to depend on culture. Studies have been conducted in a few countries significantly differing from each other from a culture perspective: Australia, China, Guyana, India, Qatar, Malaysia, Saudi Arabia, South Korea and United States. Especially for variables existing in UTAUT that is being recognized as general model, impact or its strength on behavioral intention depended on country (culture) where study has been conducted (Table 1). In most of the cases such variables were effort expectancy and social influence. Also one of UTAUT's authors, in his further study proved difference in technology acceptance determinants depending on country – USA vs China (Venkatesh and Zhang, 2010). A study for a Slavic country such as Poland validating classical UTAUT model has not been found in subject matter literature.

RESEARCH METHODOLOGY

UTAUT model was adapted before its validation. First of all variables' influence on behavioural intention (BI) to use technology was tested. Therefore facilitating conditions

variable was omitted as being connected with use behaviour (UB) and not BI. Similarly to many studies validating general models like UTAUT or UTAUT 2 all moderators have been omitted (Im, Hong, and Kang2011; Thomas Singh and Gaffar, K, 2013; Alalwana, Dwivedib and Rana, 2017).

For each connections between variables a research hypotheses have been stated to verify influence of independent variables on dependent variable. They were formulated similarly to other studies with inclusion of analysed technology (Table 1), that is m-learning, and target group being students. Table 2 contains four stated research hypotheses.

Hypoth. no.	Connection	Description
H1	PEBI	Performance expectancy impacts on students' intention to use

		m-learning.
H2	EEBI	Effort expectancy impacts on students' intention to use m- learning.
H3	SIBI	Social influence impacts on students' intention to use m- learning.

 Table 2: Research hypotheses.

The research data collected via survey was conducted during f-2-f meetings among 842 student of two polish universities. Among them 710 knew how to use mobile devices, applications and services, and were able to report on their experience. The questionnaire began with an explanation of key concepts, such as mobile devices and m-learning. The second section of the questionnaire consisted of classification, such as age and experience in using mobile services in general and during studying process. The crucial third part of the survey included 15 statement assertions formulated in accordance with technology acceptance questionnaires rules – 3-4 statements for each variable. Each question was measured using a 7-point Likert scale. The assertion statements in the survey were created for all variables included in the model. Standard UTAUT's assertion statements were used while also taking into account m-learning acceptance by students.

A data validity test was performed to reduce the possibility of receiving incorrect answers during the data collection period. Inter-construct correlation coefficient estimates were examined along with a particular item's internal consistency by using Cronbach's alpha. Afterwards the study used structural equation modelling (SEM) for the data collected via the survey, to validate UTAUT model in Poland. A two-step modelling approach, recommended by Anderson and Gerbing (1988) was followed such that the confirmatory factor analysis

(CFA) was carried out first to provide an assessment of convergent and discriminant validity. CFA included six indices: $\chi^2/d.f.$, GFI (Goodness of Fit Index), CFI (Comparative

Fit Index), AGFI (Adjusted Goodness of Fit Index), RMSEA (Root Mean Square Error of Approximation) and NFI (Normed fit index). Then SEM was carried out to provide the path coefficients with significance tests (p-value) allowing the stated hypotheses to be verified. The strength of relationships between variables was measured with β -coefficient. Such research methodology ensures the correctness of a given model.

RESEARCH RESULTS

A data validity test showed that all 710 cases (questionnaires) were valid - total reliability was equal to 0.928. Table 3 includes the relevant results particular item's internal consistency by using Cronbach's alpha.

Variable	Cronbach's Alpha
PE	0.945
EE	0.865
SI	0.824
BI	0.889

 Table 3: Data reliability.

Reliability values greater than 0.6 are considered as acceptable in technology acceptance literature (Zhang, Li, and Sun, 2006). All items far exceeded the recommended level (Table 3). The quality of the elaborated model checked via CFA - an integral part of SEM – is showed in Table 4.

Fit indice	Recommended value	Result
χ2/d.f.	<3	2.444
GFI	> 0.8	0.972
CFI	> 0.9	0.989
AGFI	> 0.8	0.955
RMSEA	< 0.08	0.045
NFI	> 0.8	0.981

Table 4: Fit indices of model.

Six measured fit indices satisfied by the elaborated model (Table 4) confirm that model meets the accuracy requirements. Proved model validity with CFA allowed to examine the stated hypotheses through significance tests, where paths with p < 0.05 were accepted (Table 5).

Hypothesis	Path	Standardized	Significance	Verification result
number		β-coefficient	(p)	
H1	PEBI	0.191	< 0.001	Accepted
H2	EEBI	0.253	< 0.001	Accepted
H3	SIBI	0.455	< 0.001	Accepted

Table 5: Hypotheses verification results.

Fig. 1 presents the results of UTAUT model validation in Poland in accordance with the hypotheses' verification results included in Table 5.





DISCUSSION

The study results contained in Table 5 and presented in fig. 2 lead to a few conclusions both from theoretical and practical perspectives. Interpreting at the outset the theoretical

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aspects UTAUT model is valid in polish context for explaining behavioral intention to use technology (BI). All variables in UTAUT directly connected with BI have been confirmed to have a significant influence on BI, as hypotheses H₁, H₂ and H₃ have been confirmed with p-value in each case below 0.001 (Table 5). Moreover β -coefficient for performance expectancy (PE), effort expectancy (EE) and social influence (SI) was always higher than 0.1 (fig. 1), meaning that each independent variable's impact on BI was at least moderate. Such a result is convergent with analyzed study of Alshare and Mousa (2014) who confirmed that all UTAUT variables have significantly impact on the intention to use mobile payment devices in Qatar (Table 1). On the other hand other studies presented in Table 1 that validated UTAUT in various countries, highlighted existence of major differences in technology acceptance factors in respect to classical UTAUT. Therefore study results confirm that culture has important role in explaining behavioral intention to use technology. In some of the countries like Poland, that represents Slavic culture, UTAUT can be directly used to explain technology acceptance. But in most of the cultures it requires significant adaptation as particular variables influence on BI was not confirmed (Table 1) highlighting that additional determinants should exist.

Study results point out also on existence of significant differences in obtained values in respect to UTAUT. First of all the level of technology acceptance explanation (R^2) is 59 percentage (fig. 1) that is lower than given for classical UTUAT – 70 percentage (Venkatesh, Thong and Xu, 2012). Therefore significant differences in this aspect might exist even if all UTAUT connections with BI are confirmed. This can be also interpreted that model should be extended with new variables not existing in UTAUT to achieve similar level in technology explanation. Also strength of particular values was different than in classical UTAUT. In UTAUT validated in Poland the most important factors were SI with β -coefficient having value of 0.46 and EE where beta had a value of 0.26. Performance expectancy had occurred to have quite low impact on BI with β -coefficient of 0.19. In classical UTAUT factors importance was completely opposite, with PE being the key influencer on technology (Venkatesh et al, 2003). Such a result also strengthens conviction that technology acceptance is culture specific. Even the same variables as in UTAUT might be confirmed to influence on BI as in the current study, the strength of their impact might be significantly different. Research results have important implications for practitioners. First of all before designing devices and applications to gain their higher acceptance from users, technology acceptance results should be studied for countries of their offering. If no researches were conducted, dedicated ones should be realized instead of analyzing data included in general models. Secondly, more specifically, study results showed that for polish students the most important factor in accepting m-learning is opinion of other students or faculty members. Therefore m-learning designers should develop and decision makers choose, solutions already having broad community and before implementation carry broad marketing campaigns. Besides, polish students require from m-learning solutions a low effort to learn how to use them. As global producers rather do not want to create a separate software, m-learning applications simplification with basic and advance modes is a solution.

LIMITATIONS

Poland represents Slavic country, but still is one of many. Moreover in a study of Kuciapski (2017) effort expectancy occurred to be not important for polish employees in mobile technologies acceptance for knowledge transfer. As studied country was the same, and technology was similar target group might be also of much importance. Also studied technology might have an impact as Wang et al. (2012) proved that type of product can moderate intention to use particular devices or applications. Therefore similar study should be conducted in other Slavic countries, other technologies and target groups to further verify obtained results. Such a set of studies would allow for full generalization of obtained results.

CONCLUSION

Study results confirmed that general UTAUT model is valid in Poland which is a Slavic countries representative. All existing in UTAUT variables influencing behavioral intention to use technology (BI) as: performance expectancy (PE), effort expectancy (EE) and social influence (SI) occurred to be important determinants explaining m-learning acceptance by polish students. Therefore as a few studies proved only partial validity of UTAUT in various countries, obtained research results strengthen such findings by highlighting that there

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are also countries like Poland, representing Slavic culture where major differences in explaining technology acceptance in relation to UTAUT model do not exist.

From the other side minor but significant differences in obtained results versus the ones in UTAUT exist. UTAUT validated in Poland occurred to explain intention to use technology on significantly lower level than classical one. Also the strength of particular variables impact on BI differed a lot compared to classical UTAUT. PE being the most important influencer in classical UTAUT occurred to be the least important one in Poland. This should be also taken into account by practitioners when designing or choosing m-learning solutions for students. Similar situation exists for SI, where it is the most important factor influencing BI in validated model, and the least important in original UTAUT.

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Digital transformation: panorama and specific issues

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ABSTRACT

Present development of digital technologies, which are also called ICT (Information and Communication Technologies), is undoubtedly one of the most important processes of modern civilization. This development is now defined as a digital transformation, starting as a business process, but also including social and cultural relations and processes. In this way, digital transformation becomes a key civilization process that is necessary to investigate. This paper proposes for this task the use of the idea of a discursive space, which is the articulation of knowledge understood in a constructivist way and which at the same time is the basis of pragmatic activities also of an organizational nature. The discursive space is complex and supervenes on a similar space of facts.. The metareflection plane constructed in this way adapts the idea of complex systems as an appropriate characteristic of the space of facts and discursive space. Thanks to this step, the digital transformation is interpreted as the emergent result of these spaces.

Keywords: management; humanistic management; complexity; digital transformation; discourse; knowledge

INTRODUCTION

The development of digital technologies, which are also called ICT (Information and Communication Technologies) is undoubtedly one of the most important processes of modern civilization. Digital transformation is an attempt to synthetically name this development. Its specificity is based on a relatively mature reflection on historically justified, observable trends and tendencies (Abolhassan, 2017; Bounfour, 2016; Leignel, Ungaro, & Staar, 2016; Matt, Hess, & Benlian, 2015; Schallmo & Williams, 2018; Ustundag & Cevikcan, 2018), and also on the search for new research tools (Gagliardi, 2017; Leodolter, 2017). It is primarily defined as a process concerning enterprises which are extremely intensively subjected to digital modernization, the impact of which

covers all phases of the value creation chain and extends to the environment at every scale. This makes it perceived in a non-trivial way, i.e. in isolation from digital technologies. Inevitably such a process must affect the area of industry, services or enterprises, but it also has a social and cultural dimensions, which allows it to be perceived even as a general civilization process (Maciag, 2016).

On the one hand, this means that setting the limits of digital transformation loses meaning, on the other it causes serious research problems related to its range and complexity. In this situation a new model of reality description is needed, built in a proper research field. This text proposes as such a field an advanced humanistic management, and as this model the idea of a discursive space. Advanced humanistic management adapts methodologies from seemingly distant fields such as humanities and social sciences, and addresses the problem of its epistemological status. This cognitive metaposition allows one to search for new research tools: concepts, structures and methodologies. This broad interpretational path also has its own place in the area of the philosophy of technology (Bijker, 2009, 1987). the construction of the discursive space proposed in this text defines such a path. It is based on the distinction between the reality layer of facts and the layer of discourses describing these facts in the form of knowledge.

In such a model, digital transformation exists in both layers: as a collection of facts and empirical processes and as an analogous collection of discourses that are manifestations of knowledge about these facts and processes. On the other hand, digital transformation as a whole emerges from the discursive layer. It is observed primarily as a concept so an epistemological construct used to describe processes related to facts. This is perfectly demonstrated by the example of the scientific literature regarding digital transformation. The idea of emergence is based on the assumption that both these collections: of facts and the corresponding discourses are complex.

The presented construction of reality consisting of a layer of facts and a layer of discourses constitutes the basis for the further use of the idea of discursive space. It has been used to describe the internet as a complex phenomenon that can only be grasped as a whole at a higher level of abstraction (Maciag, 2017b, 2018). Such a level is provided by knowledge itself, operatively available as a discourse, according to its numerous interpretations (Angermüller, Maingueneau, & Wodak, 2014; Dijk, 2013; Hyland & Paltridge, 2011; Jørgensen & Phillips, 2002). Digital transformation is treated similarly, but it is a phenomenon relatively recently identified at the level of scientific reflection. This is the result of a mature state of digital modernization and the use of ICT perceived from the perspective of their distant and non-trivial effects of various types. These effects are observed in various areas of reality and become the basis for a very diversified scientific reflection.

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RESULTS

Digital transformation is not a simple phenomenon and includes various fields of reality. Attempts to define its dimensions were limited mainly to the field of issues related to business organizations, which is understandable, because they are its main driver in the sense that they finance the development of technology and implement its solutions. However, obviously in the light of the presented literature, the dimensions of digital transformation must be extended to issues exceeding economic and technological areas, i.e. social and humanistic issues. To illustrate this thesis the following set of topics can be proposed as an example: the human person and its subjectivity, social relations and processes, culture. Their comprehensive justification goes beyond the scope of this text, but it is worth recalling the example directions of the explosion of possible considerations.

Showed directions of reflection that the issues of digital transformation can follow are scattered, numerous and far-reaching. As a rule, they are isolated and considered in accordance with a variety of methodologies, disciplined scientifically or colloquial. The presented digital transformation is, in the light of literature and complementary assumptions, a vast conglomeration of various elements. This circumstance, causing distraction and loss, can also be a source of constructive effort. It consists in suspending the ontological qualification of digital transformation as a fact-based being and treating it as a certain abstraction. This paper proposes to locate this abstraction on the level of knowledge represented by discourse.

Digital transformation appears as an emergent effect of the space of discourses and the space of facts, remaining inextricably linked to these foundations, because it is their whole. The idea of complexity can be applied to the analysis of digital transformation, which opens the important path to constructing the digital transformation model. A similar approach has been applied, as mentioned, to the Internet (Maciag, 2017, 2018), and here it has been significantly expanded.

DISCUSSION

Digital transformation

Digital transformation is usually associated with the functioning of the enterprise, so it is located in the area of economics. A very clear definition of digital transformation is provided by Matt et al. who directly connect the phenomenon of new digital technologies with activities undertaken by enterprises: "In recent years, firms in almost all industries have conducted a number of initiatives to explore new digital technologies and to exploit their benefits. This frequently involves transformations of key business operations and affects products and processes, as well as organizational structures and management concepts". It follows the necessity of adopting an appropriate strategy for the digital transformation. At the same time, they point out that changes may exceed the area of the organization itself, but in this thinking these authors do not exceed the limits set by traditional management. The need for a strategic approach, e.g. based on the classic Porter model, is obvious in the light of the arguments cited, but this approach remains still within the organization's environment, even if this environment is significantly expanded.

The attitude that sees the organization as the center of undertaken actions, for example in the perspective of its development, effectiveness, etc. still remain the base of reflection. This is further evident in the four dimensions of the digital transformation strategy adopted by the authors (Matt et al., 2015, p. 340). Because these four dimensions define one process, there is an unquestionable connection between them. In other words, we are dealing with a multidimensional process that requires careful interpretation and management that takes it into account as a whole, which is the strategic approach..

Bounfour defines broader the digital transformation which is it the subject of a book that closes the international research program Information Systems Dynamics (ISD) run from 2010 by CIGREF Foundation. It introduces the concept of digital transformation in a very concise way: "Digital transformation is a new development in the use of digital artifacts, systems and symbols within and around organizations" (Bounfour, 2016, p. 20). However, he emphasizes that the digital transformation should be described in accordance with its noticed dimensions, aspects or themes, the explication of which give Bharadwaj et al. (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013, p. 472). Bounfour gives a list of 7 themes that have become the research basis under the aforementioned ISD program with the enumeration of their operationalized and detailed explications. They strive to expand their research area and include ethical issues, or specific issues such as privacy and public-private opposition.

Digital transformation can also be interpreted in a strong context of industrial technology development, which can take the detailed or general perspective. The first direction is represented by the book edited by Ferri Abolhassan. Abolhassan understands digital transformation as a business phenomenon caused by digitalization, but according to the assumption of the book, the essence of digitization is networking (Abolhassan, 2017 p. v). Maedche et al. present an even more technical attitude (Maedche, vom Brocke, & Hevner, 2017). They don't limit the type of problems and

therefore the fields of applications of digital technology, while trying to rationalize and optimize IT solutions for their best solution from the perspective of the algorithms used like HCI problems (Human Computer Inteface) and other.

Ustundag & Cevikcan (Ustundag & Cevikcan, 2018) and Leignel et al. (Leignel et al., 2016) present a reflection on digital transformation understood as a technological modernization of enterprises but perceived as a process of a general nature. The latter focuses on the development of digital technology, which is a source of serious challenges for organizations that need to develop an appropriate strategy in the IT area.. Ustundag & Cevikcan enter digital transformation into the area of the project entitled Industry 4.0. Salkin et al. remind that the concept *Industry 4.0* "was first declared by German government during Hannover Fair in 2011 as the beginning of the 4th Industrial Revolution" (Salkin, Oner, Ustundag, & Cevikcan, 2018, p. 4). Möller rather combines the idea of *Industry 4.0* with idea of *cyber physical systems*, which are, according to him, a solution characteristic of the aforementioned 4th *industrial revolution* (Möller, 2016, p. 311).

The transition to the area of technology understood as the basis of industry, formed on the idea of historical development of technical inventions, uses the idea of the so-called 4^{th} industrial revolution. The idea of the 4^{th} industrial revolution is a theoretical and descriptive construction: it calls a certain historical period by considering its technological advancement (Schwab, 2017). The idea of this revolution is promoted at one of the largest and most important political and business events, which is the World Economic Forum held at the beginning of each year in Davos. The specific location and the rank of the idea of the 4^{th} industrial revolution obtained at this type of event illustrates its functioning in political and social discourse. This kind of characteristics undoubtedly makes these issues the proper subject under the consideration in the area of the mentioned humanistic management.

Karatzogianni et al. refer to the idea of the public sphere by Jürgen Habermas to capture the social specificity (Habermas, 1989 (1962)). However, the starting point is a very limited range of digital technologies, which rather represent a set of digital media: "computers, the Internet, mobile phone photography, digital art, games" (Karatzogianni, Nguyen, & Serafinelli, 2016, p. 2). They apply the concept of digital transformation to this narrowed collection, trying to answer the questions intensely asked in the field of the critical reflection. Karatzogianni et al. clearly represent the media studies area, however, in accordance with the accepted idea of not limiting the field of research of the phenomenon of digital transformation, as well as reflection on it, it must be admitted that they very broadly and inspirational identify possible research contexts.

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Leodolter presents a specific type of approach to the organization as a subject of digital transformation (Leodolter, 2017). The area of interpretation which is the behavioral psychology and cognitive science decides about the originality of the author's reasoning. It leads to an extremely interesting concept of organization as the so-called hybrid intelligence that arises as a result of human cooperation with the latest technologies. It also allows to identify less obvious and very interesting contexts of digital transformation, which are important from the point of view of this text like society, mass communication, art, medicine, science (Leodolter, 2017, p. 198). Moreover, Leodolter provides arguments for the thesis about the extremely deep nature of digital transformation, presenting it as a fundamental phenomenon that can be considered in the context of such a concept as humankind (Leodolter, 2017, p. 249). Stolterman and Fors, on which Leodolter relies, are also the authors of a significant from the point of view of this text the type of perceiving the digital transformation, which, firstly, has a very wide character, and secondly, it is relatively early because it comes from 2004 (Stolterman & Fors, 2004, p. 689).

Gagliardi presents the highest level of abstraction and generality in the description of digital transformation (Gagliardi, 2017). His approach is purely philosophical and based on Luhman and Batailles thoughts. His idea is that digitality represented by the "digital machine" is the rhetoric entity and its problematics is located far from real technological artefacts. However, this approach allows to place the phenomenon of digitality understood unambiguously as manipulation of information in the context of social and cultural processes.

Digital transformation is also the subject of a very intense interest of agencies such as Deloitte, Strategy & which is a part of the PwC network, Capgemini or Boston Consulting Group which provide important digital transformation studies based on our own statistical surveys. The Massachusetts Institute of Technology Sloan Management Review together with Deloitte conducts a particularly interesting and comprehensive study from 2011.

CONCLUSIONS

Digital transformation, widely described in the literature, is a non-trivial process of large scale and importance, and therefore requires appropriate research tools. This means that the task exceeds the purely empirical level, but requires an epistemological innovation. Such a task can be implemented only in the field of humanities, mainly philosophy, which, however, retains the ability to describe phenomena that are the basis of digital transformation. Such a research field is management using the tools of social research and humanities so-called humanistic management, which goes to the level of epistemological self-reflection.

This paper proposes to accept discourse as the proper space for functioning of the idea of digital transformation. This results from the assumption that discourse is the articulation of knowledge. This step falls within the constructivist trend of understanding it and assumes that such knowledge is of a local and temporal character and doesn't claim the right to objectivity, finality or truth, but it is the basis for the functioning of societies, treated as historical phenomena.

Discourse serves to build the construction of two spaces: discursive and facts, the first of which supervenes on the second, and both of them remain in close mutual relations of top-down and bottom-up causality. At the same time, due to the described properties of both spaces, such as the number of elements, their multidimensional relations of a non-linear nature, openness, dynamics, historicity etc. both of these spaces exhibit the features of complex systems. The assumption is that the knowledge represented by the discourse (discourses) must also be complex. Phenomena such as digital transformation are emergent effects of such systems.

This kind of approach opens up at least two further general research possibilities: first, it raises the problem of knowledge as a discursive phenomenon, which comes with mentioned disadvantages (mainly locality) and advantages (pragmatism). Secondly, this approach in particular puts the problem of language as a material of discourse. This old issue can be interpreted in the new way in the light of the idea of complex systems. Such a circumstance can be an inspiration for both speculative and empirical research.

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Affection as an enabler in capabilities deployment in innovation projects

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ABSTRACT

The unified model of holistic approach to structural and dynamical complexity in projects allows for algorithmization of the demanded capabilities under assumption of unified, maximal affection/willingness to act. The degree of the project success may be defined as a function of capabilities potential matrix. In particular, the capabilities grouped into the role of project manager expose majority (60%) of the required cognitive skills on the two most demanding levels in Bloom Taxonomy.

The willingness to deploy the said capabilities impacts the dynamical complexity in projects. So the capabilities' matrix get to be correlated with individual willingness of each project team member to deploy the possessed capabilities. The willingness of an individual is not uniform: he/she may favour some activities, thus using the capabilities there to higher extend, and may dislike others – with a lower affection.

The willingness to deploy the capabilities is determined by the ones' own value system. Value system is inherited and developed by individual with correlated behavioural paradigm, ethical, trust and governance issues.

The presented considerations of the above factors shall stimulate the audience to reflect on the impact of the willingness to act on a project fate.

Keywords: Dynamic project complexity, structural project complexity, generic model of complexity TOHE Model, TCI Model, Innovative Engagement, Motivational Factors Inventory, Qualitative Research.

INTRODUCTION: A CHALLENGE OF THE COMPLEXITY IN PROJECTS

Neil Johnson (Johnson 2009) defined the complexity as a phenomenon of a set of interactive, affecting each other elements. In the world of algorithms Kolmogorov (Kolmogorov 1965) defined complexity as a minimal number of quantifiable resources, needed to specify an object. Gell-Mann (Gell-Mann 1994) generalized the complexity, expressed by the length of its description, as an opposite to two extremes: very short description of perfectly ordered systems on one side and equally short description of chaos. The last, as seen by Weaver (Weaver 1948) is a large number of mutually affecting each other elements without any correlation. So Gell-Mann complex systems are sets of mutually affecting each other elements and the relations, which describe this affectation and are positioned somewhere in-between the perfect order and chaos.

In a project, the complexity of its deliverables and project results is in most cases related to the static structure of the mutually each other affecting elements (Marquardt 2009). The dynamic behaviors are modelled usually by identifying certain sub-sets of elements and limiting the affectations to the elements in the sub-set and then to the impact of the sub-sets on each other. This approach has been used by Assan (Assan et al. 2013) and Ninck (Ninck 2014) in the decomposition of the organizational structures of complex projects. Geraldi (. Geraldi et al. 2011), Davies and Brady (Davies and Brady 2000), and others, use the term of a structural project complexity for both project results/deliverables and the organizational complexity. Bosch-Rekveldt (Bosch-Rekveldt et al. 2011) developed a TOE model unifying the project results/deliverables (Technics, T)) and organization (O) with an environment (E).

However, projects are managed by humans. El-Sabaa (El-Sabaa 2001) identified the human factor as a main reason of failure (85%) in the analyzed 126 projects. A human, working in a project, is in himself an open system with a very high degree of the cognitive and behavioral complexity. In view of the above considerations, the predictability that the sub-sets with human involvement reach predefined states and their affection on other sub-sets in a system can be deterministic, are limited to the probability and another factor which impacts the project complexity: the time dimension (Ramezani 2012). Decomposition in subsystems reduces this complexity, yet does not makes projects deterministic: they are characterized still by the unlimited number of terminal states, which can be reached also with certain probability only. Whereas states' space can be repeatedly used allowing for learning and optimization, time is a unique and never repeatable variable. Human factor determines the reachability of certain states over the time, thus dynamic complexity in a project. Nevertheless

Bousquet (Bousquet 2009) suggests, that a short term predictability is feasible, thus it makes still some sense to attempt certain planning in projects.

Yet, a notion of probability of sudden unexpected system behavior, which might lead to a major human life hazards, e.g. through erroneous decisions of coupled IoT control systems. The conclusions of Waldrop (Waldrop 1992), Prigogine (Prigogine 1979), that the complex systems are non-deterministic, holds true today, even more than ever. Stewart (Stewart 2002) proved that the predictability in complex systems is limited to the probability of the adoption of a certain state because of the phenomenon of the fortuity (attributed to Lorenz butterfly effect: A flap of wings by a butterfly in India cause two years later a tornado in Texas, USA, (Curlee and Gordon 2011, Taleb 201)).

RESEARCH METHODOLOGY

Basing on Brooks paradigm (Brooks 1975), that complexity may be treated only by conceptual integrity, attention is given to functionalist theories, which consider society as a whole, and each part of it as contributing to the stability, in the case of projects – to the success of an endeavor, rather than towards meticulous nomothetic and ideographic methodologies that are dedicated to individuals. The basic epistemological assumption is that the practice-based development and survey feedbacks provide justified hints, where to handle in projects. Ontological expressis verbis that the reality is equivocal to theoretical considerations but grounded in terms of language, history and culture came from Klenke (Klenke 2008). Woolcott (Woolcott 2002) considered this approach to be the core of qualitative research.

The interpretive non-categorical approach allows us to formulate the research question as follows (Thorne et al. 1997):

Can complexity of a project be systematically analyzed and, avoiding any simplification, through this analysis comprehensively treated, thus increasing the probability of successful delivery of the project objectives?

The pragmatic paradigm that has been established for our research is as follows:

By applying the system decomposition, complete identification of the capabilities needed on one side and available on the other side, and recurrent processes bound in cybernetic approach to project management, the complexity of the project may be consciously managed, leading to higher efficiency in handling dynamical complexity, thus increasing the chances of project success.

Based on the above, the following research steps were performed:

- 1) Do systematic literature survey
- 2) Identify the key complexity components in a project
- 3) Elaborate the comprehensive mathematical model of factors to handle the complexity
- *4) Design the processes and atomize the single actions to identify the capabilities needed to perform them.*
- 5) Elaborate the procedure to identify the gap between the needed and available capabilities
- 6) Elaborate the comprehensive model of complexity handling in dynamic developments
- 7) Draw conclusions
- 8) Formulate further research areas

With this approach, we provide ontologically, epistemologically and methodologically congruent standards for our research (Klenke 2008).

LITERATURE SURVEY METHODOLOGY

A systematic literature review (SLR) of the project management covered theories, survey results and best practice advices (Kitchenham et al. 2009). A useful overviews are provided by Baccarini (Baccarini 1996), or Ameen and Jacob (Ameen and Jacob 2010). Comprehensive overview of the models and measures of complexity may be found in Vidal (Vidal et al. 2007). Iconic considerations about the modelling of dynamics of chaos may be found in May (May 1976). Rescher

(Rescher 1998) formulated a philosophical overview. Weaver evaluated qualitatively various approaches to complexity in projects (Weaver 2007). Canadian Government went one step further formulating heuristically the complexity and risk criteria and providing and assessment tool for project managers (Canada 2017).

The research question focuses on "What?" and "How?" purposely leaving out the causal and conditional "Why?" for further research (Meredith 1988). No claim of completeness nor orthogonality is made in this paper.

The criteria that were applied in the SLR focused on the following issues:

a) Is there one theory or practice that identifies and approaches the complexity issue in project realization?

b) What are the key success factors in project complexity handling named by other researchers?

c) Are there any measures in complexity or risk assessment as a consequence of a complexity?

In the assessment of the contents, priority was given to content intention over pure semantics. Excluded are issues of the impact of gender and cultural heritage.

GENERIC MODEL OF COMPLEXITY HANDLING IN ICT PROJECTS

In alignment with Brooks' conceptual integrity paradigm (Brooks 1975) first the holistic model of a project is developed and subsequently the project management approach suitable to handle the project dynamics is conceived.

Taking the above under considerations, the Bosh-Rekveldt TOE framework (Bosh-Rekveldt 2011) is extended with a Human Factor, acting through the Organization onto the Technics and subduing to the environmental impact as shown in Figure 1. Hassan and Kahane (Hassan and Kahane 2005) claim that Human Factor is the key driving element beyond the dynamical project, as without its interaction with other TOE-elements, the last would remain in stable equilibrium, despite their structural complexity prerequisites of change.

The model of Lyneis and Ford (Lyneis and Ford 2007) sees project as a set of resources and processes (unfortunately named as project properties) augmented with mental models and the

decision process of the project manager. The last considered by the author as the key interacting elements in dynamical complexity of a project.

Human interact as an individual in a team which again is placed in a context of the environment. This interaction is reflected in a Team Centered Interaction TCI model of Cohn (1975, 2009).

In this model focus of personal orientation is either on personal topics ("I" or "Individual"), on interaction with others ("We-Team") or on common goal ("Output"). The environment (the "World" in the TCI model of Cohen) is taken under considerations in closest as well as in broad meaning into account, while considering each of the perspectives. There is certain impact of thinking: while focusing on "I" we influence our "We-Team" thinking, "We-Team" thinking leads to common goal focusing ("Output") and goal oriented thinking influence back our egocentric orientation. Output is placed within the technology (even if it concern services or organizational issues). The resulting complete structure, which evolves from dynamical complexity relationship presented in Figure 1 is depicted in Figure 2 with the other, later in the following chapter explained elements.

The decomposition criteria follows the proximity of the (sub-) system attributes (Ninck 2014, Pena et a. 2012). Parsimonious assumptions distinguish the following subsystems:

Determining the structural complexity

- T: Technology = raw material and tools handled in technological processes in order to achieve the goals and producing Output(embedded).
- O: Organizational processes to handle the technological processes and constrains towards the efficiency. To avoid any confusion with the Output the procedural P nature here is later exposed.
- E: Environment, viewed by Bosh-Rekveldt as strictly procedural relations.



Figure 1: Structural TOE amd dynamical TOHE complexity in projects extended with:

- H: Human active team members contributing in project, wich following the TCI-Modell are composed of the (sub-)systems determining the dynamical complexity:
- I: an Individual, who is the decision maker. The human being is further assumed, yet the Industry4.0 and the internet of things compete in this subsystem with machine taken decisions.
- W: We-Team, which delegate the process execution to an individual and empowers his performance
- E: Environment, is extended in its dynamics by all stakeholders beyond the We-Team and the interaction imposed on them. Here several further subsystems may be distinguished: e.g. Sponsor of the endeavor or in other words Purchaser of the Goal Results; Hosting organization of the endeavor (usually a company); Society with its cultural impact on the individual, We-Team and the Environment stakeholders.

As an Output we define a singular object which demands specific and unique technology (raw materials and tools), technological processes, organizational processes, individual to perform, a minimal we-team to assure the completeness, and all conditioned by an impact of the environment (which may be positive or negative).

As each of these (sub-)systems is in itself a system of next decomposition subsystems we deal here with the system of systems. Figure 2 illustrate this model.

ANALYTICAL MODEL OF CAPABILITIES REQUIRED TO HANDLE THE COMPLEXITY

Each Team Member interact on all levels with his capabilities and abilities. Variety of the capabilities is described by w_i , where i is an index depicting the layer, to which the capability belongs. Capability on w_i , level is needed to perform the action directly, which impacts the elements of the inner layer leading to the transformation of this (sub-) system:

- w_T = width of the Technology handling capabilities (technological processes to transform the raw material into desired output using available tools under imposed constrains)
- $w_{P(O)}$ = width of the Process handling capabilities (organisational processes to handle the technological processes using available tools under imposed constrains)
- w_{I} = width of the Individual handling capabilities (needed to handle the organizational processes in social interaction using suitable tools under imposed constrains)
- w_w = width of the We-Team handling capabilities (needed to assure the proper interaction as a team with the environment under imposed constrains)
- w_E = width of the Environment handling capabilities (needed to interact with the stakeholders not directly participating in the Output production under imposed constrains).

So the impact on the capabilities is top-down. Higher level cannot deliver the capabilities to handle the requirements of a specific action of the lower (inner level), however, may impact its' performance through the restrictions and tools made available.

Capabilities of all team members jointly build the project team capabilities to handle the project.

The varying level of capabilities is expressed by the maturity levels, correspondingly:

- m_{T} = maturity level of the Technology handling capabilities
- m_{P} = maturity level of the Process handling capabilities
- m_{I} = maturity level of the Individual handling capabilities

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 m_w = maturity level of the We-Team handling capabilities

 m_E = maturity level of the Environment handling capabilities



Figure 2: Complexity capability handling model

The capabilities to perform a given task results from the interaction of the three domains (Bloom 1984):

- Cognitive (ability to process and utilize in a meaningful way)
- Affective (attitudes and feelings related to the subject action, engagement, motivation)
- Psychomotor (manipulative and physical skills, called aptitude, too)

Ion and Brand (Ion and Brand 2009) generalized later these three dimensions as:

- the Capabilities and/or Potential (which Bloom narrowed to cognitive abilities)
- the Willingness and/or Courage to act (corresponds to affective domain)
- the Feasibility to act (which extends beyond the psychomotor individual aspect).

However, taking under considerations the individually conditioned aspects of the capabilities, the Bloom definition seems to reflect better the distinguishing issues of each project team member. Therefore, Bloom classification is further followed. Thus capabilities are:

$$w_i = Cognitition*Affection*Psychomotor$$
(1)

Maturity level assessment shall be also a combination of the three domains.

$$m_i = m_i \text{ (Cognitition)}^* m_i \text{ (Affection)}^* m_i \text{ (Psychomotor)}$$
 (2)

We notice, that the psychomotor and positive (towards output's delivery) affective skills are enabling conditions for decisions execution. Decisions are the results of the cognitive skills and are categorical requirements for any meaningful action.

Under assumptions, that:

- 1. The Affection is satisfactory to perform without restrictions the action, which demands particular skill: mi (Affection)=1, where 1 means 100% fulfilment of the demanded maturity, and same, and,
- 2. The psychomotor abilities are sufficient to perform without restrictions the action, which demands particular skill: mi (Psychomotor)=1, where 1 means 100% fulfilment of the demanded maturity as above, we may focus on cognitive capabilities width and their maturity wi = wi (Cognition) and mi = mi (Cognition) and adopt the Bloom's taxonomy may be adopted in maturity level evaluation (Bloom 1984):
 - 1. Knowledge: Basic recall of facts and data: times, dates, names, formulas, etc.
 - Comprehension: Not just knowing the salient data associated with a concept, but also articulating relationships among data – to grasp the chief meaning of a concept.
 - 3. Application: Taking a concept under study and using it in a new or hypothetical situation to arrive at a correct answer.

- 4. Analysis: Breaking something into component parts looking at individual items for trends or evidence for generalization.
- 5. Synthesis:Presenting items or thoughts together in new ways, based on a presented criteria.
- 6. Evaluation: Arguing for the validity or relative worth of a viewpoint or process.

The level 2 (comprehension) assumes that the person is capable to act on the level 1 (knowledge). The capability to evaluate (level 6) assumes the possession of all lower level cognitive capabilities (Whiteley 2006). Knowledge, comprehension, and application are considered to reflect lower-order maturity, whereas analysis, synthesis, and evaluation are considered to reflect higher-order maturity. Higher-order maturity is much more difficult to achieve than lower-order maturity, since higher-order reflects critical thinking, which requires one to go beyond just the basic facts, understanding, and application, and to use reasoned thinking to gain the insight required to deal with the situation.

Pinkowska (Pinkowska 2012) analyzed the capabilities of project manager in the area of human factors. This corresponds to the layers I Individual (Self-Management process), W We-Team and E Environment (processes: Human Resource Management, Team Management, Conflict Management, Communication and Leadership). According to Pinkowska 40% (n = 10) of the cognitive skills are on the most challenging level 6 of Bloom's taxonomy, followed by 20% (n = 5) of skills on the level 5. This means that the capabilities of the project manager only in these three layers are a highly demanding, intellectual issue, involving high level thinking activities.

The capabilities, tools and constrains are temporal. So e.g.: w_i (TM A)_t = width of the Technology handling capabilities of Team Member A (TM A) at the time t.

Similar temporal properties expose the maturity level of any Team Member (here e.g. TM X): m_i (TM X) $_t$ = maturity of the i-layer handling capabilities of Team Member X (TM X, X=Variable) at the time t.

An individual Team Member X capabilities are sum of his capabilities on all i-levels. Yet, first their maturity decides about the potential (PTM X), carried by each Team Member. Assuming at first the independence between the layers with respects to the width of any layer capability and the maturity, we achieve the capabilities potential matrix [CTM X] of the Team Member X at the time t:

Affection as an enabler in capabilities deployment in innovation projects

$$[CTM X]_{t} = [\Sigma L (w_{i} * m_{i})]_{t}$$
(3)

The development potential over time t is conditioned by the capability potential matrix [CTM X] of the Team Member X, the tools T he may use and restrictions imposed on him:

$$[CTM X]_{t+1} = f([CTM X]_t, tools, restrictions)$$
(4)

Over the overall duration of the project we conclude, that final capabilities potential matrix [CTM X] is an integral:

$$[CTM X] = \int f ([CTM X]_t, \text{ tools, restrictions})dt$$
(5)

Sum of all capabilities over the project duration of all Team Members, under restriction of right sum of capabilities at the right time, when they are needed, applied to raw material impacted by the available financial resources, decides about the achievement of the project objectives. Financial resources may be made available also by the project Team Members themselves: e.g. in voluntary non-profit projects.

Degree of the project success =

 $Min_{Finances}[\int (raw material \cap \Sigma I [CTM X] \cap available financial resources) dt | t] (6)$

We reach success in a project (binary variable), when:

IF ((Degree of the project success \geq Objective target values @ desired quality) |_t)

THEN Success IS TRUE

Daft (Daft 2009) confirmed the Stewart (Stewart 2002), by stating that project success is determined by the effectiveness of its organization, which is measured by the degree to which an organization achieves its goals, whereas El-Sabaa (El-Saaba 2001), made it depending on the people who work on it.

AFFECTION AS AN INNOVATION ENABLER

In the generic model above the affection is considered ans available (w) and sufficient (m) to deliver the work of a team member.

We notice that whereas cognition and psychomotor capabilities are more or less equally distributed in the humanity, affection may decide about the final result of innovative behaviour in a team.

Further, the maturity in cognition is an issue of the educational system, maturity in psychomotor may be trained.

In this chapter some considerations are given to the affection: What do condition the affection not to be available (w) and not being deployed (m <100%)?

Affection is defined as an overall of attitudes and feelings related to the subject actions, engagement and motivation.

Sidgwick (Sidgwick 1874/2015) defined the affection in the ethics early-modern sense, as covering all pro and contra attitudes: desires, approval, likings, but also disapprovals, dislikings an so on.

[62] Modern approach es like that of e.g. Floyd (Floyd 2015) refer to Descartes, Spinoza and early brithish ethical writers in defining the affection as basically positive emotional disposition, that is externally directed and which bore a resemblance to passion, but is free of its sensuous elements and volatile nature. In Plutchik (Plutchik 1991) wheel of emotions this positively biased affection ranges from vigilance, anticipation, interest, ecstasy and admiration through joy, trust, acceptace, up to the serenity. The degree to which the affection is available for the deployment of the cognitive abilities is influenced by three factors (Bowlby 1958; Mitchell 2014, Holmes 2002):

- Inherited and Early Life Experience
- Culture, Values in particular
- Extrinsic Motivation

Modern neuroscience identifies the personality development in the womb as impact of the nutrition and stress hormons of mother on gens of a child. Upon the birth not all synapses are fully interconnected. The attitude of mother in the first three months influence the development of the trust and attachment resulting in the development of the G-Oxitocin receptors, responsible not only for the

empathy, trust, self-confidence and cognition but as a result – successful behaviour in the educational and later professional environement, thus impacting firstly the affection as defined above and secondary the maturity level, in which this affection is available.

In professional environment hardly an impact may be taken on the prenatal and early life stage. It starts with the culture and values. The innovation drive in the behaviour is determined by attitude, originating from the personal values, ("Acting" in the Circular Schwartz model (Cieciuch and Schwartz 2014)). These in turn, results from the group values, developed and maintained by the group culture (Da Deppo 2015). So it is the group culture which impacts the affection and thus innovative behaviour. Certain, however limited, influence may be exercised in this area (Figure 3).



Figure 3: Cultural impact on affection and innovation drive

Motivation is the factor with the highest impact possibility in professional innovation process. Michalik (Michalik 2003) aggregated the innovative engagement in innovative personality, which includes work engagement, determined by the affection, on one side and an innovative environment on the other side. Jointly they are leading through the extrinsic motivators, innovative atmosphere and the barriers of innovative engagement, like unwillingness (missing affection) to innovative engagement (Figure 4).

In the Swiss ICT survey research (Seiler 2012) task, team, and resource related aspects were the most important content and procedural motivational factors. Distinguishing the sub-dimension in the inventory, Clear task, goals and results (content factors) have the highest impact on motivation (5.26 on a Lickert scale 0-6), followed by procedural factor Team (subcluster of interpersonal, 5.07) then the remaining interpersonal relations (Environment), resources (innovative environment in Michalik (2003) and further procedural factors. This indicates high impact of extrinsic motivators on affection, thus handling options for managers.



Figure 4: Complexity capability handling model

CONCLUSIONS

We may develop the algorithms the mathematical models for cognitive capabilities, useful in development of the artificial intelligence in innovation and project management, yet the human factor, expressed in the dynamical model, will dominate the project fate still for generations. Whether someone will acuire the desired level of maturity in demanded capabilities is conditioned by his affection towards the project goals. Affection thus impacts the innovation drive. The prenatal und early life stage factors can be influenced only to certain degree by the society – only indirectly over the mother's situation and behavior towards saugling.

Our handling options begun with the cultural heritage of a group, to which the innovator belongs. The group values, internalized as personal attitude impacts the affection towards goals, exposed in innovative behavior.

The highest impact on someone's affection is achieved by the extrinsic motivation. Here the goal (to recall: affection is externally directed) and interactions within the team are the most motivating factors, followed by futher procedural - thus influenced by the superior and the environment – factors.

ACKNOWLEDGMENT

Author expresses his gratitude to the Chairwoman of the conference have made the work on this manuscript inspiring.

The effort and contribution of the reviewers towards quality improvement of this paper is respectfully acknowledged.

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Forth Industrial Revolution (4IR): digital disruption of cyber-physical systems

by

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When talking about Fourth Industrial Revolution (4IR) we stand on the brink of yet another technological revolution, that within its almost unprecedented scale and scope, as well as exponential pace of emerging disruptive changes (innovations), will fundamentally change the way we live, work and relate to one another. While second industrial revolution focused mainly on the automation of mass production based on electric power, gas and oil (industrial economy based on production of mostly industrial, tangible goods), the third informationcommunication revolution, described also in terms of digital revolution, brought forth the transition from analogue, electronic and mechanical to digital, network technology (postindustrial, digital economy based on the production of cognitive, intangible goods). To compare, Forth Industrial Revolution is characterized mainly by further integration (fusion) of technologies, collectively referred to as cyber-physical systems, representing new ways in which technology becomes embedded not only within the society, economy and culture, but also within human body and mind (convergence of humans and the machines). With Forth Industrial Revolution as a leading theme of 2016 World Economic Forum, Klaus Schwab [2017] the executive chairman of the WEF associated it with the "second machine age", referring to famous book of E. Brynjolfsson and A.McAfee [2014], in terms of the effects of digitization and artificial intelligence on the global economy along with a broader role for advances in bio- technologies. Bringing forth integration of technology innovations emerging in number of fields including robotics, quantum computing, artificial intelligence, 5 G wireless technologies, additive manufacturing (3 D printing), fully autonomous cars, nanoand bio- technology, Internet of Things IoT, it almost force us to "win the race between the growing power of the technology, and the growing wisdom with which we manage it" [Tegmark 2017].¹

¹ In his book *Life 3.0: being human in the age of artificial intelligence*, Max Tegmark focuses strongly on the phenomena of artificial intelligence and its impact upon all spheres of human life, using the web metaphor (1.0, 2,0, 3,0) in refers to different stages of human life since its inception: with Life 1.0 referring to biological origins, Life 2.0 referring to cultural developments in humanity, and Life 3.0 referring to the technological age of humans. With the description of current stages of development of AI like technological unemployment, self-driving cars, Deep Mind and Open AI, he brings range of possible futures that

Described dynamics of constantly progressing technological changes applies in particular to the concept of radical technological breakthrough or disruptive innovations, which J. Schumpeter (1934) wrote about that they have the power of "creative destruction",² destabilizing both the economical, social and cultural operational modes, strategies, or institutions ("a perennial gale of creative destruction .. from the inside constantly destroying the old and creating the new"). According to Toffler [1970], the accelerative curve of information-knowledge acquisition, fuelled by new technologies, impacts ever increasing pressure of 'rapid changes', bringing forth "future shock" along growing sense of uncertainty and impermanence, reflected in the way we relate to people, things, values and ideas. When imposing such an increasing pace of overlapping, 'rapid changes' on growing complexity and interdependence of the contemporary world (dynamic and turbulent global environment), we come across the area of "perfect storm" : convergence (interference) of intersecting waves of change and innovation, creating turbulent conditions with a high level of instability and unpredictability. Depicted character of disruptive changes (innovations) can generally be related to three main megatrends of digital revolution, fully discussed by Wierzbicki (2000) the technical megatrend of digital integration (technological convergence), socio-economical megatrend of digital integration (interconnected conditions based on the complex requirements of Network connections), and last but not least the cultural and cognitive megatrend (based on digital culture and communication, fundamental change in the way we perceive and relate to the world).³ Toffler underlines, that the acceleration of change(s) in our time is, itself, an elemental force, that has both the personal and psychological (individual) as well as sociological, economical and cultural (collective) consequences, thus leading to 'future shock' : shattering stress and disorientation induce upon individuals by subjecting them to too much (too rapid) change in too short a time, or massive adaptational breakdown

feature convergence of humans and intelligent machines, in both positive (Friendly AI) and negative (AI Apocalypse) scen arios.

² The theme of disruptive innovation or "creative destruction" as well as their impact on economy described by J.A. Schumpteter (1934, 1939, 1960) - "a perennial gale of creative destruction" as an immanent trait of capitalism- presents itself differently within contemporary post-modern world in refers to the original conception, underlying mainly the disruptive results (on-going innovations in technology) and discontinuous, yet systemic character of the process (innovation systems), based on the networks and open innovations (cooperation and exchange) , more : E. G. Carayannis, J.E. Spillan, Ch. Ziemnowicz (2007), Wierzbicki (2000)

³ The introduced concept of megatrend(s) is defined slightly different than the original definition of J. Naisbit (1982) referring to the megatrends as new directions - according to Wierzbicki (2000, 2015) this third (intellectual and/or cultural) megatrend brings the greatest challenge(s) of conceptual revolution - the process of destruction of old episteme, resulted in a divergent development of differing epistemai of three cultural spheres (technical sciences : more pragmatic then paradigmatic epistemai, natural 'hard' sciences more paradigmatic (Khun 1962) and 'soft' social sciences & humanities epistemai), in other words the paradigm shift (Tapscott, Caston 1993)

on the side of the collective. As such, concept of "future shock", and the theory of adaptation that derives from it, strongly suggests balance, not merely between rates of change within different spheres or sectors, but rather between the pace of environmental change and the limited pace of human response (potential). As a result, technology itself becomes the driving force with unprecedented scale and scope, and almost exponential growth, disrupting (simultaneously) economic, social, political and cultural sphere(s) with the depth of the changes, that transforms the entire system of production, management, governance, as well as social and cultural relations (introducing trans-humanism : convergence of humans and the machines).

In literature, transition from second to third industrial revolution refers mainly to the classical paradigm (concept) of industrial labour, emphasising the transition from the traditional fordist to post-fordist modalities of labour as a result of fundamental, structural transformation within the economy, described previously by D. Ricardo or J. M. Keynes in the context of industrial capitalism, or more recently by D. Bell (1973) in terms of postindustrial society, A. Toffler (1980) third-wave civilization, J. Rifkin (2011) third industrial revolution or global episteme by Kumon and Yamanouchi (2008). From the point view of the economy, its defined by transition from the industrial economy (production of material, tangible goods) based on the economy of scale (mass production and mass consumption; manufacturer's market) into the post-industrial economy (defined in terms of informational or digital economy, knowledge-based economy, or creative economy) - personalized production and consumption (castomerisation) based on the production of mostly cognitive, intangible goods (information, knowledge, culture: symbolic goods). We could also described it in terms of paradigm shift, referred by Manuel Castells [2010] in terms of information society, associated primarily with, moving for the first time, beyond the physical limitations of 'time and space'- transition from "space of places" (territorial contiguity) to "space of flows", in which physical space is partly replaced, partly extended by space of communication : symbolic and virtual. As a result, access to goods and services, as well as knowledge and information, is almost immediate, available (open access) for all 'here and now' in the digital space "through streams and flows nodes". That simply means the development of new ICT technologies radically transformed the spatiality of social interaction by introducing the phenomena of simultaneity or any chosen time frame in social practices, regardless of the location of the actors engaged in the process. Thus moving the whole civilisation from the previous 'space of places', where physical space become the significant barrier limiting development, mainly because that access to goods and services, as well as information or knowledge was limited in time and space (in large part distributed in local communities, and accumulated in the urban space) to the current 'space of flows', where within a global network of communication, the access to goods and services or information and knowledge is almost immediate (instant, interactive and synchronic), and open access, taking place in 'timeless time' within the 'virtual space through streams and flows'.⁴

Coming to the transition from the third to fourth industrial revolution we require emergence of new paradigm (concept) of digital labour (immaterial labour 2.0) as a result of fundamental changes within technology, using web metaphor (1.0, 2.0, 3.0 or 4.0) indicating the world after the information and communications revolution [Patel 2013]. Third Industrial Revolution underlines the progressive process of digitalisation of economic, social and cultural sphere as a result of fundamental (disruptive) changes within technology itself (digital revolution), imposing constant transition (moving 'in between') two different environments simultaneously: the physical environment, embedded in real space and time continuum, and digital environment of 'virtual reality', embedded in virtual time and space (timeless time and space of flows; Castells 2007). The new paradigm of network society (or informational society) introduces quite a new categories for the analysis of labour relations 'in between': human- tool- object (described in research trend STS science-technology studies, exploring the relations between science-technology-society), underlined in the theory of actor-network ATN (Latour 2005, 2010), as well as new science of networks (Barabási 2002 studies of social networks, multi-agent system analysis, including research on algorithms and artificial intelligence or technology cooperation networks ; Reingholt 2000). This new paradigm, focuses mainly on the dynamics of the relations 'in between' objects, ideas, processes as well as actors, or rather actants (expanding the definition of human actors with the categories of nonhuman: tools, technologies or objects), both in the context of the individual and collective. This new description of relations, based on new concepts: translation, transformation, or binding, launch new areas of study (tension) in between: the real, physical and symbolic, digital (environment, organization or identity), as well as in between humans and non-humans : machines, new technologies (algorithms or AI artificial intelligence). In the context of the

⁴ This new form of spatiality, defined by M. Castells as the space of flows: material support of simultaneous social practices communicated at a distance, embrace both the transmission and processing of flows of information or culture (symbolic goods) as well as the connectivity of activities located in the local nodes of global communication networks. As such the key feature of the networked connection is the relation, or rather increasing tension, between the local and the global (glocal) : micro-network of the high-level decision-making process, based on the face-to-face relations (space of places) linked to a macro-network of decision implementation, based on global digital communication networks (space of flows) - Castells (2010 : 37-38)
digital economy, or using the Latour's terms techno-human collectives (networks), arises the dilemma of effective investment in network development : in whom to invest more: the employee (human) or technologies (machines). Within the context of increasing 'human gap', we could find more and more hybrid models or solutions, which attempt to combine subjectivity or agency of human (actors) and non humans (in a concept of co-agency), which applies not only to digital networks, but in general to cooperative networks in which we participate alongside the inhuman(s), creating techno human collectives, where human(s) and nonhuman(s) form a symbiotic system engaged in the process of learning (Levy and Murnane 2004, Hirschhorn 1986, Rotman 2013).

Fourth Industrial Revolution brings forth further integration (convergence or fusion) of technologies, collectively referred to as cyber-physical systems, to become fully embedded within the societies, economy, politics and humans, thus blurring the boundaries 'in between' physical, digital, and biological spheres [IEEE 2008, Lee 2008]. With new disruptive innovations rapidly emerging, to start with the internet, social networks, mobile platforms, advanced analytics, big data, cloud computing and the artificial intelligence- the increasing convergence of social media, mobile devices, analytics, and cloud computing (SMAC) have combined to create a new technology system (environment), that supports disruptive and sustaining innovation [Cornelius 2013].⁵ Thanks to the Internet, sensors and embedded systems, completely new environment is opening up for convergence of physical, mechanical, mental and digital work with the latest phase of so called 'Pervasive Computing', based on progressive integration of Information Technology (IT) and Operational Technology (OT). This is the convergence of two historically independent, economical developments: advanced of Information Technology (Business Process Automation & Office Automation) with predictive data analytics, smartphones and traditional administrative automation, and Operational Technology (Industrial Process Automation & Factory Automation) industrial machinery and automation designed and developed since the start of the industrial revolution [Gartner 2011, Sogeti VINT 2014]. This integration results in further industrial development

⁵ SMAC (social, mobile, analytics and cloud) is the new concept, in management studies, based on the convergence of four technologies (social media. mobile devices, analytics and cloud computing) that creates the ecosystem supporting disruptive and sustaining innovation(s). While each of the four technologies can affect a business individually, their convergence is proving to be a disruptive force that is transforming industries and creating entirely new business models, enabler for the next generation of technological trends. That's not the only term describing this phenomenon, Aberdeen Group, came up with the term "SoMoClo" (social media, mobile technology and cloud computing), Gartner described it as the "nexus of forces," consisting of social media, mobile technology, cloud computing and information, International Data Corporation (IDC) as "the third platform." a combination of "technology enablers that allow businesses to accelerate their digital transformation" [Cornelius 2013]

on the basis of end to-end automation, based on the triple paradigm/profit : machine-tomachine communication (M2M) not only between machines in factories but also between all conceivable devices and systems (reduction of human work with increase in efficiency and security), predictive Maintenance of machines and appliances on the basis of direct status reports with possible upgrades and remote repairs (extra reliability/ quality upgrade and speed to numerous appliances/adjust in response to routine maintenance schedules, considerable cost reduction) and engagement or improved human to machine interaction (H2M) via consumers' products usage (sharing user data with appliances to create new value and shape/improve service quality). To understand more the phenomena of cyber-physical systems, we can describe it from the point view of the relations 'in between' humans and their artefacts (tools. objects. technologies) based on human-to-machine (H2M) chain/network/relation, that include communication of both: machine to-machine (M2M), and machine-to-human (M2H).⁶ In this way the convergence of prescribed IT and OT suddenly becomes the marriage (fusion) of Information Technology (Human and "White collar") and Operational Technology (Machine and "Blue collar"), or in other words IT OT Integration (blue and white collar collaboration) [Gartner 2011, Sogeti VINT 2014]. Full introduction of the prescribed convergence demands attention and knowledge from various disciplines, ranging from connectivity, infrastructure, standardization, work processes and risk management to human resources and marketing with new vocabulary employed, besides (classical) B2B and B2C we address more to M2M, H2M and/or E2E (end-to-end) as a necessary link for digital transformation (disruption). The end result of this process in the Internet of Things (IoT), where everything will eventually be connected to everything else, from design to maintenance, upgrade and reuse, producers, service providers and customers, the real manufacturing world and digital world of connectivity and cognitive thinking, humans and the machines [McKinsey Quarterly 2010, 2013; Philips 2014].

⁶ When talking about Fourth Industrial Revolution, based on convergence of technologies, collectively referred to as cyberphysical systems, described in terms *human-to-machine* (H2M) chain/network/relation [that include communication of both: machine to-machine (M2M)& machine-to-human (M2H)], we can observe two general trends emerging (as an ethical question) 1. cyborgization of humans (so called 'human enhancement': mechanization of the human body (prosthesis, implants) as well as broad 'culturalization' of brain computer interface (BCI) as the progressive, transformative path for humanity ; 2. humanization of the machines (discussion about E-personality to be given to advanced robots, or first granted citizenship for Sophia in Saudi Arabia). As such, with Fourth Industrial Revolution we witness transhumanism movement emerging within public and scientific discourse, rising as a strong political power, with Google's chief engineer Ray Kurzweil founder of Singularity University, Nick Bostrom and David Pearce initiating World Transhumanist Association (WTA) and Transhumanist Declaration(2002), and Nick Bostrom, head of the "Future of Humanity Institute" at the Oxford faculty of philosophy [Benedicter 2015]

At the forefront of described digital transformation, based on cyber physical systems, is the Industry 4.0, generally regarded as the Fourth stage of Industrial Revolution [Schumacher, Erolb, Sihn 2016]. Industry 4.0 refers to recent technological advances where the internet and supporting technologies (embedded systems) serve as a framework to integrate physical objects, human actors, intelligent machines, production lines and processes across organizational boundaries to form a new kind of intelligent, networked and agile value chain. According to Helmuth Ludwig, CEO of North American industrial branch of Siemens, "this is nothing less than a paradigm shift in industry: the real manufacturing world is converging with the digital manufacturing world to enable organizations to digitally plan and project the entire lifecycle of products and production facilities". If we look at the ongoing Industrial Revolution from the cyber-physical Internet perspective, four steps come into view: web 1.0 (read only, company focus, connected information, home page), web 2.0 (read-write, community focus, connected people, blogs and wikis), web 3.0 (read-write-execute, individual focus, connects knowledge, live-stream and waves) [Patel 2013]. The current form of the internet Web 3.0, known as semantic web, provides a structure to date and link existing systems more efficiently for reuse across various applications to create context, that, in turn, gives meaning (using metadata, data in converted into meaningful information which can be located, evaluated and delivered by software agent). The next step in Web 4.0, known also as a symbiotic and ubiquitous web, or intelligent web (read-write-execute concurrency web), is based on the symbiotic relations between humans and the machines, with entire web being a single operating system interacting and communicating with users in a form of personal assistance. Web 3.0 has already began the development of machine-readable content for Web 4.0. with smart appliances connected to the Internet, able to perform tasks without human involvement, mostly with the use of sensors and radio frequency identification tags (RFID). It is described in literature in terms Internet of Things (IoT) and Internet of Everything (IoE), where not only people (web 2.0) or the machines (web 3.0) are connected, but also almost all objects and appliances with given an IP address. As such, Internet of Things is the network of physical devices, vehicles, appliances and other items embedded with electronics, software, sensors and connectivity, enabling all this things to connect, collect and exchange data, thus creating the opportunity not only for more direct integration of physical world into computer based systems, but also increased efficiency, economic benefits, and reduced human exertions. To fully understand the scope and scale of disruptive character of technology innovations emerging with Forth Industrial Revolution, including Quantum Computing, Deep

Learning, Machine Learning, 4 D Printing 5 G Technology, Virtual Assistance, Brain Computer Interface, General Artificial Intelligence, Internet of Things (IoT), Industrial Internet of Things IIoT (IoT in Manufacturing, Smart Robots), Smart Homes, Smart Buildings and Smart Cities, Smart Grid (IoT Energy Management), Autonomous Transportation Systems (autonomous vehicles), Internet of Medical Things (IoT solutions for medicine and healthcare), we can address Gartner Hype Cycle for Emerging Technologies [2018]. It gives us the full depiction, a road map, graphical depiction of common patterns arising with new emerging technologies (digital disruption), tracking down maturity of the technology(ies) and its future potential (through five phases of Hype Cycle: Technology Trigger, Peak of Inflated Expectations, rough of Disillusionment, Slope of Enlightenment and Plateau of Productivity).

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[S11-BRAK]

Utilization of ICT to Enhance Political Participation and Foster Democratic Innovation in the Czech Republic

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ABSTRACT

Advanced developments in ICT technologies provide new mechanisms for fostering citizens' participation in the political decision-making process. Participatory budgeting, the Citizens' Assembly on electoral reform, direct legislation, and e-democracy are some examples of *democratic innovation* reshaping traditional institutional architecture. Smith defines *democratic innovation* by the presence of two elements: direct engagement of citizens and institutionalized forms that provide citizens with a formal role in policy, legislative or constitutional decision-making.¹ The ICT landscape provides infrastructure to combine these elements. Not only do new technological advancements allow direct citizen participation, but they also provide opportunities to introduce alternative voting methods.

This paper examines democratic innovation in respect to the application of an alternative voting method, proposed by Czech mathematician Dr. Karel Janecek, to a pseudo presidential election, Prezident 21 (P21). This was done using an online platform that not only facilitated voting but also served as a place for information sharing and deliberations in a transparent manner. The election outcome under Janeček's alternative-voting method in P21 was significantly different from the actual election results. Separating the results of the online game from the application of the online game itself, the latter demonstrated that new developments in ICT provide unique opportunities for boosting citizens' political participation, in this case through introduction of alternative voting methods. They can also be used to facilitate large-scale studies to test alternative voting systems and measure the participants, as well as other strategies meant to improve civic engagement. The P21 game showed that D21 was easily understood and applied by the voters; its success indicates that

¹ Smith, g. (2009). Democratic innovations: designing institutions for citizen participation, Cambridge University Press, 6.

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innovative ICT applications may well be useful in reversing the tide of political disengagement.

Key words: political landscape, need for democratic innovation

The Moral Fundations of Ethical Optimism

by

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ABSTRACT

The purpose of the study is to establish the predicators of Ethical Optimism (EO) (Bassellier, and Benbasat, 2001; 2004), the view that successful managers IT professionals or IT users are also more ethical than avarage. We presume the attitude is anchored in more general set of moral convictions and worldviews. We are trying to situate EO in the larger theoretical landscape, specifically the psychological mechanisms underlying morality. Among the variables that might contribute to EO we examine the Moral Fundations (Graham, Heidt et al., 2013), the innate intuitions that guide specific evaualtions of right and wrong. We hypothetise that among the five fundations Harm/care and Fairness/reciprocity will positively predict EO, whereas Authority/respect will negatively do. As for Ingroup/loyalty and Purity/sanctity we do not make any specific preditions, as they seem unrelated to EO. Also, we predict EO will be positively correlated with Quality of Life, Social Trust, and negatively with Social Dominance Orientation (Sidanius and Pratto, 1999), Social Darvinism and Belief in Dangerous World (Duckitt and Sibley, 2009). Taking a deam view of the interpersonal relations and the rules governing social life leads to the pessimistic stance on the way organizasations. The study will cast a new light on the moral, and possible ideological and worldview considerations of EO.

Keywords: Moral Fundations, Ethical Optimism, Internet Society, IT professionals, IT users

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The influence of IT investment on non-profit hospital' value

by

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ABSTRACT

This paper deals with a problem of IT investments' analysis in the hospital industry. We pose a research question, whether the investments in IT bring additional value to a hospital as an enterprise. Based on that *we hypothesise that investment in IT creates important activity's improvement which effects should be incorporated in the financial analysis*. As a result, investment in IT brings the additional value for a company.

In this paper we employ popular methods of investment valuation (DCF, IRR,) but we suggest important modifications. We assume, that in the case of for-profit hospital (private owner) both a purpose and the methodology of hospital investment's analysis is similar as in the case of any other commercial company – the main goal of activity is to achieve the satisfactory profit / rate of return. However, in the case of not-for-profit hospitals (usually publicly owned) it looks quite opposite, as profit is no longer a main aim of

In our paper we present a method which allow estimation cash flows, cost of capital, social benefits and external effects related to public hospital's investment analysis. Although hospitals invest intensively in infrastructure and diagnostic equipment, in this paper we are focused on investment in IT systems. Taking into account the whole economy we can observe that greater investment in IT is associated with greater productivity growth (Dedrick, Gurbaxani

• Kraemer, 2003) but a rate of growth decreases according to the logarithmic of logistic function of growth (Siedlecki, Papla & Bem, 2018).

The modern hospital is a company that processes a huge amount of information – IT systems allow improvement of clinical efficiency (Lee & Lee, 2018), as well as financial efficiency, hospitals' return on assets and productivity (Wang, Wang & McLeod, 2018), (Walker, 2018), (Kohli, Devaraj & Ow, 2012), (Devaraj & Kohli, 2000), (Furukawa et al., 2008). The operable IT systems also increase quality of care (Carvalho et al., 2018) and patients' perception of service fairness (Liang et al., 2017), (Handayani et al., 2017).

The value of IT projects in enterprises depends on the way in which companies use this technology to improve management and operational activities. IT resources should be "general purpose technologies" - if they are used only partially, for example in only one department or to limited extent, they do not create an extra value for the company, while IT tools which comprehensively support company's activity can significantly reduce operating costs (Gu, Xue

Ray, 2008). Köbler (et al., 2010) observe that private hospitals display relatively higher IT budgets than do non-profit or public hospitals, what might express the pursuit to achieve higher profitability.

In the DCF method, the enterprise value is equal to the sum of all of realized investment projects, which is the sum of the discounted cash flow:

$$V = \sum_{i=1}^{N} (NPV_i + I_i) = \sum_{i=1}^{\infty} \frac{FCFF_i}{(1 + WACC)_i} = E + D$$

In contrast to the analysis of investment projects in commercial companies, in the case of non-profit hospitals (as well as similar public entities) not only the value of the generated cash flows (income-based) but also the value of social benefits, as well as the value of the externalities must be taken into account. Based on that, NPV for hospitals can be written as follows:

NP = () + () - =
$$\int_{t^{\infty}}$$
 () $\cdot^{-1} \dots + \int_{t^{\infty}}$ () $^{-2} + \int_{t^{\infty}} h$ () \cdot

where:

- PV (FCFF) present value of FCFF community benefits,
- PV (CB) present value of community benefits,
- PV (EE) present value of external effects,

f(t) – function of cash flow (ANOPAT),

- g(t) function of cash flow from community medical benefits
- h(t) function of cash flow community non-medical benefits
- to =0

Free Cash Flow to Firm (FCFF), taking into account the following effects:

- the increase in sales from analyzed project,

- the cash rate of profit (operating profit margin) (effects of reduced costs)
- the actual tax rate,
- working capital (without stocks representing a negligible position)
- capital expenditure (investments),

- cost of capital (WACC),
- project's duration,

- investment in intellectual capital and the costs of adaptation to the new conditions,

- the specificity of public hospitals (tax exemptions, medical procedures with are not cover by the payer, the obligation to provide unprofitable but necessary procedures).

Community benefits - taking into account the interests of all stakeholders, such as, local and national authorities, employees, society, suppliers. Community benefits can be divided into:

- community medical benefits – equal access to benefits, queues' reduction, time saved, faster procedures, etc.,

- community non-medical benefits – transportation costs, telemedicine, introduction of electronic prescriptions, electronic access to test results, etc.

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Keywords: IT investments ICT, innovation, investment analysis, non-profit, for-profit hospitals, social benefits

JEL Classification: G32, I15, M21

Spiritual resources as soft competencies of leaders – developing spiritual sensitivity. Conclusions from research review.

Spiritual resources as soft competencies of leaders – developing spiritual sensitivity. Conclusions from research review

by

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ABSTRACT

This paper shortly presents conclusions from the review of literature and studies on the spiritual resources or spiritual competencies of business leaders in the context of their effectiveness. The author with research team (M.Straś-Romanowska, J.Kowal) propose a special, unique concept which gathered and concern these competences as "spiritual sensitivity" (i.e. a disposition for experiencing spirituality, manifesting in the perception of events in the transcendent and ultimate perspective, in moral sensitivity and the ability to find sense in paradoxical and boundary situations) and its components (Holism and Harmony, Wisdom, Consciousness, Meaning, Religiosity and Faith, Ethical-Morality Sensitivity / Conscience, Openness to Others, Spiritual Involvement, Aesthetic Sensitivity). Also, the author indicates the importance of spiritual sensitivity for personal development of leaders, as well as for the whole organization or community. It turns out that the phenomenon is useful and valuable in leaders' work and it can be shaped through professional tutoring or training and through self-education.

Key words: spiritual sensitivity, spiritual sensitivity components, Spiritual Sensitivity Inventory, spiritual resources, soft competences, business leaders. Spiritual resources as soft competencies of leaders – developing spiritual sensitivity. Conclusions from research review.

INTRODUCTION

Business trainers, specialists in public relations, those who create organizations' environments, and those who built social or political structures often ask themselves "What makes a good leader?". There are many ideas (see: Dent, Higgins, Wharf, 2005; Giacalone & Jurkiewicz, 2003; Houston & Sokolow,2006; Miller, 2000). Some of them focus on results, not reaching the causes, and indicate real, concrete, material achievements, and effects of leader's work – earnings, which organization or business brings, position on the stock exchange, quantity or quality of manufactured goods. Some concentrate on figures – for example, the stock indexes, level of social or political support or voting results.

But even a short review of the psychological literature and studies shows that to be a good leader we should take under consideration something more. Of course, he or she – the leader - should has the intellectual potential (IQ), a set of consistent emotional abilities (EQ) to deal with the everyday work, stuff, and environmental problems. Moreover, the review brings a conclusion that to be a good business, organizational, political or social leader, we need a solid resource of spiritual competencies. The authors like Zohar and Marshall (2001), Wiggleworth (2002), Korcz (2006), Emmons (2000), Vaughan (2003), Hense (2006), Hyde (2004), Gardner (1999), Johnson (2006), McHovec (2002), Wolman (2001), Amram (2007), Sisk i Torrance (2001), Katz & Smith (2006), Fairholm (1996) call it a "spiritual intelligence" (SQ). In most reviewed literature the model of being a good leader considers a high level of:

- IQ, or intelligence quotient, which refers to rational, logical, rule-bound, problem-solving intelligence. It is supposed to make people bright or dim. It is also a style of rational, goal-oriented thinking. All of us use some IQ, or we wouldn't be functional.
- EQ refers to emotional intelligence quotient. Goleman (1995) claimed that it is the kind of intelligence that heart, or emotions, have. EQ is manifested in trust, empathy, selfawareness, and self-control, and in the ability to respond appropriately to the emotions of others. It's a sense of where people are coming from;
- And SQ, spiritual intelligence quotient, which underpins IQ and EQ. Spiritual intelligence is the ability to access higher meanings, values, abiding purposes, and unconscious aspects of the self and to embed these meanings, values, and purposes in living a richer and more creative life. SQ is the ultimate intelligence of the visionary leader. The secret of their

leadership is the ability to inspire people, to give them a sense of something worth struggling for (Zohar & Marshall, 2001).

Some of the authors have even distinguished more types of intelligence (see: Sidle, 2007; Gardner, 1999).

Spiritual resources/abilities in being a leader

The reflection about the place of spirituality in companies and business is particularly important in the XXI century, in which the existential and identity issues calls for special attention and care, and many organizations, despite increasingly better technical capabilities, communication, enabling the expansion of the market, are in crisis, because the economic systems are based more on maximizing profits, not on the deeper relationships and higher goals or values. These problems are becoming more severe and urgent - both at the individual level – of leader or employee, as well as the entire organization (Kriger,1999). Not surprisingly, the amount of research and publications about the use of elements of spirituality in the organization is recently growing fast (Benefiel, 2005; Dent, Higgins Wharf, 2005; Fry, 2003; Grace 1999; Houston and Sokolow 2006; Miller 2000 ; Mitroff and Denton 1999; Giacalone and Markiewicz 2003; Reave, 2005). And since 2002, even the special journal devoted strictly to the problem - Journal of Spirituality, Leadership, and Management - has been issued (Kapała, Kowal, Straś-Romanowska, 2016 a).

When we analyze the large body of literature and studies about spiritual intelligence of leaders we can find out, that often it consists of such abilities as:

- Self-Awareness: Knowing what to believe in and value, and what deeply motivates oneself;
- Spontaneity: Living in and being responsive to the moment;
- Compassion: Having the quality of "feeling-with" and deep empathy;
- The celebration of Diversity: Valuing other people for their differences, not despite them;

- Ability to Reframe: Standing back from a situation or problem and seeing the bigger picture; seeing problems in a wider context;
- Positive Use of Adversity: Learning and growing from mistakes, setbacks, and suffering;
- Being Vision- and Value-Led: Acting from principles and deep beliefs, and living accordingly to them;
- The tendency to Ask Fundamental Questions: Needing to understand things and get to the bottom of them;
- Holism: Seeing larger patterns, relationships, and connections; having a sense of belonging;
- Field Independence: Standing against the crowd and having one's own convictions;
- Humility: Having the sense of being a player in a larger drama, of one's true place in the world;
- The sense of Vocation: Feeling called upon to serve, to give something back (Zohar & Marshall, 2001).

Although all above competencies form one whole - spiritual intelligence, a leader may be strong in one and weak in others. But each can be nurtured and developed through practical life learning, special tutoring or training, and self-education. Using and developing these abilities e.i. spiritual intelligence, the leader has no problem to be elastic and effective in standard, typical leaders activity – he/she give a clear sense of direction, make tough decisions, to plan some actions, command, and control, or to inspire loyalty in those led through strong emotional empathy. But moreover, he/she has a vision for which he/she reach for, aspire to, and which is the driving force of leader and stuff. This vision touches the deepest values and gives a sense, a purpose to leader and enterprise (Bradbery, 2011; Kowal, Keplinger, Kapała, Mäkiö, and Straś-Romanowska, 2018).). It is very important - many authors drew attention that there is a lack of such leaders in the modern world. It is because too much value our society places on one particular kind of capital - material capital. This obsession with material gain has led to short-term thinking and the narrow pursuit of self-interest. For leadership, to inspire long-term, sustainable enterprises, spirituality is needed. In

business, spiritual intelligence plays a large role in shaping the company's organizational culture. If employees adhere to other values, even those subjected to thorough training, integration workshops will not be a harmonious team (Chin, Tong, Anantharaman, 2011). It is a challenge for the modern leader.

A spiritual sensitivity construct and measurement

For some psychologists linking the intellectual, rational phenomena as intelligence with enigmatic, subtle, elusive spirituality is too controversial. They even argue that spirituality cannot be tested by scientific methods or – if so – the other disciplines should deal with that, not psychology. But spirituality is a very important area of human life, which has a meta-sphere character and has the power to integrate human existence. Ignoring spirituality can have serious consequences for understanding, describing and explaining a person's life, motives, and actions (Straś-Romanowska, 1992).

Considering the above doubts, in course of our own studies about spirituality, also – spiritual resources of leaders - we decided to put it as "spiritual sensitivity", and characterized it as a disposition to experience spirituality, manifested in the embracement of nature of things in transcendent and final perspective (beyond empirical), in the moral sensitivity and the ability to find meaning in paradoxical and limit situations. It is a collection of related (specific) skills and abilities, with a direct reference/use in everyday life, used in adaptive problem solving and implementation of purposes (especially in the moral field), which is necessary for the full development in adulthood (Emmons, 2000). Such an understanding of spiritual intelligence is close to what, in developmental psychology, is called wisdom (especially the transcendent wisdom). The definitions of spiritual sensitivity components are (Straś-Romanowska, Kowal, Kapała, 2016 b; Kowal, Keplinger, Kapała, and Mäkiö, 2018):

 Holism and harmony manifests itself in the feeling of belonging to a greater whole (the universe, the cosmos, humanity, creation, etc.), being its unique part, a sense of unity with the greater whole, and awareness of the interaction between this whole and Spiritual resources as soft competencies of leaders – developing spiritual sensitivity. Conclusions from research review.

the "self". A person can draw a deep inner peace, joy, a sense of security and meaning in life from the feeling of unity.

- Wisdom-Awareness-Meaning refers to the fundamental questions of life, to what is important in life, but often uncertain. It tems rather personal experience than from theoretical knowledge. It refers to the knowledge and ability to make judgments about the course of human life, its changes, conditions of the existing entities, the context of their existence in a dynamic perspective, and the relationships between them (Baltes 1990). It manifests itself in need and the ensuing quest to understand the essence of things, in asking the questions about the meaning of phenomena and events, like "Why?", "For what reason?", "With what purpose?" and in the ability to understand oneself and deep intuitive understanding of existential questions. It is based on the use of not only logic, but also the insight and intuition, therefore it requires acceptance of irrationality, uncertainty, relativity, diversity and contradictions in life.
- Religiosity and faith kind of personal involvement, resulting from the deep inner need and will of a person, allowing to relate common and special life events to "higher senses" to ultimate concerns (Tillich). Its result is the strive for consistency in conduct of professed religion, in the principles of faith. The essence of religion and faith is the belief in the existence of God and His presence in human life, and the desire to build a personal relationship with Him. Religion and faith can manifest itself in the quest to learn the truths of faith, exploring the sacred writings/religious knowledge, making private and organized spiritual practice, participation in community life. Religion and faith can also be regarded as the resources used to cope with difficult life events.
- Moral ethical sensitivity (conscience) manifests itself in the possession of organized, hierarchical system of values organizing our experience, which allows a person to respond to the problems of life in many of its aspects from everyday events to dramatic life decisions. In practical aspect it results in the ability to distinguish between good and evil, sensitivity to values, their conscious choice and their pursuit in daily life. It leads to self improvement and personal development, and more generally to life in accordance with our own conscience.

- Openness to Other People it is an attitude resulting from ethical sensitivity. In practice it manifests itself in the understanding and respect for other people, skill of forgiveness, compassion and empathy, in perceiving the needs of others, taking action to assist and realize people well-being, sense of responsibility for others, respect for the principles of social justice and disagreement to do harm to others.
- Spiritual commitment understood as a two-dimensional factor. It is expressed both quantitatively - in the amount of time spent on activities relating to the implementation and development of our own spirituality, as well as in a qualitative way -in the intensity of feelings and sensations associated with operations serving for realization and development of spirituality. The result of spiritual commitment is effective interaction between the spiritual realm of higher values and everyday actions.
- Aesthetic sensitivity It is expressed in the possession of so-called good taste and sense of beauty - seeing it around us, in need to have beauty in the closest surroundings, in seeking aesthetic. A person with this type of sensitivity is characterized by finesse and sophistication in meeting the needs from the lowest biological, through mental, to the highest - spiritual (Socha, 2000).

The authors also created the method of measuring spiritual sensitivity – Spiritual Sensitivity Inventory (SSI). It was constructed with the use of theoretical methods (e.g. Zawadzki, 2006). The construct was thus predetermined whereas clarification of the semantic scope relied in collecting of the required information from various sources and including them into a coherent whole. A key step in the construction process was to analyze the theory, to create a definition of spiritual intelligence and its components and content selection of indicators (criteria). In the course of the method construction method the APA Standards were used defining the relevance of the assessment process. Psychometric model, used in the construction of the SII corresponds to the classical theory of the test, the selection of items was based on the discriminant power analysis, and the final model of the phenomenon was confirmed by the confirmation methods (e.g. by CFA).

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Inventory assumes that spiritual intelligence is a personal attribute, exhibiting individual stability (situational and timely) and interpersonal variations (Strelau, 2001). It is not directly observable, not only has it the status of a latent variable, but also the components (including latent ones), which describe the intensity of inventory and various scales. To latent components, there are observable indicators assigned directly included in the content of the inventor claims.

In the original version (see: annex), the method consists of 56 items, from which summarized results from the overall score. It allows to the measure the intensity of spiritual sensitivity and within the inventory, there can be distinguished positions that make up the scales measuring spiritual sensitivity components. The subjects (test-takers) are characterized by the inventory against the population to which they belong.

In accordance with the standards of the methods of questionnaire construction, the inventory has instructions of use for the subject explaining the mode of how to respond to claims. This relies on a selection of one among several possible answers, without the intermediate option, expressed as a numerical scale from 1 to 4 (respectively: 1- I strongly disagree, 2-I rather disagree, 3- I rather agree, 4- I strongly agree). Multicategory four-scale with so-called forced choice excludes the possibility of mechanical "acceptance" or "denial". Individual items of inventory describe heterogeneous forms of behavior in different situations and are the operationalization of behavior - indicators of individual components of spiritual intelligence. Inventory items include a) a description of the reaction (internal and external), b) a description of the personal attributes, c) a description of the interests and expectations, d) a description of the attitudes and beliefs (Angleitner and Riemann, 1991).

Some time ago, the authors adopted dimensions of the full earlier version of the SSI (Straś-Romanowska, Kowal, Kapała 2016 b). The SSI was shortened to fourteen questions but kept all dimensions [Table 1]. The shortened version of SSI was also translated into English, as depicted in Table 1 (Kowal, Keplinger, 2015).

Table 1. Items for Spiritual Sensitivity Inventory (SSI) (Adapted from Straś-Romanowska,Kowal, Kapała, 2016 b)

Dimensions	Items
HH: Holism	
and Harmony	Hh1: My life is a whole spiritual unity with other people.
	Hh2: Despite difficulties and adversities, I feel grateful to fate, when I think
	about my life.
MSS: Wisdom,	MSS1: I accept that not everything in life is certain, predictable and rational.
Consciousness,	
Meaning	
	MSS2: I have a strong need to understand the meaning of what happens to
	me in my life.
RW: World	RW1:I have a sense of community and responsibility towards fellow
View	believers.
	RW2: Thanks to faith I see the meaning of what happens to me in my life.
EMS: Ethics,	
Morality,	
Conscience	Ems1: There is a person representing moral authority to me.
	Ems2: I'm guided by moral ethical principles in decision making.
	Op1: I'm certain that doing good pays off.
OP: Openness	

Table 1. Items for Spiritual Sensitivity Inventory (SSI) (Adapted from Straś-Romanowska,Kowal, Kapała, 2016 b)

to other people	
	Op2: I try to forgive those who hurt me even it is sometimes difficult.
	Z1: My daily activities are accompanied by a sense of realization of universa
Z: Engagement	values (truth, goodness, beauty, etc.).
	Z2: I try to organize my time so that I can find a moment to realize spiritual
	needs on every day basis.
WE: The	
Aesthetic	
Sensibility	WE1: I'm moved by and admire works of art.
	WE2: I can see the inner beauty in other people.
Respond to ever	v item by selecting one of the five possible answers: 1 – strongly disagree.
2 – rather disag	ree, 3 – rather disagree, 4 – strongly agree.
Source: own ela	boration.

The adaptation and validation process comprised the following steps (Hornowska, 2001, Kowal, Gurba, 2015, Kowal, Keplinger, 2015, Kowal, Roztocki, 2015a, Kowal, Roztocki, 2015b, Straś-Romanowska et al., 2016 b; Zawadzki, 2006) 1) analysis of the preliminary theoretical positions of the authors; 2) transforming of the indications for test

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operation, the test items, the instructions and the name of the test in the branch language of the users; 3) preliminary acceptance of the inventory and verification of the psychometrical characteristics of the items; 4) formulation of the final inventory version and evaluation of its reliability and validity; 5) the structural relations verification between the scales belonging to the questionnaire; 6) standardization of the test to the target population; 7) methodical indications preparing for the application of the test by creating instructions.

Vade-mecum of spiritual sensitivity

The review of literature and studies about the spiritual resources of leaders shows, how important it is in practical, everyday business actions (Duchon, Plowman, 2005; Green, Duncan, Kodatt, 2011). We call this resources, built a questionnaire to measure it. But what can we do to develop spiritual sensitivity? What kind of single, concrete steps can we take in the self-education process, or on what point an educator, a coach should concentrate to help expand the leader's spiritual sensitivity? Let's have a short look at conclusions, which came from theories and studies (Delbecq, 2000; Johnson, 2006; Wiggleworth,2002; Sisk & Torrance, 2001; Katz & Smith, 2006; Fairholm,1996; Lynton & Thogersen, 2009; Vaiil, 1998).

We can take into consideration what classic psychology said about spiritual competences and development. For example, Maslow (1968) mentioned about shaping B-cognition, characterized by:

- experiencing the whole, detecting organization and structure;
- striving for perfection;
- the motivation for fulfillment;
- seeking justice;
- vitality, dynamics, the fullness of activity;
- the wealth of recognition, the perception of complexity, differentiation;
- searching for simplicity, essence, canonical type of structure;
- perceiving beauty, sensitivity to form, comprehension, harmony;
- focus on goodness, kindness, compassion;
- preferring uniqueness and individuality;

- preferring ease, lack of potential or drive;
- caring for a good mood, joy, humor;
- striving for the truth;
- creating self-sufficiency, autonomy, independence, distance.

Sisk (2001), Kessler (2000) and Noddings (1993) among the elements of education to spirituality mentioned:

- Learning to insight, reflection, and self-reflection, deepening awareness and selfawareness, for example, keeping a diary / self-observation.
- learning a holistic view (eg showing the focus of values, goals, creating the ethos of groups, work, and tasks in groups);
- exploring the existential term, asking questions about the meaning, the clue of phenomena, events, (eg a discussion about real events, from real life, or fictional ones in a movie, books, etc.);
- solving dilemmas from the moral field (by the same means as above);
- teaching empathy and responsibility (eg charity, care for the elderly, the sick, children, animals).

An accent in self-education of leaders, and in training them should be also put on abilities connected with the perception of reality – using elements of postformal thinking: relationism, dialectism, problem discovery, abstract thinking, contextual thinking, metasystemic and paradoxical thinking. Further, it is important to develop creative thinking: curiosity, fluidity, flexibility, tolerance on ambiguity, integration of opposites, gestalt, originality, and sensitivity to problems, independence, and courage, and criticism and independence of thinking.

In order to have a high level of spiritual sensitivity, it is also worth taking care of a holistic view of reality - its contextual, association-based, relation-based understanding. This property is associated not only with biological conditions, eg. brain function but also to a certain extent it is taught. When in experiments temporarily was induced an independent notion of self - the respondents thinking became analytical, there was a tendency to catch objects from the background, while when the interdependent notion of self was raised - thinking became more holistic Self-education, and pieces of training of spiritual sensitive leaders should also take into account the formation of wisdom, understood as:

- the highest stage of cognitive development developed relativistic and dialectical thinking,
- expert knowledge,
- a phenomenon involving declarative and procedural knowledge and awareness of its limitations, reference to the meaning of life, management of life and development taking into account personal and universal good, a reference to values and acquiring the virtue of character manifesting itself in action.
- applying hidden and explicit knowledge for common use, by balancing personal, interpersonal and non-personal interests, in the short and long term as well as adapting, modifying and changing the environment.
- spiritual, existential wisdom.

Finally, self-education and coaching of spiritual sensitive leaders should embrace the sphere of moral reasoning and conscience. In the course of the moral development process, leader by himself/herself or the educator should stimulate, and the subject should gradually "climb up" the levels of successive stages, which Piaget (1971) and Kohlberg (1981) said about, but should also take into account what Haidt writes about (2013). He indicates criteria influencing the discrepancies in ethical assessments, so-called foundations of morality/ethics:

- caring, ("harm-care");
- justice, ("justice-reciprocity");
- loyalty ("intragroup loyalty");

Spiritual resources as soft competencies of leaders – developing spiritual sensitivity. Conclusions from research review.

- authority ("authority-respect");
- sanctity ("purity-holiness").

Each of societies and groups differ in weight given to these ethics, eg. there are discrepancies between the culture of the West and the East, between communities and individuals with liberal and conservative views on politics and religion. A spiritually developed leader remember about it and is able to understand and respect these differences.

Conclusions

The issue of spiritual competences of leaders is undoubtedly worth of further exploration and studies. To achieve real transformation or positive development of modern individuals, organizations and societies, the motivations that drive behaviour should be changed. That is the prime responsibility of a visionary leader (Benefiel, 2005; Wingrove & Rock, 2008). A leader practicing the seven competencies of spiritual sensitivity can provide inspiration and energy to the subordinates, stuff, enterprise. It is obvious that global business, organisations, politicians or social leaders has the financial and influence or power to make a significant difference in today's complicated and troubled world, but it can happened only when being a leader becoming a kind of vocation. To make this possible business leaders, politics, social activists must remember about a moral dimension, becoming more service and value oriented (Grace, 1999; Middlebrooks, Noghiu, 2010; Shah, 2009) and eliminate the assumed natural distinction between private enterprise and public institutions. Business leaders should also be a servant leaders, who serve the bigger whole - community, nations, humanity or the planet (Zohar & Marshall 2001). Developing spiritual sensitivity can help leaders maintain a sense of subjectivity in the conditions of the modern business, organizational (or political) environment, and also prevents the prejudice of others (Kowal, Keplinger, Kapała, Mäkiö, and Straś-Romanowska, 2018).. Maybe both - in the micro -

interpersonal and in macro dimension - on the level of intergroup contacts in communities differentiated generations, culturally and ideologically, spiritual sensitivity creates a meta level, a plane of understanding, facilitate communication and - using the terminology of dialogue philosophy – it forms the reality of a real meeting - a person-subject with person-subject, whom although differences and individuality, can co-create a new reality and enrich each other.

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ANNEX:Spirituality Sensitivity Inventory

Department of Psychology, University of Wrocław



Please fill in all the above fields carefully and then read the instructions on the next page ...

INSTRUCTIONS:

It is Spiritual Intelligence Inventory. It contains 56 numbered theorems that apply to you, other people and life values. Read each of the statements and determine how each of them relate to you.

The survey is completely anonymous and for scientific purposes only. There is neither bad nor good answers, it is important that your answers are consistent with what you feel reading the claims. Please answer according to your usual (not: unique) behaviour.

You must respond to every claim by selecting one of the four possible answers:

1 – I strongly disagree

2 – I rather disagree

3 – I **rather** agree

4 – I strongly agree

Religion/creed	Tick:
(a) atheism	
(b) no affiliation or a person not practising	
(c) Catholic	
(d) Protestant	
(e) Orthodox	
(f) Judaism	
(g) Islam	
(h) Buddhism	
(i) Hinduism or Hare-krishna	

(j) other option (fill in):

The time to respond is <u>unlimited.</u> Think about each answer, and after finishing filling Inventory, make sure that no claim was omitted.

1	I strive for spiritual development.	1234
2	I'm moved by and admire works of art.	1234
3	I often wonder about the meaning of different events.	1234
4	I'm often moved by someone else's hard luck.	1234
5	Religious orders are signposts which I try to follow in my life.	1234

6	My life is a whole spiritual unity with other people.	1234
7	My daily activities are accompanied by a sense of realization of universal values (truth, goodness, beauty, etc.).	1234
8	There is a person representing moral authority to me.	1234
9	I believe that the beauty of life reveals the Divine.	1234
10	I have a sense of community and responsibility towards fellow believers.	1234
11	When I think about my life and the world I feel that I am in the right place.	1234
12	I'm certain that nothing happens by accident in my life.	1234
13	I feel responsible for others.	1234

14	Thanks to faith I see the meaning of what happens to me in my life.	1234
	1 – I strongly disagree	I
	2 – I rather disagree	
	3 – I rather agree	
	4 – I strongly agree	
15	I try to organize my time so that I can find a moment to realize spiritual needs on every day basis.	1234
16	The most important in my life is to be in accordance with my conscience.	1234
17	I get involved in activities for the sake of others.	1234
18	I'm impressed by the beauty and harmony of the world.	1234
19	I believe in the existence of the Supreme Being who is the ultimate ruler of the universe.	1234
20	I try to find something positive in every aspect of my life.	1 2 3 4

21	There are times when I have a sense of unity with other people and the world.	1234
22	I try to deepen the knowledge concerning my faith/religion.	1234
23	I accept that not everything in life is certain, predictable and rational.	1234
24	I feel uncomfortable when, for some reason, I have to stay in unaesthetic (ugly, discordant) environment.	1234
25	I try to live in harmony with the values I hold.	1234
26	Despite difficulties and adversities, I feel grateful to fate, when I think about my life.	1234
27	I realize myself in the love for another human being.	1 2 3 4
28	I believe that the Supreme Being is the cause of order and harmony.	1234
29	I have a strong need to understand the meaning of what happens to me in	1234

	my life.	
30	I think that regardless of the circumstances we should be guided by the highest values.	1234
31	I can see the inner beauty in other people.	1234
32	I am aware that I multiply the good by helping others.	1234
33	Despite various obstacles I consider myself a lucky man.	1234
34	I think the feelings and intuition are an important complement to reason.	1234
35	I'm guided by moral ethical principles in decision making.	1234
36	I'm certain that doing good pays off.	1234
	1 – I strongly disagree 2 – I rather disagree	

	3 – I rather agree	
	4 – I strongly agree	
37	Thanks to faith I can distance myself from what is going on in my life.	1234
38	I believe that the spiritual path I had chosen will lead me to realise my goals.	1234
39	My philosophy of life helps me deal with external influences.	1234
40	I try to understand the motives of the people, even when in my opinion they do wrong.	1234
41	Everything what I get involved in I take seriously and with due consideration.	1234
42	I try to deepen my knowledge about myself, other people and the world.	1234
43	I think people are not inherently evil, even though they may sometimes err.	1 2 3 4
44	I experience the closeness of God every day.	1234

45	The values I hold guided all my life.	1234
46	What I see around me, makes me feel disappointed, but also encourages to do good.	1234
47	I try to ensure agreement in my surroundings.	1234
48	I am reconciled with what happened to me in my life.	1234
49	I try to forgive those who hurt me although it is sometimes difficult.	1234
50	Prayer (meditation) resulting from internal needs is something important for me.	1234
51	Moral principles facilitate and organize my life.	1234
52	I'm often moved by listening to music.	1234
53	I look for answers to questions about my life, my place in the world and the goals I want to (I should) achieve.	1 2 3 4

54	I feel compassion for the weak and suffering.	1234
55	I actively participate in the life of the church/community to which I belong.	1234
56	The values I hold and realize make me who I am.	1234

Please double check that no claim was omitted ... Thank you!

KEY:

Holism and Harmony – 6, 11, 21, 26, 33, 47

Wisdom, Awareness, Meaning - 3, 12, 20, 23, 29, 34, 38, 42, 48, 53

Religiosity and Faith - 5, 10, 14, 19, 22, 28, 37, 44, 50, 55

Ethics, Morality, Conscience - 1, 8, 16, 25, 30, 35, 39, 46, 51, 56

Openess to Other People – 4, 13, 17, 27, 32, 36, 40, 43, 49, 54

Involvement-7, 15, 41, 45

Aesthetic Sensitivity- 2, 9, 18, 24, 31, 52

SPHERE	1 HH	2 MŚS	3 RW	4 EMS	5 OD	6 Z	7 WE
RESULT							
OVERALL RESULT							

Keynote addresses

A SWOT Analysis of Using Mobile Technology in Knowledge Providing in Organisations

by

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ABSTRACT

The development of various technologies affects the functioning of both individuals and organizations. Mobile technology plays an important role in the modern society. Mobile devices, as ones of the most important elements of this technology, are becoming increasingly ubiquitous and provide sophisticated functionality for both personal and professional use. This article has two main goals. Firstly, the article systematizes the "mobile device" term that, while commonly used, lacks a precise definition. The definition of this term depends on how people perceive it, and on the type of services it offers. The analysis of the previous studies allows to identify four factors that play a key role in defining the "mobile device" concept, namely: (1) portability, (2) pocket-size, (3) being handheld, and (4) wirelessness. It should be emphasized that these factors can also be crucial from the point of view of the use of mobile devices in the area of knowledge providing. Secondly, in the manuscript, the results of SWOT analysis that allowed to identify strengths, weaknesses, opportunities, and threats related to the use of mobile devices in knowledge providing in organisations are presented. To achieve the research goals, a comprehensive literature review was conducted. The research outcome might be useful both for practitioners who design mobile applications, and for researchers who develop conceptual models of knowledge management.

Keywords: Knowledge, organisation, mobile technology, mobile device, SWOT analysis.

INTRODUCTION

Over the last decade we can observe an immense change in the access to knowledge. This change is driven as a consequence of advances in technology, particularly mobile technology, which plays an important role in the modern society and offers several benefits including connectivity, flexibility, interactivity, and location awareness (Nord et al., 2016). Mobile technology is commonly used all around the world attracting people's attention as mobile devices are portable, ubiquitous, and easily accessible. Today, billions of users own mobile devices, which opens up new possibilities in many areas providing access to information, processes, and communication anytime and anywhere (Martin & Ertzberger, 2013). With the increase in the importance of high-speed mobile Internet access and also due to the many features and properties, in particular portability or the ability to use mobile devices anywhere and at any time, the access to knowledge resources via the Internet has changed significantly, enabling the use of mobile devices in both general and professional areas. Nowadays, mobile devices are much more commonly used as a tool for providing information compared to traditional desktop computers (Statista, 2018). This situation shows enormous potential to enhance knowledge providing with mobile devices.

At the same time, the widespread use of mobile technology and mobile devices does not go hand in hand with the precise definition of their meaning. Despite many existing studies (over 16,000 articles in the Google Scholar database only in 2017 related to mobile technology and mobile devices), too much flexibility can be observed with regard to attempts to define these concepts. Numerous existing definitions explain which of the used devices should be classified as a mobile device in an unclear and not very precise manner. Additionally, many authors also use interchangeable terms (e.g. mobile device, mobile computing) to describe mobile technology. As a result, there are no unambiguous arguments that would allow the devices to be classified.

Mobile devices undoubtedly have numerous benefits that have contributed to the increase in their popularity. However, it should be noted that they have several limitations. In their study, Stal & Paliwoda-Pękosz (2018) and Stal (2010) highlight some of the most important issues connected to mobile technology, namely: (1) cost of mobile Internet access, especially compared with the cost of wired Internet access, (2) access to mobile Internet anytime, anywhere, (3) insufficient mobile network speed, (4) the necessity to optimize

content for correct display on small display dimensions, (5) the necessity to match the content to the mobile user expectations which are different compared with users working in one place, and (6) the limitations in mobile hardware (small display dimensions, lack of a physical keyboard or mouse). These factors may play an important role and have a fundamental impact on the possibility of effective use of mobile devices in providing knowledge.

Based on the issues related to mobile technology and mobile devices mentioned above, this article has two main goals. Firstly, it systematizes the "mobile device" term that, while commonly used, lacks a precise definition. Secondly, in the manuscript, the results of SWOT analysis that allowed to identify strengths, weaknesses, opportunities, and threats related to the use of mobile devices in knowledge providing in organisation are presented. Taking into account the two goals, this paper addresses the following research questions:

1/ What are the key factors that affect the way the term "mobile device" is defined?

2/ What are the key determinants of mobile technology/mobile devices in providing knowledge in organizations?

The paper is organized as follows. The next section provides the research background related to the mobile technology/mobile device definitions followed by an overview of the SWOT analysis. Next, research results and discussion are presented. The paper concludes with a summary and future research directions.

RESEARCH BACKGROUND

In the last decade, an increasing level of interest in mobile technology, education, and knowledge in the context of mobile technology can be observed. The number of scholarly literatures in the mentioned areas has grown dynamically in the last years and remains at a very high level. This may be a sign of the high interest of researchers in this subject. Even though the term mobile technology and, in particular, a mobile device is in regular use these days, the meaning is still not precise and there is not a strict definition of this term.

One of the sources in which one could expect definitions of the listed terms is Encyclopedia Britannica (Encyclopedia Britannica, n.d.), a general knowledge Englishlanguage encyclopedia, developed by about 100 full-time editors and more than 4,000 contributors. Interestingly, this encyclopedia does not define such terms as mobile technology or mobile device at all. Only approximate indications lead to selected devices with mobility characteristics, namely: PDA (handheld computer), mobile phone, mobile telephone, cellular phone or a smartphone. A broader perspective has been adopted by the Cambridge Dictionary (Cambridge, n.d.), in which a mobile device is characterized as "any piece of electronic equipment such as a mobile phone or small computer that you can use in different places". On the other hand, Techopedia (n.d.) emphasizes that mobile devices are also known as handheld computers. In the same vein, the mobile device definition as "a handheld tablet or other device that is made for portability and is therefore both compact and lightweight" has been proposed.

Numerous studies have attempted to explain the meaning of the "mobile device" term. Dearnley et al. (2009) defines mobile technology as a coexistence of an easy-to-transport device that allows for instant access to information. Hussain & Adeeb (2009) states that mobile technology refers to areas defined by mobile Internet connections and mobile devices. The latter, however, should be understood as mobile devices (hardware) along with mobile software (mobile operating system and mobile applications). Caudill (2007) maintains that mobile devices should be defined as portable, wireless computing devices that are small enough to be used while held in the hand. Huang (2009) argues that mobile devices should be defined in different ways when they are looked at from different perspectives. He maintains that mobile devices refer to "a pocket-sized computing device, typically having a small display screen, a small keypad with miniature buttons or a touch screen with stylus of input". Sharp, Rogers, and Preece (2007) hold the view that mobile devices are handheld and intended to be used while on the move. Gikas and Grant (2013) pay attention to the "mobile computing devices" category, in which they mention cell phones, smartphones and tablet computers. Similarly, Cui and Roto (2008) claim that mobile devices can be referred to as pocket-sized computing devices, primarily mobile phones and personal digital assistants (PDAs). According to that theory, a mobile device can be accessed anytime, anywhere and mobile devices are always-carried. As noted by Keskin and Metcalf (2011), mobile devices (such as mobile phones, PDAs and digital audio players, as well as digital cameras and voice recorders, pen scanners, etc.) are portable, ubiquitous, easily accessible and used by many people. Keagen (2005) suggests that mobile devices could be carried everywhere. At the same time, in a technocentric perspective, he concentrates on the size of mobile devices. Hintze et al. (2014) underlines that mobile devices have become ubiquitous today, pointing at smartphones and tablet computers as those that belong to the category of mobile devices.

These studies clearly indicate a pertinent role of the four device attributes (portable, pocket-size, handheld and wireless, i.e. using a mobile Internet connection) for determining its mobility. Hence, considering the aforementioned factors, a mobile device could be defined as "a portable, wireless computing device, possible to carry without additional equipment and small enough to be used while held in the hand".

In order to identify mobile devices, these attributes were then compared with typical commonly used computing devices (see Table 1). The results obtained from the analysis show those from computing devices that should be classified as mobile.

	Mobile device attributes				
Devices	Portable	Pocket- size	Handheld	Wireless	
Laptop	+	_	_	+	
Tablet	+	_	+	+	
Smartphone	+	+	+	+	

 Table 1. Mobile device classification.

In summary, these results indicate significant differences in the understanding of the mobile device concept. In common belief, the computing devices from Table 1 are usually classified as mobile. However, considering the above-mentioned attributes, only the smartphone can be classified as a full-fledged mobile device.

RESEARCH METHODOLOGY

The study was designed based on the Strengths Weaknesses Opportunities Threats (SWOT) analysis framework (Figure 1) – a heuristic technique for organizing and analyzing information, used in a wide variety of domains (Zavadskas, Turskis & Tamosaitiene, 2011).

	POSITIVE	NEGATIVE
PRESENT	Strenghts	Weaknesses
FUTURE	Opportunities	Threats

Figure 1. Conceptual structure of the SWOT framework.

The analysis is based on two categories of factors positively influencing the development of an organization (strengths and opportunities), and two having negative impacts (weaknesses and threats), assuming that strengths and weaknesses are features of the current state, and opportunities and threats are expected future phenomena. The SWOT analysis was conducted on the basis of a literature review.

RESULTS

The literature review was conducted by searching Springer Link, Scopus and Web of Science databases with the phrases "mobile device" and "knowledge management"; "mobile technology" and "knowledge management"; "mobile" and "organization" and "knowledge". Firstly, only manuscripts that were published in the last three years were taken into account. Secondly the analysis was extended to research works published since 2002. The results of the SWOT analysis (Strengths, Weaknesses, Opportunities, and Threats) are presented in Tables 2-5.

Table 2. Strengths of mobile technology in the context of knowledge providing.

S1UbiquityThe possibility of delivering content anytime and anywhere(Derballa & Pousttchi, 2004)	No	Strengths (present, positive)	Description	References
	S 1	Ubiquity	The possibility of delivering content anytime and anywhere.	(Derballa & Pousttchi, 2004)

		Portability.	
S2	Easy to operate	Everyone knows how to use it.	(Zhuang et al, 2011)
\$3	Context sensitivity: personalisation	User-targeted content delivery - specific content delivered to the specific user. The possibility of personalized knowledge organization.	(Derballa & Pousttchi, 2004) (Balfanz et al., 2005) (Bortlik et al., 2018) (Zhuang et al, 2011) (BenMoussa, 2003) (AlSagri & Zemirli, 2015)
S4	Context sensitivity: location determination	The possibility of specific content delivery at a specific location, e.g. a weather forecast.	(Derballa & Pousttchi, 2004) (Anabel et al., 2018)
S5	Context sensitivity: just in time learning, learning in a workspace (context- based learning)	The possibility of obtaining information that is needed right away in the working environment.	(Ally et al, 2014) (Leroux et al, 2013)
S6	Identifying functions	The possibility of user identification.	(Derballa & Pousttchi, 2004)
S7	Command and control	The possibility of using mobile devices to control applications or other devices.	(Derballa & Pousttchi, 2004)
S 8	Easy access to information	The benefits of a constant Internet connection.	(Adamczewski, 2016)
S9	Learning flexibility	The possibility of acquiring new knowledge anytime and anywhere. The ability to access information repeatedly.	(Ally et al, 2014) (AlSagri & Zemirli, 2015) (Fralick et al., 2017)
S10	Support for all knowledge management phases	The possibility of acquiring, storing, sharing, applying and creating knowledge.	 (Chen & Huang, 2010) (Lima et al., 2016) (AlSagri & Zemirli, 2015) (Stal, Paliwoda-Pękosz, 2017)
S11	Catching up new knowledge quickly and effectively	The possibility of accessing professional knowledge databases anytime and anywhere.	(Ally et al, 2014)
S12	Pervasive learning	The possibility of accessing learning materials in the	(Ally et al, 2014) (Vinu et al, 2011)

		environment where specific knowledge is needed.	
S13	Encouragement for learner-centered education	Employee knows best what he/she needs and when.	(Ally et al, 2014)
S14	Instant access to social portals	The possibility of forming the "communities of practices" that share best practices and provide help at real-time.	(Ally et al, 2014) (Clough, 2010) (Adamczewski, 2016)
S15	Interactivity, real- time communication	The possibility of the workers' interaction in real time and working collaboratively on projects.	(Derballa & Pousttchi, 2004) (BenMoussa, 2003) (Ally et al, 2014) (Adamczewski, 2016)
S16	Compliance with the workers' style of acquiring knowledge	The possibility of the adjustment to a learning style of the new (younger) generation that enters the labour market – making learning more effective.	(Ally et al, 2014)
S17	Easy access to experts' knowledge; expert-systems mobile applications	The possibility to benefit from experts' knowledge.	(Alsharif et. Al, 2018) (Anabel et al., 2018)
S18	Access to real-time information	The possibility to access real- time market information that might influence current decision making.	(Anabel et al., 2018)
S19	Enabling of agile business process optimizations	Enhancement of business processes owing to the possibility of real time information exchange and provision.	(Mourtzis et al., 2016) (Gröger et al., 2016) (Gröger et al., 2013)

Table 3. Weaknesses of mobile technology in the context of knowledge providing.

No	Weaknesses (present, negative)	Description	References
W1	Limited mobile Internet connection speed	This might be an issue especially outside major cities.	(Abrahamse & Lotriet, 2012)
W2	Limited functionality	When compared to desktop computers.	(Abrahamse & Lotriet, 2012)
W3	Security issues	Mixed private-business usage	(Alsharif et al., 2018)

		(especially when a bring-your- own-device policy is in force), lost/stolen devices.	(Gröger et al., 2013)
W4	Potential distractions	The possibility of workers' being distracted by access to social media.	(Alsharif et al., 2018)

Table 4. Opportunities of mobile technology in the context of knowledge providing.

No	Opportunities (future, positive)	Description	References
01	Mobile business intelligence	Instant access to business intelligence systems.	(Adeyelure et al., 2017) (Gröger et al., 2013) (Motta et al., 2014)
02	New business models	The possibility of new business models development that take into account emerging standards/trends of information and communication technologies e.g. SMAC (Social, Mobile, Analytics, Cloud): cloud data storage through mobile devices.	(Adamczewski, 2016)
03	Future digital world	Mobile technology facilitates current trends of accessing information anytime, anywhere, just in time – requirement of the future digital world.	(Ally et al, 2014)
O4	Potential use in the Internet of Things area	Reading sensors and accessing device information via mobile.	(Jeng et al., 2010)

Table 5. Threads of mobile technology in the context of knowledge providing.

No	Threads (future, negative)	Description	References
T1	Techno-stress	Techno-stress was defined by Brod (1984) in the following way: "inability to adapt or cope with new computer technologies in a healthy manner".	(La Torre, et al, 2018)
T2	Privacy issues	The possibility of tracking employees.	(Gröger et al., 2013)

DISCUSSION

In the SWOT analysis, the longest is the list of strengths of mobile technology in the context of knowledge providing. Mobile technology can influence positively knowledge providing in an organization that might contribute to the enhancement in the following domains of organization functioning: decision making process (S10, S11, S14, S16, S17, S19), risk avoidance (S4, S17), workers' training (S5, S9, S11, S12, S13), workers' professional knowledge (S16), facilitating real-time collaboration (S15), support for knowledge management phases (S10).

There are also several weaknesses of mobile technology that might influence its applicability, especially connected with lack of reliability (a risk of losing the connection to the Internet: W1), lack of enough functions (W2), the possibility of unauthorized access to the data available via mobile (W3), and reduction in productivity caused by workers' distraction by activities on social media during work time.

However, mobile technology provides new opportunities for organizations that have not been yet fully investigated. Among them are the possibilities of business process enhancement via development of new business models that embrace the mobile technology, business intelligence, and Internet of Things concepts.

It should be noted that mobile technology, as every technology, might influence people's lives in a way that still remains to be investigated. One of the issues that has been already mentioned in this context is techno-stress. It might result in psychological and behavioural disorders, productivity reduction as well as reduction in job and life satisfaction (La Torre, et al, 2018). The other important issues are connected with breaching the workers' privacy, and the possibility of constant monitoring of workers' activities.

CONCLUSION

On the basis on the extensive literature review concerning the different views on the "mobile device" definition, we defined mobile device as "a portable, wireless computing device, possible to carry without additional equipment and small enough to be used while held in the hand ".

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The conducted preliminary SWOT analysis of the usage of mobile technology in knowledge providing in organizations provides an overview of current benefits, weaknesses and future opportunities and threats of this technology. It seems that the benefits and future opportunities of mobile technology prevail on weaknesses and threats, however this issue calls for further research.

In future research we would like to conduct a systematic literature review that will provide a full picture of mobile technology in providing knowledge in an organization.

ACKNOWLEDGEMENT AND FINAL DISCLOSURE

This research has been financed by the funds granted to the Faculty of Management, Cracow University of Economics, within the subsidy for maintaining research potential.

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Implementation of a gamification koncept for elearning

by

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ABSTRACT

The economic growth and competitive ability of industrial countries depends on the availability of high qualified engineers. In the current high global economic competition, the key competitiveness success factor for any industrial nation is the ability to both generate ideas and translate them into innovative products and services. That ability is most entrenched in and acquired through achievements in STEM (Science, Technology, Engineering and Mathematics) making it a critical component for competitiveness. Industrial countries need a large number of young citizens well-educated in STEM. However, the interest of young people in STEM is low. The question here is how to make technical subjects more interesting for young people. To awake the interest in the university is obviously too late. It seems to be natural to start with it already at the school time. However, the challenge has multiple facets as the problems to solve are social, educational and technical. One possible solution is to adapt gamification elements in the education. This paper presents the implementation of the gamification concept that is developed for the hybrid e-learning platform STIMEY.

Under the gamification we understand the use of game design elements, like points, levels, badges, etc. in a non-game related context, like health marketing, online communities or education. The aim of the gamification concept developed for the STIMEY-platform is to motivate users (young people in age between 10 to 18 years) to be active in learning. The motivational effect is reached through a point system that rewards user activities on the platform. For this the user activities are monitored while using the STIMEY-platform. The gamified activities will be forwarded onto a queue within a messaging service. The

application will listen to this certain queue and recognizes the user activity. Databases will be taken into consideration to check how many points are assigned to the executed activity and if limitations are given for this specific activity. In that way students can be motivated to be active on the platform. The activities are connected with learning. With the earned points the students may get some benefits, e.g. an access to games or other benefits. The earned points are visualized. This allows students to follow up their own development in form of points. This additionally motivates students to be even more active on the platform.

In this work we demonstrate a prototypical implementation of the gamification concept of the E-Learning platform STIMEY. For the implementation the gamification development process was adapted. The phases are:

Business Modelling: In this phase all parties involved in the development process are shown which processes should be gamified within the project. The goal of this phase is to provide a general understanding of these processes, including benefits and shortcomings. In addition, the general objectives are identified; these include the group of end users to be addressed, as well as other important variables to consider. The group of domain experts is responsible for this phase.

Requirements: For the requirements, the respective use cases are analysed based on the project goals. The target group identified in the Business Modelling phase must be analysed for motivation, attitudes and participation. This analysis can be accomplished through personal interviews or questionnaires. Participants in this phase are gamification experts, domain experts, business experts and the end users, or a subset thereof.

Design: The design phase is mainly concerned with the requirements for a promising gamification design, with which all those responsible are satisfied. This phase can be run through several times, for example, if not all parties agree with the current design. Once a uniform design has been approved, a prototype is created to test the gamification. This

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prototype can either be roughly implemented, with the help of IT experts, or initially performed without any implementation. By consultation with the end users, then if necessary, the previous design can be adjusted. Responsibility for this phase lies with the gamification experts.

Provisioning: In this phase, the gamification design and the requirements of IT experts are used to analyse the market for existing and suitable software solutions in the area of gamification. The decision on the appropriate software is influenced by the technical requirements of the existing IT infrastructure, the gamification design and all other requirements that were set in the previous stages. The result of this phase may well be that it is decided to implement the gamification software itself. In this case, the result of this step also includes the consideration of the given resources, which may need to be additionally provided to ensure a successful implementation.

Implementation: After the procurement phase, IT professionals are responsible for uniting, deploying and integrating all components for the gamified system. In the event that the previous phase has resulted in using an existing solution, the integration of the new software into the existing processes, with the respective gamification solution, will be carried out in this phase. In the previous phase, if the use of existing software was denied, IT professionals at this stage are responsible for implementing the gamification design themselves.

Test: The test phase combines all the test objects of the previous phases and checks the implemented prototype for fulfilment of all requirements and prerequisites, both on a technical and non-technical level. At this stage, domain, gamification, business and end-users are responsible for the non-technical testing and the IT technical experts.

Deployment: Once all tests have been successfully completed, the IT experts are responsible for the final use of the software. The software will be integrated into the IT landscape and made accessible to all end users.

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Monitoring: In the context of gamification, the end is not reached after the deployment phase. The primary component of this phase is the control of the applied gamification. User data must be collected and analysed in order to understand whether the goals set are achieved by gamification. It may be necessary to adjust the software over time to evoke an improvement, which will start the entire process from scratch.



Figure 1: The Gamification development process according to Herzig 2014

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Effects of using English in business communication in Polish-based corporations

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ABSTRACT

Polish companies tend to become more international and become increasingly involved in global business. It has become more and more popular in Poland to use English. Recently, English has been recognized the official language of some Polish corporations. English is not used for international operations only but it is required in almost all functions.

English has an undeniable role as the lingua franca of global business. Employing English is no more a choice but necessity for companies trying to compete in international markets. Yet, the effects of English in business communication have not been examined much until recent years.

The objective of this research is to analyze the effects of employing English in Polish-based corporations. Employing qualitative research method, the empirical part of the research involves a two-step study concerning three interviews and a questionnaire. Participants were chosen from four Polish-based corporations.

Three main topics are presented in the study. Firstly, the concept of language skills in crosscultural business communication is examined. Secondly, the effects of exploiting English in Polish companies are investigated on two levels comprising individual and company levels. On individual level, it is presented how employing English influences job performance, and how English language skills shape career development in Polish corporations. On company level, it is tested how the corporate strategy can support effective use of English in Polish companies.

There were two main findings in this study. Firstly, English language skills can contribute to better job performance and promotion in Polish-based corporations. Employees with English

language skills appear to have better opportunities for promotion and overseas assignments, and have wider career choices. On the other hand, employing English can make communication slow, create misunderstanding, frustration and barriers for employees with poor language skills. Secondly, it was observed that the company strategy has a vital role in supporting effective business communication in English.

In summary, by presenting a qualitative study of Polish-based corporations, this research tries to contribute to better understanding of effective business communication. The role of language cannot be left aside, since effective cross-cultural business communication can result in Polish companies' success in today's multicultural business world.

Keywords: cross-cultural communication, corporate language, English language in business
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The concept and testing of the mental calculator for flexibility training In mental calculation

by

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ABSTRACT

Because of the rapid development of science and technology, there is a great supply and demand gap in human resources, especially in science, technology, engineering and mathematics area (Alexa J. & European Schoolnet, 2015). Faced with this grim situation, it is necessary for the government and educational establishment to find a way to motivate students to learn and improve their performance in STEM (Science, Technology, Engineering, and Mathematics). In STEM learning, mathematics ability is important and basic, especially mental calculation ability. The flexibility of mental calculation strategy is the main factor of efficient and accuracy of approach the calculation problem. This work researches how to motivate students in mental calculation and train their flexibility in mental calculation. According to the research and analysis, a design for a novel mental calculation tool – the "Mental Calculator" – will be presented. This mental calculation tool is not only a tool for training but also an assisting tool for teachers/parents to teach their children mental calculation strategies. The major goal of this tool is to motivate students to train their flexibility in mental calculation. In order to prove the influence of different elements in Mental Calculator, a test was conducted.

Keywords: Students, Mental calculation training, Flexibility, Mental calculation strategies, Motivation, Gamification in eLearning.

INTRODUCTION

The latest global rankings on student PISA (Programme for International Student Assessment) show that the performance in science and mathematics of most European students is worse than the students from East Asia.

Mathematics can be applied in all fields of science, so naturally it can be said that mathematics is the mother of all subjects (Kumar, 2012, p.23). Students begin to learn mathematics with counting numbers and doing the basic calculation. Counting and calculating number is considered as the first step in learning mathematics. So, training calculation for improve mathematics ability is meaningful.

According to Pauli (1994) students can improve their speed and accuracy in mental calculation by regular training. To examine the effects of regular training on the mental calculation, a mental calculation tool is designed for students training their computational abilities, especially the flexibility in mental calculation - although there are already many free-of-charge training applications available. But these applications often have different strengths and weaknesses. The design of this work has learned from the strengths and avoids weaknesses of these applications.

BACKGROUND AND RELATED WORK

The skills in science, technology, engineering and mathematics (STEM) are becoming an increasingly important part for basic literacy in nowadays' knowledge economy (Man, Goździk, Korda & American Systems Sp. z o.o., 2016). The education in science field can no longer be treated as only elite training for future scientists or engineers. The knowledge in science field should be supposed to be viewed as the key factor of Europe growing. There is a need for one million additional researchers by 2020 to keep the Europe growing (European Schoolnet, 2016).

The importance of the mathematics ability for science was described by Roger Bacon "Mathematics is the gate and key of the sciences." (Kline, 1969) This means that without the mathematics ability people cannot even enter the world of science. From this we may safely draw a conclusion that mathematics ability is the basic ability for science learning. And if the young people want to improve their performance in science, they have to first heighten their ability in solving mathematics problem. However, students are easily getting bored with learning the knowledge in science, technology, engineering and mathematics field. Moreover, millions of students buy smartphones and tablets for games or social, but they don't pursue the necessary skills to build them (Ohio Mathematics Steering Committee, 2014). Faced with such a grim situation, it is necessary for the government and educational establishment to find a way to use Internet for motivating to learn mathematics and improve their mathematics performance. As the first step of learning mathematics, mental calculation training is a way to improve students' mathematics performance.

Over the last decades in many countries in Europe, major changes in mathematics program for primary and secondary education have been made (Lemonidis, 2016). For example, in Greece, mental calculation is being considered as part of the Cross-Curriculum Framework.

CONCEPT OF MENTAL CALCULATOR

By research on existing similar tools, the top 3 calculation training tools were identified: "Math Trainer", "Practice mental arithmetic", and "Case Mathe - Trainiere Kopfrechnen" (German). Learned from their strong points and to avoid their weaknesses, the concept of Mental Calculator is made and will be described more in detail in following subsections.

MENTAL CALCULATION QUESTIONS

Mental calculation is calculation done mentally and using strategies. It produces a precise answer. Usually it takes place without the use of external media such as paper and pencil (Lemonidis, 2016). Calculation question consists of numbers and operation. The difficulty of calculation question depends on number and operation. In Mental Calculator, the four basic operations (Addition, Subtraction, Multiplication, and Division) will be included and the numbers which will be calculated will be leveled as well. So that Mental Calculator can provide user different calculation questions for different level.

GAMIFICATION ELEMENTS

Learning can be fun if people find their interests. Advancing skills can be fun if people find a suitable training tool. Even making mistakes can be fun if people can learn from them. Clearly there are supposed to be a way to help students learn from what they do best – play. And this idea, to put gamification elements in learning, is now called "Gamification of learning". The goal is to maximize enjoyment and engagement through capturing the interest of students and inspiring them to continue learning.

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Gamification of learning is about more than just playing games. Gamification is the applying game elements in non-gaming systems to improve user experience and user engagement, loyalty and fun (Deterding, Sicart, Nacke, O'Hara & Dixon, 2011, p.1). In education field, gamification comes down to the use of points, badges and rewards to motivate students and keep their motivation. In the gamified training process students' skills will be enhanced.

GAMIFICATION ELEMENTS IN MENTAL CALCULATOR

Gamification is the addition of game-like-elements, also called game mechanics, in nongame settings. Game mechanics can be classified as self-elements or social-elements. The Following elements will be applied in Mental Calculator. Self-elements get students to focus on competing with themselves and recognizing self-achievement (W. Huang and D. Soman, 2013). Social-elements put the students in a community with other students, and their progress and achievements are made public (W. Huang and D. Soman, 2013).

TRAINING DURATION

Time Restrictions is one of the self-elements. Mental Calculator is a tool to train students' calculation ability. It is unavoidable that the training process can be a little bit boring even if it is gamified. Therefore, the daily mental calculation training will not last for too long time. There will have a countdown timer to remind the students how long they must do the training.

PROGRESS MECHANICS

A way to encourage students to learn and train mental calculation is by collecting points. The assumption here is that students will work harder in exchange for points. It is a simple way that occasionally works to motivate those students, who like treating the game as a competition against other students. Explicit and frequent feedback is a key element in most good game design, and points provide feedback quickly and easily (K. Werbach, D. Hunter, 2012).

In addition, students are usually curious about their progress and whether they improved their mental calculation ability. Thus, it's important for students to check their training progress in a visual way. Every time when the students have done mental calculation training, their score will be recorded, and they can also view and check their scores in visual way.

IMMEDIATE FEEDBACK

Immediate feedback is an important part in gamified Mental Calculator. In training process when students complete one question, they can check the correct answer. And the Mental Calculator will give students an immediate feedback on the checked question. With the immediate feedback students can timely adjust their training status, for instance be more concentrated on the questions or analyze questions detailed to choose more suitable calculation strategies.

SOCIAL CONNECTION

In gamified Mental Calculator social connection is also important. Students' level, points and progress will be documented in the Mental Calculator application. Students might often want to know where they stand relative to other students. There is leaderboard to show students' point and amount of solved calculation problems. Additionally, the Mental Calculator allows students to participate at different times. This encourages students to participate and does not make them feel like they cannot catch up and lead.

MENTAL CALCULATION STRATEGIES

Mental Calculator is supposed to be a tool for students to do mental calculation training. It will be an assistant tool for teachers or parents to teach children calculation strategies as well. Some approaches used by children when calculating mentally involve a flexible and inferential use of number knowledge. These approaches are often called 'strategies' (Threlfall, 2008, p.1). To learning and training mental calculation flexibility, children should master holistic calculation strategies. The mental calculation strategies must be possible to characterize, as general types, a range of what might be done. For instance, for additions, there are several different types of strategies, like "Close to the doubles", "Use of the 5", "u- 1010", "N10", "N10C(Compensation)" and so on. Only when students learned holistic and suitable calculation strategies, then students can compare which strategies are more effective for particular problem with different types of numbers. It is impossible to solve problem in different ways. Mastery of mental calculation strategies is almost the foundation of flexibility in mental calculation.

Based on the character of the particular problem, flexibility means that children are able to choose mental calculation strategies to solve the calculation problems (Threlfall, 2002, p.1). In addition, there are many variations on strategy, all based on a similar concept but relying on

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children's inventive, creative and innovative interpretations as witnessed in the mental calculation (Macintyre & Forrester, 2003, p.54). It is no doubt that everyone who does mental calculation even the master will meet different difficulties. Sometimes just because they get anxiety in particular situation like test and competition. As a training tool, it is necessary to provide some suitable strategies to solve the calculation problem.

TEST

In current study, we test the above aspects of design of Mental Calculator for researching user acceptance and which aspects could trigger students' interest in mental calculation. This evidence could contribute to the decisions that will improve the Mental Calculator.

The first user testing session was conducted during the STIMEY Festival. Participants were 66 students (34 females) from Greece and Germany (Mean age 10.91, SD = 2.29). The experiment took place during a 50 minutes session, where students engaged with the Mental Calculator. After engagement with the application, students completed an online questionnaire for assessing participants' subjective experience related to a target activity. Moreover, participants asked to denote their subjective experience about the likeability, use, and usability of different aspects of the MCT. Most data from the questionnaire was collected using in a seven-point Likert type scale (1: strongly disagree to 7: strongly agree).

Following figure shows the diagram of the question "Do you like the design of the program?". By analysis of this question, it was concluded that most of the students have good impressions of the Mental Calculator, about 80.30% (Answer "1" for "No, I don't like it" and "7" for "Yes, I like it").



Figure 1: User acceptance of Mental calculator

The question about training duration "Do you think that three minutes is a good length for a session in the mental calculator program?" revealed the users' acceptance on the session duration. Answer "1" for "Can be longer", "2" for "Right duration" and "3" for "Can be shorter". The positive results can be seen in following figure.



Figure 2: Question about training session duration

As for the question about social connection: "Are you happy seeing which of your friends has the best results in mental calculation?", we can know that most of the students are curious about performance of other students(Answer "1" for "No, I don't want" and "7" for "Yes, I really want

to see"). They want see which of their friends has the best ability in mental calculation. Figure 3 shows users' answers of this question.

The design of the Mental Calculator and the competition aspects contributed to the perceived value of the Mental Calculator, while the competition contributed to their perceived interest.



Figure 3: Question about social connection in Mental Calculator

CONCLUSIONS

To summarize, the importance of learning mathematics and the meaning of training mental calculation ability are elaborated. With regular training, the flexibility in mental calculation is expected to be improved; children are expected to find the more appropriate solution in particular problems more and more efficient. As many gamification elements are used in Mental Calculator, the gamifications elements are supposed to motivate students learn the strategies and do mental calculation regularly.

In addition, with the help of holistic strategies and inventive, creative and innovative interpretations of particular calculation problems students ought to understand the question deeply and choose strategy more efficiently. And finally improve their mental calculation ability and the skills in other disciplines like science, technology and engineering.

According to the results of first test, the implications for the design of the current application, emphasizing the importance of learning and competition aspects for the Mental Calculator. Moreover, they pointed out some weakness of the Mental Calculator. This helps us to improve it further.

ACKNOWLEDGMENT

This project has received funding from the European Union's Horizon 2020 Research and Innovation Program under Grant Agreement N° 709515 — STIMEY.

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The mediating role of emotions and cognition between participation in social media communities and building trust of the brand

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ABSTRACT

No Fluff Jobs (NFJ) is an IT industry leading job posting web portal in Poland, also offering a variety of everyday products, under its own brand on the No Fluff Coder (NFC) commercial online store. NFJ is available to be followed on social media channels such as Facebook, LinkedIn, Instagram and many more, providing job offers, publishing up-to-date content, sharing facts and opinions with the users, as well as with its customers. However, content makers and company managers have limited understanding how social media affect their trust and intention to buy. To fill this gap, we investigated 146 (114 males and 32 females) NFJ portal users in order to observe the impact of organization-created social media content on brand trust (BT) and purchase intention (PI) by using a standardized online survey, available online from May to August 2018. To test the conceptual model, we applied partial least squares (PLS) method to construct and estimate the multivariate structural model in order to explain the behaviour of respondents by extracting underlying latent factors. The empirical results show that following NFJ on social media facilitates the connection with the employees from IT sector and determines their intention to following NFC on social media. The mediating variables in building trust and purchase intention have cognitive attitude (CA) and emotional attitude (EA). In conceptualizing the construct of brand trust we considered four latent factors, namely: job application intention (JAI), service interaction intention (SII), job recommendation intention (JRI) and content recommendation intention (CRI). The main conclusion from the study show the importance of social media in building brand trust and creating purchase intention, necessary

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to maintain current and acquire new followers and customers who eventually determine the existence and further development of NFJ and NFC.

Keywords: Social Media, Brand Trust, Purchase Intention.

INTRODUCTION

In 2018, global audience of social network (SN) surpassed 2 billion users, and currently the global average penetration rate is 37 percent (Statista 2018). In 2017, an average user spent more than 2 hours per day on messaging services and social networks (each day half an hour longer than five years earlier), which in total to about one third of the entire daily computer time (Baccarella et al. 2018). While the Internet is the main source of information, then social network sites (SNSs) plays a dominant role in the maintenance of relationships (Steinfield et al. 2008) and information sharing among the population of users (Kim et al. 2012). It has been recognized that information disseminated among social network users can build (Ha 2004; Hajli 2014; See-To and Ho 2014) or undermine trust in the brands (Charki and Josserand 2008; Dimoka 2010; Marineau et al. 2018). Indeed, 81% of online consumers rely on information published on blogs, and 61% of U.S. online consumers have made a purchase based on recommendations from a blog (Liedke 2018). On the other hand, a brand trust has a significant direct effect on purchase intention (Sichtmann 2007; Hajli 2014). An important factor in performing successful in technology industry is to increase the pursuit intention of a variety of potential high-tech job seekers (Tsai et al. 2015). In essence then, a question arises, what individual intentions are being created while interacting with trusted brand within social media channels?

While the managers in social media contexts have been asking themselves and other employees to find rationale for expenses related to the social media activities, then the content marketers can "only" prepare and release detailed reports with rigid statistics and fancy charts. Yet, the dozens of these analyses and figures have not provided the answer about the benefits of social media based brand communities (SMBBCs), but they do agree on several points. First, social media channels facilitate the dissemination of information quickly and to a vast audience (McKinsey Global Institute 2015); second, requiring social engagement (Dunu and Uzochukwu, 2015) increase users' perceived quality of interaction (Haiying and Guoliang 2012); third, direct interaction support the creation and development of trust in the brand (Liao 2015). Indeed, one

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marketing objective is to gain users' trust in the brand (Habibi et al. 2014). Therefore, knowing if/how SMBBCs influence brand trust is essential for marketers. In addition, this might be valuable to managers because measuring return of investment (ROI) in social media is a challenge for them and one possible way of measuring ROI is to carefully examine what kind of "marketing objectives" the social media activities would satisfy (Habibi et al. 2014). However, to the best of our knowledge, few studies have explored the impact of social media in building trust in the online recruitment industry.

Recruitment "includes those practices and activities carried out by the organization with the primary purpose of identifying and attracting potential employees" (Breaugh and Starke, 2000), and recruiting is "the process of employing new people to work for a company or organization" (Cambridge Dictionary 2018). In case of using electronic resources (Parry and Tyson 2008), particularly the Internet, by both recruiters and job seekers, the term is defined as the online recruitment (OR), e-cruiting, cybercruiting, or Internet recruiting, which imply the formal sourcing of job information online (Galanaki 2002). The advantages of OR over other methods, commonly concern relatively lower cost, shorter recruiting cycle time, better quality of response, attracting the passive job-seekers, and opportunities to address specific labour market niches (Galanaki 2002; Liljander et al. 2002; Parry and Tyson 2008). The online recruitment is one of the fastest growing groups of recruitment (Woźniak 2014). The most common OR models are (Galanaki 2002): (1) to use a media site (advertisement appear similarly and simultaneously with traditional printed newspaper, (2) to add recruitment pages to the existing organization site, and (3) to use Web sites specialized in online recruitment, while those sites act as proxies that connect the companies with potential applicants. The interest of this study concern only the last model.

This research answers the call to examine the role of social media in the context of building the trust in the brand which aims to contribute to the management and marketing literature by addressing two research questions. First, what are the roles of emotional and cognitive attitudes in explaining relationships between participation in social media communities and building trust of the brand. Second, to what extent the following an on-line store on social media channels is related to the purchase intention. Our study aims to fill existing gap and enhance our knowledge about the roles of these attitudes in the successful implementation of social media channels. The rest of the paper is organized as follows. Section II provides a theoretical background to research questions. In Section III, we outline methodology of study design, followed by the discussion of the obtained results. Finally, we conclude the paper with closing remarks and open questions for future research.

THEORETICAL BACKGROUND

The background to the explanation of the observed results in our study is the theory of social identity (Tajfel, 1974), and the social capital theory (Bourdieu, 1986). According to the theory of social identification, users join the community to satisfy the need for identification with symbols or a group members. This broadens their concept of their own identity, and releases the motivational force resulting from the need for identification manifests itself through participation in the company's community (PC). On the other hand, the social capital theory predicts that users strive for a certain type of economic value by establishing contacts with other members of the community and follow them. The motives and benefits of social identification and benefits in today's dawn are focused around social media. While social media (SM) is "a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of user generated content" (Kaplan and Haenlein, 2010). Social media is good foundation for creating narrations and leveraging situations for building trust toward the company among users.

Brand Trust (BT) in turn is defined as "the willingness of the average consumer to rely on the ability of the brand to perform its stated function" (Kabadayi and Alan 2012). In the commitment-trust theory of relationship marketing (Morgan and Hunt, 1994), trust is a key variable in the development of long-term relationships. To earn trust, brands must create an emotional relationship with their customers through actions that inspire them and align with their values. Brands that forge strong relationships and build trust with their customers earn their loyalty (Chase 2017). Loyality can be expressed by appropriate intentional behaviors like different behaviours in different manner toward brand. To explain some antecedents of the specific behaviour related to the brand trust we used simple intention variables. People, despite unexpected events, usually act accordingly to their various intentions. Due to The Theory of Planned Behavior (Ajzen 1985), the intention to perform a specific behavior immediately precedes real behavior. If a person does not behave as intended, it means that the intention has changed, for example, due to the passage of time, new information or unexpected events (Ajzen

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1985, 1991). Ajzen distinguishes three factors determining the intention: attitudes towards behavior, subjectively perceived social norms of behavior and perceived control over behavior. In the present study we tested only attitudes as antecedents of different behavior intention. Intention defined in this way is a willingly used indicator of the willingness to buy in consumer research and various behaviors in every context of the social and personal life (Ajzen, 1991; Schwarzer, 2008). Due to the measurement of different intentions of behavior in this article, we will use the concept of intention to predict the following spectrum of intentional behaviors: Purchase intention (PI), job application intention (JAI), service interaction intention (SII), job recommendation intention (JRI) and content recommendation intention (CRI). In relation to intentions, we also use their direct antecedents, distinct type of the attitudes. Cognitive attitude (CA) and emotional attitude (EA) towards objects that involve personal disposition towards them are an important part of both psychology and also consumer behavior. In the concept of Allport (1935), attitude refers to the preparation to encountering certain objects, people, products, and events. Ajzen (1985) and Bocian et al. (2018) characterize attitudes as an instruction by which a person reacts positively or negatively to persons, objects or behaviors. Breckler (1984) distinguishes three components of such attitudes (cognitive, emotional and behavioral). The cognitive component (knowledge) reflects the openness to the product and knowledge about the product or its quality. They have the form of beliefs (correct or not) that the consumer has about the product, brand or service. The emotional component (feelings) refers to the sentiments and feelings towards the object, which may be good or bad, pleasing or unpleasant. Feelings, impressions, moods, and emotions directed to the product are this part of attitude. On the other hand, the behavioral component (action) refers to the action tendencies or the willingness of the person to behave towards the object in a certain way. Attitudes determine many behaviors, e.g. moral assessments of other people (Bocian et al., 2018), having a new child (Ajzen 1985, 1991), buying organic cosmetics (Mombeini, Sha'abani, Ghorbani, 2015), environmentally friendly products (Chirag Malik 2006), and animals (de Graaf et al., 2016).

In the model of predicting trust of a given company, we operationalize that trust like the width of the spectrum of behaviors manifested by people directed to the content of the company in social media, their strength, and the promotion of these content outside the context of social media. We anticipate that trust in the company is determined by mutual building relationships and maintaining a bond between users and a website that builds its image in social media. This phenomenon occurs due to the ongoing cascade of interaction between users responding to the

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specificity of content in social media of this company and its responses to their reactions. This interaction is constitutive for the trust of the company, because it creates the momentary possibility of manifesting personal feelings towards the company, as well as formulating beliefs about it. These in turn are the fundamental determinants of various intentions, and then behaviors related with this company. Intentions to behave directly prove trust in the company because users guide their intentional behavior towards it accordingly with what they feel and what they think about it.

METHODOLOGY

This study combined phenomenological and quantitative approaches. The underpin of the former is to understand, through systematic analysis, individuals' structure of conscious actions driven by their own personal accounts rather than through theoretical structures imposed by the researcher.

Subject

The subject of the research is chosen as No Fluff Jobs (NFJ), being one of the fastest growing online recruitment agency in Poland, strictly devoted to the IT sector. The core service of the (NFJ) is an online recruitment service that acts as an intermediary between recruiting companies and job applicants by posting companies' job announcements and collecting applicants' records. So far more than 1,5 thousand organizations have been the NFJ clients, submitting more than 10 thousand job posts (Wirtualne Media 2018). NFJ is available on social media channels, having its profile on Facebook, Twitter, Instagram, LinkedIn, Google+ and YouTube, writing its own blog. In total, they have generated almost 22% of NFJ web traffic, which stands for over 240k visits from May to July 2018 only from desktop computers (SimilarWeb 2018). In 2018, based on Google Analytics the monthly average is over 700k, which 33% concern all social media channels. The Facebook NFJ fan page have gathered over 27.5k followers, the Instagram is being followed by 1,3k users, and the Twitter account has attracted over 3k observing users.

In June 2016 NFJ has set up its own an on-line store, namely No Fluff Coder (NFC), which sells unique daily use products like cups, t-shirts, socks, blankets, and coffee as well. So far, in total over 1,5k clients have bought products. In September 2018 the Facebook fan page

has gathered over 1k followers, and mainly serves to present the line of the products, while both on Instagram and Twitter NFJ announces new promotions and discounts.

Sample

In the study took part 146 people (32 women). In the 18-24 age group there were 38 people, 24-30 were 76 people, 31-36 were 22, and 36+ were 10. In the IT industry there were 112 people working and 34 were outside IT.

Measures

The survey was prepared in Polish and then translated into English. We also conducted a pilot test with three students and three academics to improve the clarity of the survey instrument and eliminate any misconceptions and typos. All the measures used in this study were adapted from well-established scales that have exhibited high reliability and validity. In the appendix, a list of items for all the multi-item measures are given.

RESULTS

In order to verify the predictions, the structural equations modeling analysis was performed using the PLS method in the WarpPLS program (Kock, 2010). The analysis consists in verification of causally effective and linear relations between latent variables, reflected by measuring test items of the questionnaire. Analysis of fit of the data to the created model showed that the collected data are strongly fitted to the path model GoF=0,44 (Pearl, 2009), there was neither collinearity between the variables used in the model AVIF=1,80 nor in the measurement model of latent variables AFVIF=2,47 (Kock & Lynn, 2012; Kock & Mayfield, 2015). Analysis of Simpson's paradox coefficient showed that the studied path relations between variables corresponded to the expected directions SPR=0,92 (Kock Ned, 2016). Analysis of the statistical coefficient of suppression showed that the path values corresponded with the values of independent correlations between pairs of variables SSR=0,89. The discrepancy between the theoretical measurement model of the variables studied and their empirical variability ranged from 9 to 11%. The coefficients of this discrepancy were respectively SMAR = 0.09, SRMR = 0.11, which indicates the goodness of fit (Iacobucci, 2010). The shape of the model is shown on Figure 1, and the assessment of the goodness of fit is presented in Table 1.

Fit indicators of the path model	Fit indicators of the measurement model
AVIF=1,80	SRMR=0,11
AFVIF=2,47	SMAR=0,09
GoF=0,44	-
SPR=0,92	-
SSR=0,89	-

Table 1. Fit indicators empirical data to the structural PLS model.



Fig. 1. The tested model of relations between variables.

SEM-PLS model interpretation

Analysis of composite reliability coefficients showed that the measurements of the variables were accurate CR=(0,71-0,95). The variance inflation coefficients did not show significant collinearity between variables in the path model VIF=(1,23-4,01). The results are presented in the table No. 3The analysis of path factors showed that the NFJ tracking on Social Media was significantly related to the NFJ bond β =0,26;p<0,001, and tracking of the NFC store β =0,36;p<0,001. In turn, the bond with NFJ was associated with an increase in cognitive β = 0.43, p <0.001 and emotional attitude β = 0.47, p <0.001 toward NFJ, intent to interact with NFJ β = 0.36, p <0.001, recommended content and materials made available by NFJ β = 0.24, p

<0.001, as well as purchase of items in the NFC shop $\beta = 0.14$, p <0.05. On the other hand, tracking the NFC store did not have much to do with NFC-related behavior. Keeping track of the NFC store was associated only with the intention of buying items in the store $\beta=0,18$;p<0,05. The analysis of the model showed significant and fundamentally different roles of the types of attitudes resulting from the relationship with NFJ. The cognitive attitude was very clearly related to the intention of seeking a job through NFJ $\beta=0,48$;p<0,001, and the emotional attitude was clearly associated with the recommendation of other people to work by the NFJ portal $\beta=0,61$;p<0,001. In the case of other variables, the analysis showed weaker relationships based on the fact that the cognitive attitude was related to the willingness to interact with NFJ $\beta=0,29$;p<0,001, recommending a job search by NFJ $\beta = 0.24$, p <0.001, as well as recommending content and buying products in the NFC store $\beta = 0.22$, p <0.001. In the case of an emotional attitude, similar directions of relationship and strength of relationships were obtained. The results are presented in Table 2.

Table 2. Values of path coefficients of studied direction of relations between variables (β), their significance (*p*) and strength of relations (R^2).

	β	р	R^2
Follow NFJ in SM \rightarrow PC - NFJ	0,26	<0,001	0,07
Follow NFJ in SM \rightarrow Follow NFC in SM	0,36	<0,001	0,13
$PC - NFJ \rightarrow CA - NFJ$	0,43	<0,001	0,18
$PC - NFJ \rightarrow EA - NFJ$	0,47	<0,001	0,22
$PC - NFJ \rightarrow JAI - NFJ$	0,09	0,134	0,03
$PC - NFJ \rightarrow SII - NFJ$	0,36	<0,001	0,20
$PC - NFJ \rightarrow JRI - NFJ$	0,00	0,495	0,00
$PC - NFJ \rightarrow CRI - NFJ$	0,24	0,001	0,11
PC - NFJ \rightarrow PI in NJC	0,14	0,04	0,05
Follow NFC in SM \rightarrow CA - NFJ	0,01	0,438	0,00
Follow NFC in SM \rightarrow EA - NFJ	-0,05	0,289	0,00
Follow NFC in SM \rightarrow JAI - NFJ	-0,11	0,097	0,01
Follow NFC in SM \rightarrow SII - NFJ	0,01	0,439	0,00
Follow NFC in SM \rightarrow JRI - NFJ	-0,02	0,39	0,00
Follow NFC in SM \rightarrow CRI - NFJ	0,04	0,319	0,00
Follow NFC in SM \rightarrow PI in NJC	0,18	0,012	0,04
$CA - NFJ \rightarrow JAI - NFJ$	0,48	<0,001	0,33
$CA - NFJ \rightarrow SII - NFJ$	0,29	<0,001	0,16

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$CA - NFJ \rightarrow JRI - NFJ$	0,24	0,001	0,17
$CA - NFJ \rightarrow CRI - NFJ$	0,32	<0,001	0,18
$CA - NFJ \rightarrow PI in NJC$	0,22	0,003	0,10
$\mathbf{EA} - \mathbf{NFJ} \rightarrow \mathbf{JAI} - \mathbf{NFJ}$	0,20	0,006	0,13
$EA - NFJ \rightarrow SII - NFJ$	0,15	0,032	0,08
$\mathbf{EA} \cdot \mathbf{NFJ} \rightarrow \mathbf{JRI} \cdot \mathbf{NFJ}$	0,61	<0,001	0,49
$\mathbf{EA} - \mathbf{NFJ} \rightarrow \mathbf{CRI} - \mathbf{NFJ}$	0,20	0,006	0,11
EA - NFJ \rightarrow PI in NJC	0,22	0,003	0,10

Table 3. Model summary and measurement properties of variables specified in the model.

	\mathbb{R}^2	ΔR^2	CR	α	AVE	VIF
Follow NFJ in SM	-	-	0,71	0,51	0,25	1,31
Participation in NFJ community	0,07	0,06	0,75	0,63	0,24	1,75
Follow NFC in SM	0,13	0,12	0,70	0,41	0,37	1,23
CA - NFJ	0,18	0,17	0,88	0,82	0,65	3,38
EA - NFJ	0,22	0,21	0,88	0,83	0,60	4,01
JAI - NFJ	0,49	0,48	0,87	0,78	0,69	2,10
SII - NFJ	0,45	0,43	0,92	0,89	0,70	2,93
JRI - NFJ	0,66	0,65	0,89	0,82	0,74	3,42
CRI - NFJ	0,41	0,39	0,95	0,92	0,86	2,30
PI in NJC	0,29	0,27	0,95	0,93	0,82	2,25

CONCLUSIONS

Analysis of the PLS structural model in which all relations between variables were controlled at the same time showed results that gave rise to confidence in the measurements and observed relations in the study. The statistical model showed that tracking a company in social media with job offers for IT employees is a prerequisite for participation in the NFJ community, as well as a condition for tracking their NFC gadgets store. Tracking, participating and maintaining ties in such a virtual community was associated with positive attitudes, i.e. beliefs and feelings towards the brand and the store. These in turn mediated in the trust towards the company manifesting itself in a wide range of behaviors. Favorable beliefs and positive feelings determined the interaction with the website (liking posts, comments), content of published materials (entries, links, news), and their recommendation. The unpredictable result was observed in clearly different meanings of attitudes in terms of two completely different behaviors. Favorable beliefs about the service were very much related to searching for a place of work in it. On the other hand, the warm and positive emotional reception of the brand was very

clearly related to recommending the website to other people looking for a job in IT. Apparently personal cognitive representations about the company are a stronger basis for showing confidence in the company as an intermediary in the search for work for themselves. However, your own feelings and emotions related to the company are also a carrier of trust towards her, but they determine her expression in relation to other people, for example, by recommending them work in her website.

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Appendix 1. List of items for all multi-item measures used in this study

Follow NFJ in SM (F)

F1. Facebook	F4. LinkedIn	F7. Twitch	F10.	Newsletter
F2. Twitter	F5. Wykop	F8. GitHub	F11.	Blog
F3. Instagram	F6. YouTube	F9. Snap Chat	F12.	Other
Participation in NFJ	community (P)			
P1. Contact with 1	P4. Contact with 4	P7. Contact with 7	P10.	Contact with 10
P2. Contact with 2	P5. Contact with 5	P8. Contact with 8	P11.	Contact with 11
P3. Contact with 3	P6. Contact with 6	P9. Contact with 9	P12.	Contact with 12

Cognitive attitude (CA)

- CA1. No Fluff Jobs' content on social media is valuable.
- CA2. No Fluff Jobs' content on social media is interesting and leading to reflection and discussion.
- CA3. The advertisement formula on No Fluff Jobs is transparent due to information concerning salary and full technology stack.
- CA4. No Fluff Jobs is a company that has changed the online recruitment standards for IT sector in Poland.
- CA5. No Fluff Jobs is a brand which can be trusted.

Emotional attitude (EA)

- EA1. No Fluff Jobs arouses positive associations in me.
- EA2. I like No Fluff Jobs.
- EA3. I like sharing information published by No Fluff Jobs (e.g. developers' salary reports) with others.
- EA4. It happens that I talk about No Fluff Jobs with others.
- EA5. I would not like the No Fluff Jobs to be closed.

Job application intention (JAI)

JAI1. I would use No Fluff Jobs in order to find a job.

- JAI2. Next time when I will be looking for a job, I would apply via No Fluff Jobs.
- JAI3. I would like to subscribe No Fluff Jobs in order to get job offers matching to my professional profile.

Service interaction intention (SII)

- SII1. I could be an ambassador of the No Fluff Jobs brand.
- SII2. I would like to participate in surveys and discussions published by No Fluff Jobs on social media channels.
- SII3. I would react using like button and other reactions to the posts created by No Fluff Jobs on social media channels.
- SII4. I would like to participate in competitions organized by No Fluff Jobs on social media channels.
- SII5. I would like to comment articles published by No Fluff Jobs on social media channels.

Job recommendation intention (JRI)

- JRI1. I would recommend job advertisement to a person who is looking for a job in IT sector.
- JRI2. I would recommend No Fluff Jobs to anyone who is looking job in IT sector.
- JRI3. I would recommend a colleague as the candidate for a job in a bonus premium system running by No Fluff Jobs.

Content recommendation intention (CRI)

- CRI1. I will recommend job posts published by No Fluff Jobs to people willing to find first job in IT sector.
- CRI2. I will recommend articles published by No Fluff Jobs to people willing to increase their knowledge about software development.
- CRI3. I will recommend articles published by No Fluff Jobs to people willing to increase their knowledge about IT sector.

Purchase intention on No Fluff Coders (PI-NFC)

- PI-NFC1. I would like to buy myself a software-oriented gadget in No Fluff Coder store.
- PI-NFC2. I would recommend to buy a software-oriented gadget to my friends in No Fluff Coder store.

- Hryniewicz, WeichbrothThe mediating role of emotions and cognition between participation
in social media communities and building trust of the brand
- PI-NFC3. I would buy a software-oriented gadget for my friend (e.g. as a gift) in No Fluff Coder store.
- PI-NFC4. I would like to drink from a cup with coding puzzle bought on No Fluff Coder store.

The Relation between IT Project Management and Creativity

by

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ABSTRACT

The ongoing observion of a low percentage of successful IT project implementation and of the use of the functionality of IT systems in organizations leads to a multidirectional search for the causes of this phenomenon and the possibility of change. Due to the fact that technological progress in IT projects is more and more dynamic and the business industry expects increased flexibility, solutions that are not supported by creative techniques will not be innovative and satisfying. The literature on this subject lacks detailed research on the actual use of creative methods by IT teams in project management, although there is a proven positive correlation between creativity with effective project management and overall organisational performance and customer satisfaction, which is crucial in the modern definition of a successful IT project. The article presents the results of a pilot study of IT departments in the Polish SME sector in the field of knowledge, experience, evaluation and application of creative methods in IT project management. The study allowed to conduct an initial assessment of the effectiveness of the studied creative methods and a selection of areas of their application in IT project management.

Keywords:

IT Project Management, Success Management, Creativity, TRIZ, Problem Solving

INTRODUCTION

The last few decades indicate an inseparable connection between innovative activities in business and the development of information technology (Hoque and Bruckner, 2011). That is why a systematic increase in the implementation of IT projects in companies is observed (The Standish Group, 2014; PMR, 2014). At the same time, there is a low percentage of IT project completed successfully, and there are problems with their adjustment to the real needs of the client and improper communication in the IT manager - IT team - client triangle (Gartner, 2014; PMR, 2014; The Standish Group, 2014). This has led both the business world and the science to multidirectional search for causes and solutions in this area. The main focus was on technical aspects and the methodology of project implementation, but nearly no improvement has been achieved in the results of the assessment of the success of IT projects. Reports on information systems show that in most enterprises only about 10% of the functionality of the programs is used in a significant way (Gartner, 2014). Business expects more and more flexibility from IT this is the opinion of international companies dealing with the most comprehensive IT solutions providing support for software management, incident management, problem management, configuration management, change management, version management and accessibility management.

Meanwhile, the perception of the success of an IT project has also changed from the classic design triangle (i.e. time, budget, scope) (Atkinson, 1999) to the narration of success and failure done by the client (Ika, 2009). In this situation, the right expectation of dialogue between the IT team and the client for a better matching of IT project products is growing. A dialogue of this type requires appropriate awareness, space and attitude of IT teams. This, in turn, requires going beyond the industry area and beyond the usual paths of thinking, standard procedures and solutions.

This is not easy, because there is a psychological barrier blocking flexibility and creative thinking. It is called "psychological inertia" or "vector of psychological inertia." Its essence is preference of past professional experience in the process of solving problems (Arciszewski, 2016). Psychological inertia is such a powerful mechanism that without appropriate techniques we are not able to overcome certain patterns and habits of thought.

Due to the above-mentioned problems of the IT industry, one should strive to find solutions that will make the process of IT project management more effective and its products

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more satisfactory to the recipients. Due to the existence of the vector of inertia, these solutions often lie outside the usual cognitive zone of people involved in IT Project.

THE ROLE OF CREATIVITY IN PROJECT MANAGEMENT

Cheng observed the differences between East and West in terms of culture, social organization, philosophical thinking, values and historical experiences. Based on the results of the research, he developed C Theory (Cheng, 1995), where *C* stands for *creativity*. This theory includes all valuable ideas about management and philosophy in the East and West. It consists of five mutually supporting elements, which include control, creativity, adaptability, personnel and decisions. I-Chan Kao in the article entitled "The application and practical benefits of C theory in project management" (Kao, 2017) presented an analysis of the correlation between project management using "C theory" and organizational performance.

To assess organizational performance, the BSC (Balanced Score Card) system was adopted (Norton and Kaplan, 1996). Harvard Business Review commented that BSC is one of the most influential strategy management tools. BSC is developed and successfully used today in various sectors of the economy around the world (Norton and Kaplan, 2001; Balanced Scorecard Institute, 2018). It covers four main dimensions: finance, customer, internal business processes, and learning and growth.

Studies have shown that the higher is the use of "C theory" in project management, the better is the organizational performance, while the creativity factor in project management and overall organizational performance has the highest positive correlation. Exploring this issue in more detail, in project management, among all the "C theory" factors, the creativity factor has the highest positive correlation with three of the four BSC dimensions:

- internal processes,
- customer satisfaction,
- finance control.

Additionally, the creativity factor has demonstrated the greatest predictive power in project management for the BSC dimensions such as customer satisfaction, and learning and growth.

The results of the above studies have shown a significant impact of creativity on project management and organizational performance, which translates into increased likelihood of project success. It should also be remembered that customer satisfaction is one of the main elements of the modern definition of project success, and here creativity has also shown the highest positive correlation and the greatest predictive power.

John C. Donovan, who for many years has been specialist in the subject of creativity, lists four rules for success in creativity:

- Recognize creative opportunities.
- Put an effort into creativity.
- Manage judgment (deferred judgment).
- Aggressively seek a quantity of ideas.

Most people see and apply only the last two of the four rules. They are well known in the form of "brainstorming" (Osborn, 1953). However, the first two are much more important for gaining success in creativity. Usually, problems that require creative solutions are solved by routine methods, are not considered as problems, or the possibility of solving the problem is not recognized.

Following this path of thinking, one can say that it is important to recognize the creative opportunities that are due to the mere existence of problems and to put effort into creativity. For this, however, one needs awareness and knowledge of creativity techniques. The presented results of pilot studies will show the state of knowledge, skills and experience in this area among employees of IT and PM IT units in Polish companies from the SME sector.

INVENTIVE METHODS

Until recently, the role of creativity in the organization has often been underestimated. If by any chance the creativity happened to be manifested by the employees, it was effectively suppressed or ignored by the actions of managers. The present 21st century has changed this attitude and creativity plays now the dominant role, being sometimes raised to a level higher even than technical knowledge (Belski, Adunka and Mayer, 2016). The importance of creativity is also confirmed by studies of the role of employee creativity during work in teams (Bai, Lin and Li, 2016).

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More and more often, creativity finds its application in organizations implementing longterm large-scale projects related to complex products. With such projects, multifunctional teams are created, which often experience a crisis in communication as early as at the stage of designing. At the same time, this crisis transforms into a chance to stimulate the creativity by different techniques and generate new technical knowledge that enables the implementation of the main objective of the project (Kazanjian, Drazin and Glynn, 2000).

Inventics is a methodology of searching for creative solutions, stimulating creative thinking in various fields. When a problem appears in the organization for which there is no ready solution, and the traditional methods and techniques used so far are not sufficiently effective, the situation may be solved by the inventic tools.

The first inventic techniques were derived from the methods of Socrates, Descartes and Pólya, representing a philosophical approach to the problem. In the modern literature of the subject, many different divisions of the inventic methods can be found. One of the divisions proposed by Koch (Koch, 2008a) divides the methods of creative problem solving into:

- intuitive creative, based on the subconsciousness, where intuition plays the main role,
- systematic analytical, involving the participation of a conscious rational process, much faster in the process of generating solutions than the previous one,
- mixed a combination of the aforementioned methods applied in order to increase the number of generated solutions.

Another division proposed by Crum (Crum, 1973; Knosala et al., 2014) divides creative methods into:

- techniques of free associations (e.g. brainstorming method, Gordon synectics),
- techniques of forced associations (e.g. the Delphic method, Six Thinking Hats of Osborn),
- analytical techniques (e.g. morphological analysis by Zwicky),
- checklists (e.g. Scamper, Osborn checklist).

A completely separate methodology is the Theory of Inventive Problem Solving, which is currently the most serious tool for solving problems that can not be solved by the previously mentioned techniques. This methodology, despite the death of its author, evolves all the time thanks to his followers and pupils.

RESEARCH PURPOSES

Based on the research background and motivation mentioned above, the following research objectives have been selected:

- Understanding the impact of the creativity factor in project management based on the correlation of the elements of C Theory with the performance dimensions of the BSC organization.
- Assessment of the creativity factor in the IT project management cells in the SME sector:
 - o assessment of experience and knowledge in the field of creativity methods,
 - assessment of the application of the proposed creativity methods in the management of IT project management.
- Selection of areas of application of the proposed creativity methods in the IT project management.

RESEARCH METHOD AND PROCESS

The survey was conducted in the first half of 2018. The research involved the employees of IT cells (including PM IT) from the SME sector. Sixteen organizations were examined. Employees of IT cells were introduced to the subject of the inventics through a lecture and workshop training on selected methods. Then they were asked to think together about the meaning of creativity techniques in their design work and to complete the questionnaire. The questions were grouped into the following areas:

- a. experience and knowledge of the IT team in the field of creativity methods,
- b. assessment of creativity methods,
- c. application of creativity methods in the IT project management.

The obtained results were subjected to statistical analysis.

SELECTED CREATIVITY METHODS

As part of the pilot study, training was conducted taking into account selected creativity methods. The techniques included brainstorming, six thinking hats, system analysis (TRIZ) and a new RCA+ (TRIZ) tool.

BRAINSTORMING

The brainstorming method was developed by Osborn. It is a typical quantitative method aimed at generating as many solutions as possible to a given problem for solving conflicts or making decisions in a group. Brainstorming increases the effectiveness of decision makers and diverts their attention from the stereotypical pattern of behaviour. Based on the qualitative research carried out by Sutton and Hargadon (Sutton and Hargadon, 1996), important effects of brainstorming in the organization were defined. These are:

- supporting the organizational memory of design solutions, providing diversity of skills to designers,
- providing diversity of skills to designers,
- supporting the attitude of wisdom (acting with knowledge while doubting what you know),
- creating the so-called status auction (competition for status based on technical skills),
- increase in the number of clients,
- increase in the company's income.

There are many brainstorming forms and varieties (Al-Samarraie and Hurmuzan, 2018) of carrying out the brainstorming sessions, such as traditional, nominal and electronic. This study used a traditional method based on the selection of the most diverse group in terms of sex, age, education and views in order to look at the problem differently. The teams examined showed differentiation in terms of the above-mentioned criteria. The team is led by the moderator, in this study - project manager, whose task is to allow the members of the team to present their ideas without criticizing others. Each idea is saved. At the end, all written ideas are subjected to a multi-criteria analysis. Varieties of the traditional brainstorming are numerous, such as the 635 method (brainwriting) involving 6 people, each formulating 3 ideas in 5 minutes, discussion 66 - 6 teams working for 6 minutes (Knosala et al., 2014).
SIX THINKING HATS

Edward de Bono is considered the creator of this method. The method allows the session participants to present opinions on a given problem by artificially giving them one of six roles. Roles are represented by hats of different colours, where red hat means emotions, intuition, white - objectivism, black - pessimism, yellow - optimism, green - possibilities, blue organization (process moderator). Man does not like to be judged and scored, and assigning him a role is like "putting on a face mask", which allows for a fuller opening. An additional advantage of the method is a holistic approach to the problem. Six hats combine different styles of thinking, among others, rational, intuitive, pessimistic, optimistic and creative. As a consequence, this method allows for a multilateral view of the results of the undertaken project. Planning implemented by this method will be fuller, multi-variant, more flexible and with reduced risk (Cempel, 2013).

System analysis (System operator)

The system operator is one of the main instruments of the TRIZ (Theory for Solving Innovative Tasks) methodology, and at the same time one of the best tools for systematizing thinking in the category of time and space. Effective, strong thinking is primarily systemic, block thinking that allows looking at the problem as a whole. When analyzing the problem in the company, it is necessary to look more broadly not only at the problem itself (system), but also at its environment (the supervisory system) and at the components of the problem (subsystem). Additionally, the whole is analyzed in terms of time, i.e. the past, present and future.

Thanks to the use of system analysis, the organization achieves the following benefits (Knosala, Wasilewska and Boratyńska-Sala, 2018):

- avoiding errors in problem analysis,
- correct formulation of the purpose of the analysis and its implementation,
- effective system management,
- raising the quality of decisions and reducing the time needed to implement them,
- combining the knowledge of many sciences,
- a critical look at the entire system,

• anticipating the effects of changing the system.

RCA+ (Root Conflict Analysis) method

This method is one of the younger TRIZ tools. It was developed by Souchkov as an aid in managing complex problems by identifying contradictions that make up the problem and analyzing the relationships that occur between these contradictions (Souchkov, Hoeboer and Zutphen, 2007). The author of the method distinguished the following areas of its application:

- The system or some of its components have a negative effect: they either fail or do not provide the required behaviour during operation, or cause negative side effects. The goal is therefore to solve a specific problem to prevent the occurrence of a negative (undesirable) effect.
- 2. The system works well and meets most of the requirements, but one should improve its performance or control it.
- 3. The system works well, but the costs associated with its complexity, production, maintenance, support etc. should be reduced.
- 4. There is no system or system component that would provide a specific function, so one should create a new functionality.

The method helps to identify problems and develop possible solutions. After defining a negative effect, the RCA+ method helps to define contradictions (fig. 1) that contribute to the problem using a well-developed "chain of causes and effects".





The basic steps in creating RCA+ (Souchkov, Hoeboer and Zutphen, 2007; Knosala, Wasilewska and Boratyńska-Sala, 2018) include:

- 1. Defining the negative effect of the situation and making an in-depth analysis of its causes (cause and effect analysis).
- 2. Creating a table of revealed causes.
- 3. Using TRIZ techniques to eliminate contradictions in order to solve selected problems (defining technical and physical contradictions).
- 4. In the case of a technical contradiction, using the contradiction matrix to find the final solution to the problem.

RESEARCH RESULTS

The following results are the outcome of pilot studies carried out on 16 IT teams from the SME sector. Teams for research purposes were trained in selected creativity methods described above.

In the area of knowledge and experience of IT teams in the field of creativity methods, questions were asked about knowledge and application of creative methods of problem solving in professional work. All IT teams have mentioned a brainstorming. Only one team additionally knows and applies the method of 6 hats.

All teams noticed the effect of psychological inertia during work on IT projects. The most frequently mentioned areas in which it works most strongly include:

- searching for the causes of problems, designing new solutions,
- designing new solutions,
- planning new activities,
- the habit of carrying out various projects in the same way.

The second part of the survey concerned the assessment of creativity methods. It also included methods newly learned by the participants of the study. In the presentation of results, the following abbreviations were used for the names of the methods: BM - brainstorming, 6H

- 6 hats, SA - system analysis, RCA+ - Root Conflict Analysis. The general assessment of the methods concerned the possibility of achieving the best results in IT project management. The results are shown in Figure 2.



Fig. 2. The best result of the selected creativity methods in IT projects management Source: own

Almost half of the IT teams considered the RCA+ method as the one that could bring the best results in IT project management. The second place was given to system analysis. The

lowest percent approval rating has gained brainstorming, which was previously widely used by IT teams.

All methods were evaluated in terms of five criteria:

- 1. degree of difficulty,
- 2. number of solutions,
- 3. time to find a solution,
- 4. innovation of solutions,
- 5. quality of solutions.
- IT teams gave weights to individual criteria (see Table 1).

Criteria	weight
degree of difficulty	11
number of solutions	11
time to find a solution	14
innovation of solutions	31
quality of solutions	33
total	100

Table 1. Criteria and their weightSource: own

Figure 3 presents the obtained results of method assessment in terms of the above-mentioned criteria. For the assessment, a 10-point scale was used, where 1 means - the lowest, the smallest, the shortest, and 10 - the highest, the largest, the longest.



Fig. 3. The results of the methods assessment

Source: own

In terms of the level of difficulty, compared with system analysis and RCA+, brainstorming and 6 hats belong to easier methods. The most difficult method for team work is the RCA+ method. The largest number of solutions can generate brainstorming. Nevertheless, in this respect, system analysis and RCA+ differ only by 0.25 points to the disadvantage. The RCA+ method and 6 hats are the most time-consuming. The fastest results are achieved by system analysis. In terms of the other two criteria, i.e. innovation of solutions and quality of solutions, the RCA+ method and system analysis were definitely dominant. The 6-hats method was in the middle of the scale, and brainstorming was rated as the lowest in the scale. At the same time it should be emphasized that criteria such as innovation of solutions and quality of solutions were the criteria most valued by IT teams in project management.

In order to clearly determine the effectiveness of a given methodology in IT project management, the assessment of individual criteria was reduced to a single indicator. Individual assessment criteria were calculated on a 10-degree scale in terms of 1 - worst, 10 - best. Then, after applying the weights to individual criteria, the following performance indicators were obtained for individual methods (see Table 2):

Method	Performance indicator
Brainstorming	4,52
6-hats	4,88
System Analysis	6,54
RCA+	6,95

 Table 2. The performance indicators for methods

Source: own

In the light of the adopted assessment criteria and weights indicated by the IT teams, the RCA+ method and system analysis are the most effective for use in IT project management. The difference between RCA+ and the least effective in this assessment brainstorming method is nearly 35% in favour of RCA+.

In the third part of the survey, the focus was on the areas of application of creativity methods in the IT project management. The following IT project management processes were distinguished: planning, analysis, design, implementation, testing and maintenance. Figure 4 shows the application of the methods mentioned above in individual IT project management processes.



Fig. 3. The application of the methods in IT project management processes Source: own

In the first cycle of IT project management, i.e. in the planning process, the application of all methods was assessed at a similar level with system analysis gaining a few more scores. The remaining processes were clearly dominated by RCA+ method and system analysis. Additionally, taking into account the sums of applications of individual methods in the entire IT project management cycle, most of the applications were also indicated for RCA+ method and system analysis, i.e. by over half more compared to brainstorming or 6 hats.

CONCLUSIONS AND SUGGESTIONS

Among the IT teams studied, the level of knowledge and experience with creative methods was limited to using the most popular brainstorming. In the opinion of respondents, this method is perceived as the easiest to apply.

Among the newly learned methods, RCA+ was considered the most difficult one. This is natural because it is the most demanding method, which requires the highest level of thinking, both intuitive and logical, while brainstorming and 6 hats are based largely on intuitive thinking (Koch, 2008b).

Despite the high level of difficulty and the relatively long time of finding a solution, RCA+ achieved the highest efficiency rate in comparison with other methods. The explanation lies in the fact that it allows generating solutions whose innovation and quality indicators are higher by more than half than the indicators of the worst method in this respect, i.e. brainstorming. In second place after the RCA+ method is system analysis.

The most numerous areas of application in IT project management were also selected for the RCA+ method and system analysis. The indication of the largest number of applications for RCA+ method and system analysis coincides with the fact that these methods as part of the TRIZ methodology support the entire work cycle with the problem, i.e. understanding, defining, solution variants, solutions, evaluation of solutions and implementation, whereas brainstorming and 6 hats do not include implementation (Cempel, 2013). Therefore, while all the above methods can be used in the planning process, the other processes of IT project management clearly indicate the preference of the RCA+ method and system analysis. The processes of analysis, design, implementation, testing and maintenance require specific implementation solutions.

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In all of the analyzed entities, IT teams use a non-effective quantitative method (brainstorming) for the whole cycle of IT project management process. This is due to the ignorance of other creative methods. A positive phenomenon, however, is the perception by all teams of the negative impact of psychological inertia. The results of the conducted research suggest that there is a lack of knowledge about creative methods in the IT environment. This is in line with the research reports from recent years, in which doubting the innovative potential of IT sector becomes more and more apparent (Gartner, 2014; The Standish Group 2014). Combining these facts with the research on the positive correlation of creativity with the project management and overall performance of the organization presented in the first part of the article, the importance of building awareness in this direction in the IT environment should be recognized. Especially for the IT project management, it is extremely important to have a high positive correlation between creativity and customer satisfaction, which is crucial in assessing the success of an IT project.

Therefore, it would be a good practice to introduce the methods of the inventics into the education of IT project management. In a like manner, broader research and more publications on the role and effects of using creative methods in IT project management could contribute with time lapse to the incorporation of creativity techniques into project management standards. This could significantly increase the success rate of IT projects.

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Creative techniques in the Field of IT Project Management - Use Cases

by

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ABSTRACT

Although effective project management is crucial to the success of IT projects, little empirical research focuses on how to solve problems of the immediate environment of an IT project. Therefore, a study was carried out on 16 IT teams from the SME sector. They were asked to specify the key organisational problems and ways to deal with them. Afterwards, they participated in training workshops on two popular methods (brainstorming by Alex Faickney Osborn and 6 thinking hats by Edward de Bono) and on lesser-known, but very effective, techniques for solving non-standard tasks within the Theory of Inventive Problem Solving by Henry Altszuller (TRIZ) methodology, i.e. System Operator and Root Conflict Analysis. The participants of the workshop were people with different levels of education. IT teams identified problems and generated solutions in accordance with the strategies of the newly learned methods. The main objective of this article is to show, on the example of cases implemented by the examined teams, the possibilities of using TRIZ tools in project management to develop intraorganisational solutions for problems related to the organisation and implementation of an IT project. The teams evaluated the solutions created with the use of the last two methods as high-quality solutions.

Keywords: IT Project Management, Creative methods, TRIZ, Problem Solving

INTRODUCTION

In the literature on the subject, in both the analysis of the reasons for failures and critical assessment of IT projects success, the most commonly stated reasons and factors are from the second-level environment (management, employees, superiors) and third-level environment (client, subcontractors, suppliers). The immediate environment of the project to which project managers and the IT team belong are mentioned in farther places (The Standish Group, 2014). Meanwhile, problems from the immediate environment of the project may also indirectly affect the success of the IT project. For example, multitasking commonly encountered in IT projects can result in project errors, delays, inefficient customer service, etc. (Woźniak, 2016)

In IT project management, attention is often focused on the project itself. The highest priority is given to technical problems (Laplante, 2003). In most cases, the intraorganizational problems of the project management and problems of the project team do not have high rank and are solved in a routine manner, usually through meetings and discussions or at most through brainstorming.

Meanwhile, research shows that it is the immediate environment of the project that plays the key role in maximizing the possibilities of achieving the success. Competences that determine the highest efficiency in IT project management are the ability to accurately assess and apply problem-solving strategies (Taylor, Woelfer, 2012). However, these skills are not provided by project management standards.

Moreover, another important problem in IT project management is the tendency to hide problems with the implementation of tasks by IT team members (Wang et al., 2017). The specific character of the work of knowledge workers, which includes the IT group, favours this situation. It involves difficulties in estimating and evaluating this type of work (Thothathri, 2007).

Therefore, there is a need to reach for methods and tools that will enable an effective, non-routine approach to organizational problems of the immediate environment of an IT project, creating a space for dialogue and for common, structured work on the problem.

METHODS OF ANALYTICAL CREATIVITY

In the studies of IT managers who developed an effective IT project management practice, all participants mentioned that an effective IT activist must actively face problems and have analytical skills to reach the root cause of the problem (Napier , Keil, Tan, 2009). However, both practice and literature in the field of IT project management lack any mention of the most effective methods of generating solutions that combine the highest level of logical and intuitive thinking, such as, e.g. the TRIZ methodology (Koch, 2008).

TRIZ (Theory of Inventive Problem Solving), developed in the 1940s by Genrikh Saulovich Altshuller, was an attempt at a methodical approach to inventive tasks, originally of a purely engineering character. TRIZ is known and used more in engineering, so its use in the areas of business and management is still little known. Recent years, however, have changed this approach and one can see the development of TRIZ methods for this area of knowledge (Woźniak, 2017). The first results have been more than encouraging. Seemingly insoluble business and management problems were solved very quickly. This is due to the fact that TRIZ methodology used for solving complex and difficult problems requiring creative "out of the scheme" thinking is independent of the application area and can solve various problems that appear in technological, social, business, cultural and artistic systems. Hence a New direction (one of the five new directions) was born inside TRIZ, namely "TRIZ - Management" and it seems that it will be actively developed in the years to come (Boratyńska-Sala, 2008, Souchkov, Hoeboer, Zutphen, 2007).

So how can TRIZ help solve problems? An important achievement of Henry Altszuller was determining the general law of development of technical systems, which in his formulation read as follows: "Technical systems develop in accordance with real, objective laws, these laws can be known, defined and used for deliberate, purposeful solving of inventive tasks" (Altszuller, 1972).

Analyzing the available database of patents, he noted that the invention consists in removing the technical contradictions, which occur when the technical system developing as part of one general concept reaches the limits of further development. He also noted that the removal of these contradictions requires the use of specific inventive principles and that there are only about 40 of these principles, disclosed in tens of thousands of patents (later 10 further were defined). The troubleshooting procedure is nothing more than a few simple steps:

- defining the "negative effect",
- formulating the "inventive task",
- formulating the "ideal final result",
- applying the system of indicators, inventive principles and "matrix of associations".

TRIZ therefore forces the innovator to imagine the ideal final solution, to define the negative effect, to ask questions why and for what reason this effect occurs, to find the key contradiction and a method to solve it to get the perfect result. Next, it tells us to identify the resources our system has. This approach to the task is a methodical thinking process characteristic for the TRIZ methodology. Thus, due to the use of systematic problem-solving techniques, TRIZ increases the innovation and creativity of project teams.

RESEARCH PURPOSES

In the research undertaken, the following related research goals were assumed:

Identification of key organizational problems related to the IT project management and ways of dealing with them by the examined IT cells from the SME sector.

Checking the applicability of selected TRIZ methodologies in evaluation of problems and generating solutions in IT project management.

RESEARCH METHOD AND PROCESS

A pilot study was conducted in the first half of 2018. The research involved the employees of IT cells (including IT project management) from the SME sector. Sixteen organizations were examined. They were asked to identify key organizational problems related to the IT project management and to present ways to deal with them. Then employees of IT cells underwent training in selected TRIZ methodologies. After mastering the procedures for

applying the proposed methods, IT teams started working on solutions. The article presents the most interesting cases.

Selected techniques of TRIZ methodology used in the study

The training was addressed to employees of IT cells in entities from the SME sector. Two methods from the TRIZ methodology, namely system analysis and RCA+ (Root Conflict Analysis) developed by Valeri V. Souchkov, were chosen for the training programme.

1. Analysis using a nine-screen system operator

This method is one of the tools of the Theory of Inventive Problem Solving (TRIZ). It is of great importance when TRIZ is used in solving problems from the initial definition to the evaluation of the best solution, and also for all technical and non-technical situations (Mann, 2001). There are no independent systems in nature. Each of them consists of subsystems, while forming part of a larger system or super-system. The subsystems, in turn, consist of components, which are elementary systems or individual parts. Whether a given fragment of the system is a "component" or a "part" depends on the degree of system decomposition. The use of the system operator focuses on looking at the problem through the prism of time (present, past and future) and space divided into a system, a super-system and a subsystem (a total of 9 screens). The problem is placed in the centre of the "system". This way of analysing the system liberates us from the "vector of inertia" and thinking only at the level of the system, i.e. directly at the level of the problem itself. The system operator should be used in a situation when we are looking for resources (preferably without costs), in identifying constraints, defining the requirements of the problem, and in defining the problem itself and solving it. (see fig. 1)

To perform a system analysis, it is necessary to strictly separate the sphere of technical or material systems from the sphere of function. Management functions are directed primarily at people. In a simplified form it can be said that management consists in generating management information of a different nature, i.e. organizational, substantive, disciplining, mobilizing, training, etc.



Fig. 1: System analysis - nine screens of the "Manager" System Source: own

For proper construction of the system operator diagram, some concepts related to management should be clarified. If the main "system" is the management situation in the company, that is, the set of functions, the other "windows" of the operator should also include non-material elements of the management system functions. So, if the "system" is the management group, i.e. the management board or even one person, its subsystem may include the material elements indicated there due to the information that they help to create, transmit and process. In this situation, we are talking about the technical arming of the management system, which obviously does not have management functions.

In managing we use material and non-material tools. The first group includes technical means of generating and processing information (computers, scanners, telephones, etc.),

information carriers (radio, telephones, Internet, posters, banners, mobile devices, etc.). The second group is information.

The result of the management system operation may be technical objects in material sense and non-material objects like documentations, programmes, organizational systems, advertising, that is, most often various forms of the broadly understood information, using material information carriers that cannot be treated as a material product because their essential value consists in the transfer, production and processing of information.

2. Root Conflict Analisis (RCA+)

TRIZ is still evolving. With the emergence of the "xTRIZ" methodology, where "x" means "extended TRIZ"), the development of the RCA+ tool has begun. This tool helps to analyze business and management problems, identify conflicts and their primary (root) causes, select problems to be solved, generate new ideas and strategies for solutions, and evaluate final results. This approach organizes the use of both basic and advanced TRIZ tools and can be applied to both technology and business systems. In addition to the standard TRIZ tools, the process includes additional techniques to improve problem solving and decision making, such as Root Conflict Analysis, Comparative Score Card and Multi-Criteria Decision Matrix. The method helps to identify problems and develop possible solutions. After defining a negative effect, the RCA+ method helps to define contradictions (fig. 2) that contribute to the problem using a well-developed "chain of causes and effects." One of the main advantages of RCA+ is that one can stop at a level where it turns out that the examined cause is largely responsible for the problem without the need to discover every other possible cause (Souchkov, Hoeboer, Zutphen, 2007).



Fig. 2. An example of defining a technical contradiction Source: own

SEARCH RESULTS - A DESCRIPTION OF USE CASES

All IT teams received a unified task containing problem aspects that referred to the IT project management area. The task was to analyze and identify the main problem and develop solutions using both methods (System Analysis and RCA+).

The content of the problem task is given below.

"You know how to manage projects. Schedules, budgets, tasks, dependencies - you know all this perfectly well. Nevertheless, you still need to spend time on other non-project activities that flow to you from all sides. Undoubtedly, you have noticed changes in the scope of the project, hidden somewhere at the bottom of the extended e-mail thread, dispositions of managers issuing special commands during corridor discussions, as well as status updates In the form of self-adhesive notes. Trying to control all these phenomena is like reconciling a dog with a cat. Add to this time wasted on manually edited status update reports and time spent at meetings, and you will realize the danger of project slipping out of control before you can intervene. Non-project work such as running commands, maintenance and repairs can disperse resources and lead to a derailment of the project. Without transparency throughout the entire work cycle, it is almost impossible to assess the real impact of these commands. Until you take a broader perspective of looking at the work of the company, each of your projects will run the risk of failure. How to increase the efficiency of managing the entire work of your team? "(Meysztowicz, 2014)

The first method used by the groups was System Analysis (fig. 3). Each of the groups has defined the system operator in the following way:

- Lack of project management
- Effective project management
- Loss of control over the course of the project implementation
- Ineffective project management

When defining areas over time in a super-system, system and subsystem, teams used the following questions:

Past: If I could go back in time and do something to prevent this problem, what would it be? Present: If I could do something else now so that this problem does not happen, what would it be?

Future: The problem is happening and I was not able to prevent it. How can I fix it? (Ivanov, 2012)



Fig. 3 System analysis of four groups

Source: own

In each group there were people from different areas of project management, with different education and experience, which could be seen in the way the nine screens were completed. Conclusions from the system analysis in groups are as follows.

Every problem, including problem in the project management, is systemic and consists of infinite areas with super-systems and subsystems. All systems are interconnected, that is, changing one of them involves changes in all others. The stiffness of relations increases towards subsystems and weakens towards super-systems. System analysis offers solutions to problems very innovative and of high quality. IT project management includes in each analysed case nine basic screens - the system, the super-system and the subsystem in the past, present and future, but one should not forget about the "up" and "down" areas. Looking at the system in the future, we can avoid mistakes in the present. System analysis in the past means the chance to avoid mistakes in the future. When solving a problem, one should think globally covering all systems in time and space, but acting locally it is necessary to ensure minimum costs and operate in the same space and time.

System analysis of the problem defined as "lack of project management"

Considering the above remarks, "lack of management" refers to the intangible sphere of information, where the issues of the technical equipment of institutions are not taken into account. The formulation of the task is a description of the situation in the management centre. The basic organizational unit is a group performing tasks together and presenting the negative effect. The consequence of such formulation must be a "description of effects" in the entire system operator grid (fig. 4).

	Past	Present	Future
Supersystem	 the beginning of the company's activity: a small crew, gaining Market focus on marketing and Advertising skipping the issues of work rationalization and its organization 	• lack of work organization in all management divisions at the level of company management as a whole and in individual departments, sections, etc.	 efficient management, rhythmical, systematic work good cooperation with clients • uniform distribution of work among all departments, sections and individuals, adequate to their capabilities, competences and preferences

System	• casualness in task execution, accumulation or downtime, no time to analyze customer Expectations	LACK OF PROJECT MANAGEMENT	 rhythmic calm work tasks performed strictly in accordance with the expectations of customers full coordination among members of organizational units, a good, mutually friendly atmosphere
Subsystem	 project development not in accordance with customer expectations postponing one task in favour of another "more urgent" frequent changes in priorities casualness of action at the level of an individual worker 	 non-systematic implementation of tasks, accumulation of tasks, accumulation of tasks at the level of sections and individuals or periods of "downtime" lack of prioritization and timeliness of individual tasks problems with archiving of tasks, difficult access to tasks old, similar, etc. 	 integration of team members at every level of the activity scheduling tasks setting real dates of their performance in agreement and consultation with clients

Fig. 4 System operator Source: own

The above diagram is a preliminary "analysis". The record in each operator "window" should be analyzed on a multilateral basis. An important element of such analysis is uncompromisingness and impartiality. Managers at all levels must understand that a description of the situation, even putting their actions in a bad light, does not serve to diminish their importance and merit in the company, but to make a diagnosis and develop further steps towards achieving the Ideal Final Result (IFR). The phenomena presented in the operator windows are typical for companies from the SME sector, which first pass the initial stage of

the organization and, above all, strive to "exist" on the market and achieve financial liquidity, which involves obtaining a steady stream of orders. It is necessary to fight for this stream and "there is no time" for activities that are assessed as prospective, but not necessarily. Work on optimizing the organization is therefore postponed until the situation begins to get out of control. Then reorganization is necessary, but it can be difficult and laborious. Some spare time "must be found" regardless of the current tasks. The elementary conclusion is therefore constant monitoring of work organization in the company at all levels of management and its ongoing improvement.

RCA+ analysis

The same situation in the companies was analyzed by the RCA+ method. The method is very extensive, and that is why each group had one case of technical contradiction to discuss (fig. 5).



Fig. 5 Fragments of RCA+ analysis discussed in individual groups

Source: own

Below are listed the contradictions most frequently chosen by IT teams and proposals for their solution in the form of rules (fig. 6-8). Then the teams were asked to present an interpretation of those rules in the context of IT project management.



Fig 6 Technical contradiction - example 1 Source: own

Out of 39 Technical System Indicators, the team members selected Indicator 24 -Information losses for the negative effect, and Indicator 39 - Performance for the positive effect. Both effects were compared in the matrix and the following generalized principles were obtained:

13 - the principle of "the other way round", 15- the principle of dynamics, and 23 - the principle of feedback.

The team selected Principle 15 (Dynamics) with the following comment: "Extract tasks performed outside the procedure (flexible organizational structure). Adapt the procedures to the real needs".



Fig 7 Technical contradiction - example 2

Source: own

The team members selected Indicator 30 - Harmful factors acting on the object for the negative effect, and Indicator 27 – Reliability for the positive effect. Rules developed: 27 - The principle of cheap short-living objects in exchange for expensive objects with long service life, 35 - The principle of changing the physico-chemical parameters of objects, 2-The principle of taking out, 40 - The principle of using composite materials.

The team selected Principle 40 (Switching to composite materials) with the following comment: "Create a team of different personalities. Create a team for negotiations consisting of a hard person and a submissive person. Mix high and low risk strategy".



Fig 8 Technical contradiction - example 3

Source: own

The team members selected Indicator 22 - Energy losses for the negative effect, and Indicator 21 - Power for the positive effect. The following rules were derived from the matrix: 10 - the principle of prior action (preliminary arrangement), 35 - the principle of changing the physico-chemical parameters of objects, 38 - the principle of accelerated oxidation

The team selected Principle 38 (accelerated oxidation) with the following comment:

"Increase the number of employees and focus only on one project at a time".

Based on the formulated technical contradictions, using the matrix of contradictions, IT teams developed rules and then solutions. In the process of evaluating the known methods, IT teams have found that the RCA+ method is the best one at the stage of problem analysis. The method uses a different approach to the task of formulating contradictions than classic TRIZ and seems to be more understandable and flexible.

CONCLUSIONS AND SUGGESTIONS

The pilot study used four methods of creative problem solving, namely Brainstorming, Six Thinking Hats of de Bono, System Analysis and Root Conflict Analysis. The teams participating in the study gave the highest rating to the last two analyses. Without doubt they will be used in work related to the implementation of IT projects. Therefore, the article discusses the use of these two methods belonging to the group of the TRIZ methodology. The methods of brainstorming and 6 hats are popular, easy and typically quantitative methods, and do not give such effective solutions as the other two methods that provide strong targeted solutions. The research will be continued on a larger group of IT teams with further extension of issues related to intraorganizational aspects that are key to the success of an IT project.

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The interrelation between human capital, ICT infrastructure and economic growth in the national innovation system of Belarus

by

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ABSTRACT

The article contains the study of interrelation between human capital, ICT infrastructure and economic growth in Belarus. The theoretical framework of innovation system, human capital and ICT is described. The interrelation between aggregate indicators of human capital, ICT infrastructure and economic growth is investigated. The regression analysis of HDI, IDI and GDP growth rates in Belarus is performed.

Keywords: Innovation System, Human Development Index, ICT Development Index, Economic Growth.

INTRODUCTION

Innovations are one of the key factors of social and economic development. The innovations carried out at different levels of economic space, the effective use of various tools for their financing, the rational structure of innovation mechanisms at different levels determine not only the development of enterprises, but the entire industries, regions, as well as the success of structural reforms in the economy as a whole.

Innovative activity is a process of transformation of the received ideas and knowledge into the object of economic relations. This process is a complex multilevel system of economic relations in the area of knowledge "materialization", which is characterized by specific relationships and patterns (*Pozhueva*, *p. 118*). Given the crucial role that innovation processes have in the modern economy, identifying these features and taking them into account during planning and implementation of measures to stimulate innovation development is a prerequisite for economic growth.

As the Russian economist K. Mikulski rightly points out, the innovation process cannot be limited to narrow sectoral framework, since there is an interdependence between innovation processes in different sectors (*Mikul'sky*, p. 11). Thus, the potential of innovation-driven development is created, used and enhanced within the framework of multilevel innovation systems. Theoretical studies show some difficulties in unambiguous distinction between national, regional and local innovation systems (*Freeman, Edquist, Nelson*). Some authors suggest to abandon attempts of innovative systems gradation by the level of economic space and to consider any innovative systems of the lowest levels as an integral element of national systems (*Wiig, Archibugi*).

At the same time, there is a relative consensus in understanding that the innovation system is both a set of formally (or informally) interlinked organizations and institutions, and a set of specific legal, financial and public institutions that ensure the flow of innovation processes, unique for each individual territory or the country as a whole. Defining of innovation-driven development elements needs detailed clarification. Thus, the innovative potential should be considered as a system that combines human capital and conditions for attracting all types of internal and external resources. The innovation mechanism is a dynamic integral system, providing legal, contractual, regulatory functions and bearing responsibility for its final integral socio-economic effect.

If we look closely at the innovation system components, we can figure out two aspects, which define the potential and the intensity of the innovations within certain territory: the human capital, as the key pillar of the innovation system intangible basis, and the ICT, as the basic tool, facilitating human capital towards innovations.

The human factor is considered as a decisive factor in the national economic growth. It is generally recognized that nowadays natural and financial capital are no longer the primary factors of production. The concept of human capital was widely discussed in scientific literature of the second half of twenties century (*Becker, Mincer, Schultz*). T. Schultz defined human capital is anything, that is a source of future satisfaction or future earnings; any asset

(material or human) has the ability to generate a stream of future income. The best-known application of the idea of "human capital" in economics is that of Mincer and Gary Becker of the "Chicago School" of economics. Becker notes that human capital is health, education, abilities and labor skills, the application, which brings income.

The representatives of the neoclassical economics insist, that an individual, bearing certain abilities, knowledge and skills must be considered as a capital that generates income for its bearer. The motivations that induce a person to accumulate human capital in the form of contributions to education are similar to those that determine the accumulation of material capital; the cost of the upbringing and educating the person forms the real costs; the labor of a skilled worker is more productive, therefore, the cost of education increases the national wealth (*Solodukha, pp. 207-208*).

The process of innovation is primarily provided on the basis of the accumulated stock of skills, knowledge, abilities of the innovation creators. So it is necessary to note that human capital directly participates in the innovation-driven development. Moreover, the formation of human capital accompanies all stages of the innovation process. The degree of innovation efficiency and the value of the expected increase in economic benefits depend on the quality of human capital management, which differs from nation to nation and which can be considered as one of the specific features of national innovation systems. The human capital is facilitated by financial capital, providing necessary physical infrastructure, and ICT, which accelerate the research and development processes, and provides crucial improvement of communications efficiency.

METHODOLOGY

We have based our research on the following assumptions: (1) any national innovation system theoretically depends on ICT and human capital as key drivers for innovations development and implementation; (2) the efficiency of human resource and ICT deployment depend on the specific legal and organizational mechanisms, which differ from nation to nation and define the actual influence of the two factors on the economic growth.

So, *the aim* of our research is: (1) to check the interrelation between the Human capital, ICT development level and economic indicators globally; and (2) to investigate the correlation between economic growth, ICT and human capital in Belarus.

The Human Capital in our research is measured via the Human Development Index (HDI), as an aggregate indicator of life expectancy, education level and individual income. The ICT development in our research is measured via aggregate ICT Development Index (IDI), and shows the level of ICT infrastructure disaggregated from its efficiency. Finally, we use the GDP per Capita (Purchasing Power Parity) to measure the level of economic development disaggregated from the country scale (per capita) and prices scale (purchasing power parity).

Firstly, we've compared the data on above indicators for 156 countries in 2016 to figure out the level of these indicators interrelation for different economies and different specific innovation systems. *Secondly*, we've taken the values of the given factors for the period of 2007-2017 for Belarus and performed the regression analysis for their growth rates to find out the level of their impact on the economic growth taking into account the specific features of Belarusian Economic and Innovation System.

RESEARCH

In the table 1, the data on HDI, IDI and GDP per Capita (Purchasing Power Parity) is shown. The number of cases is 156, all taken as of year 2016.

Country Name	GDP per capita (PPP)*	HDI**	IDI***	Country Name	GDP per capita (PPP)*	HDI**	IDI***
Afghanistan	0,194412	0,494	1,710	Kiribati	0,210854	0,610	2,040
Albania	1,155930	0,782	4,900	Korea, Rep,	3,662986	0,900	8,800
Algeria	1,501330	0,753	4,320	Kuwait	7,426400	0,804	5,750
Angola	0,644099	0,577	2,000	Kyrgyz Rep.	0,356952	0,669	4,060
Mongolia	1,225228	0,743	4,910	Lao PDR	0,654967	0,598	2,430
Argentina	2,004254	0,822	6,680	Latvia	2,558629	0,844	7,050
Armenia	0,883276	0,749	5,560	Lebanon	1,430875	0,753	6,090
Australia	4,614412	0,938	8,080	Lesotho	0,295102	0,516	2,940
Austria	5,052148	0,906	7,700	Libya	1,542017	0,693	3,930
Azerbaijan	1,725663	0,757	6,250	Lithuania	2,986232	0,855	6,970
Bahamas, The	2,977980	0,806	6,290	Madagascar	0,150624	0,517	1,700
Bahrain	4,706676	0,846	7,460	Malawi	0,116883	0,474	1,580
Bangladesh	0,357976	0,597	2,370	Malaysia	2,768261	0,799	6,220
Barbados	1,805474	0,799	7,110	Maldives	1,534800	0,712	4,970
Belarus	1,808905	0,805	7,290	Mali	0,212572	0,421	2,050
Belgium	4,641685	0,915	7,700	Malta	3,736333	0,875	7,650

Table 1: Data on 156 countries, including GDP Per Capita (Purchasing Power Parity), HumanDevelopment Index and ICT Development Index, as of year 2016

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Belize	0,854040	0,709	3,540	Mauritania	0,385253	0,516	2,080
Benin	0,216727	0,512	1,920	Mauritius	2,110256	0,788	5,510
Bhutan	0,890076	0,609	3,580	Mexico	1,776966	0,772	4,870
Bolivia	0,723420	0,689	3,840	Moldova	0,535278	0,697	6,210
Bosnia and Herzegovina	1,217265	0,766	5,230	Antigua and Barbuda	2,266149	0,778	5,480
Botswana	1,696096	0,712	4,510	Montenegro	1,763315	0,810	6,300
Brazil	1,518147	0,758	5,890	Morocco	0,785749	0,662	4,570
Brunei	7,742061	0,852	6,560	Mozambique	0,121579	0,435	2,230
Bulgaria	1,924262	0,810	6,660	Myanmar	0,572123	0,574	2,590
Burkina Faso	0,177116	0,420	1,740	Namibia	1,059642	0,645	3,330
Cabo Verde	0,654110	0,652	4,830	Nepal	0,247790	0,569	2,600
Cambodia	0,373696	0,576	3,040	Netherlands	5,053861	0,928	8,400
Cameroon	0,360938	0,553	2,140	New Zealand	3,946512	0,915	8,230
Canada	4,481948	0,922	7,640	Nicaragua	0,553307	0,657	2,850
Chad	0,202574	0,405	1,060	Nigeria	0,586109	0,530	2,440

Table 1 continued

Country Name	GDP per capita (PPP)*	HDI* *	IDI** *	Country Name	GDP per capita (PPP)*	HDI**	IDI** *
Chile	2,347643	0,842	6,280	Norway	5,880839	0,951	8,450
China	1,553063	0,748	5,170	Oman	4,301285	0,822	6,140
Colombia	1,416545	0,747	5,120	Pakistan	0,523821	0,560	2,210
Comoros	0,152186	0,502	1,780	Panama	2,315722	0,785	4,800
Costa Rica	1,638705	0,791	6,290	Paraguay	0,956734	0,702	4,020
Croatia	2,371041	0,828	6,960	Peru	1,303001	0,748	4,610
Cyprus	3,270787	0,867	7,300	Philippines	0,780065	0,696	4,520
Czech Rep.	3,474921	0,885	7,060	Poland	2,738325	0,860	6,730
Denmark	4,902901	0,928	8,680	Portugal	3,065863	0,845	6,880
Dominica	1,094772	0,718	5,760	Romania	2,305001	0,807	6,230
Dominican Republic	1,522794	0,733	4,260	Russian Federation	2,478868	0,815	6,910
Ecuador	1,124205	0,749	4,520	Rwanda	0,193070	0,520	2,100
Egypt	1,113403	0,694	4,440	Samoa	0,637826	0,711	2,950
El Salvador	0,772617	0,679	3,620	Saudi Arabia	5,437870	0,854	6,870
Equatorial Guinea	2,614209	0,593	1,820	Sao Tome and Principe	0,323941	0,584	2,910
Estonia	2,974334	0,868	8,160	Senegal	0,256612	0,499	2,480
Ethiopia	0,173446	0,457	1,420	Serbia	1,451496	0,785	6,510
Fiji	0,910995	0,738	4,340	Seychelles	2,764144	0,793	4,800
Finland	4,337815	0,918	7,830	Slovak Rep.	3,046038	0,853	6,840
France	4,135799	0,899	8,050	Slovenia	3,272307	0,894	7,200
Gabon	1,807126	0,698	3,620	Solomon Isl.	0,235019	0,543	2,040
Gambia, The	0,167688	0,457	2,430	South Africa	1,325059	0,696	4,910
Georgia	1,000453	0,776	5,590	Spain	3,630522	0,889	7,610
Germany	4,894310	0,934	8,200	Sri Lanka	1,234336	0,768	3,770
Ghana	0,429522	0,588	3,880	Sudan	0,473046	0,499	2,560
Greece	2,676496	0,868	7,080	Suriname	1,496671	0,719	4,770

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							-
Grenada	1,420001	0,770	5,390	Sweden	4,890455	0,932	8,410
Guatemala	0,794668	0,649	3,190	Switzerland	6,388167	0,943	8,660
Guinea	0,204306	0,449	1,710	Tanzania	0,278627	0,533	1,730
Guinea- Bissau	0,161642	0,453	1,380	Thailand	1,693793	0,748	5,310
Guyana	0,783638	0,652	3,440	Timor-Leste	0,786945	0,631	3,110
Haiti	0,178394	0,496	1,630	Togo	0,149742	0,500	1,860
Honduras	0,475248	0,614	3,140	Tonga	0,574519	0,724	4,130
Hong Kong SAR, China	5,868162	0,930	8,470	Trinidad and Tobago	3,185836	0,785	5,710
Hungary	2,670076	0,835	6,740	Tunisia	1,160576	0,732	4,700
Iceland	5,074568	0,933	8,780	Turkey	2,524720	0,787	5,660
India	0,657393	0,636	2,650	Uganda	0,181943	0,508	1,900
Indonesia	1,161099	0,691	3,850	Ukraine	0,826961	0,746	5,310
Iran	1,994882	0,796	5,040	UAE	7,301748	0,862	7,180
Ireland	7,138876	0,934	7,900	UK	4,265622	0,920	8,530
Israel	3,725822	0,902	7,710	United States	5,758854	0,922	8,130
Italy	3,838017	0,878	6,840	Uruguay	2,166998	0,802	6,750
Jamaica	0,882131	0,732	4,630	Uzbekistan	0,651268	0,703	4,480
Japan	4,228119	0,907	8,320	Vanuatu	0,308057	0,600	2,750
Jordan	0,904777	0,735	5,970	Vietnam	0,629559	0,689	4,180
Kazakhstan	2,528643	0,797	6,720	Zambia	0,393866	0,586	2,190
Kenya	0,315612	0,585	2,670	Zimbabwe	0,202708	0,532	2,850

* - measured as 10'000 of US dollars, data source - www.worldbank.org

** - data source – www.worldbank.org

*** - data source - www.itu.int

Graphical and correlation analysis between GPD per capita, HDI and IDI for 156 countries show significant interrelation between these parameters (see fig. 1). HDI and IDI show mutual correlation with R^2 of 0,95, and relating each of these parameters to GDP show correlation with R^2 of more than 0,8 for dependence based on power law. Taking into account the above theoretical basis and the analysis results, we can conclude, that in general HDI and IDI significantly influence national economies. Obviously, this influence will differ for different nations, taking into account specific features of national innovation systems, such as legal framework, financial mechanisms and innovation infrastructure.

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Figure 1 – Interrelation between: a) GDP per Capita (PPP) and HDI and b) GDP per Capita (PPP) and IDI for 156 countries based on data of 2016

Now the second step is to study the impact of HDI and IDI parameters on GDP per Capita growth in Belarus on the basis of 2007-2017 data (Table 2).

Table 2: Data on Belarus GDP Per Capita (Purchasing Power Parity), Human DevelopmentIndex and ICT Development Index for 2007-2017

Year	GDP per capita (PPP)*		(PPP)* HDI**		IDI***	
	Value*	Growth	Value**	Growth	Value***	Growth
		rate		rate		rate
2007	1,3540	-	0,757	-	3,77	-
2008	1,4972	1,105813	0,774	1,022457	3,93	1,042440
2009	1,5036	1,004237	0,784	1,012920	4,62	1,175573
2010	1,6235	1,079775	0,792	1,010204	5,30	1,147186
2011	1,7167	1,057377	0,798	1,007576	5,57	1,050943
2012	1,7480	1,018247	0,803	1,006266	6,11	1,096948
2013	1,7656	1,010080	0,804	1,001245	6,45	1,055646
2014	1,7944	1,016317	0,807	1,003731	6,89	1,068217
2015	1,7230	0,960174	0,805	0,997522	7,02	1,018868
2016	1,6773	0,973513	0,805	1,000000	7,29	1,038462
2017	1,7168	1,023536	0,808	1,003727	7,55	1,035665

* - measured as 10'000 of US dollars, data source – www.worldbank.org

** - data source – www.worldbank.org

*** - data source – www.itu.int



The data on IDI for 2009 was replaced by the average of 2008 and 2010. For the above indicators we performed regression analysis of growth rates. The interrelation between GDP per capita growth rate, HDI growth rate and IDI growth rate for Belarus is shown in figure 2.

Figure 2: The regression analysis of (a) the GDP per Capita (PPP) and HDI and (b) the GDP per Capita (PPP) and IDI growth rates for Belarus in 2007-2017

As we may see, there's significant correlation between GDP growth and HDI growth. Although the coefficient of determination is 0,6742, it shows that HDI growth may be viewed as one of the most important factors of the GDP growth in Belarus. On the other hand, the ICT infrastructure development doesn't show any influence on the GDP per Capita growth rate, which may mean that the existing economic mechanisms in Belarus do not incorporate this factor as a significant human capital facilitator.

DISCUSSION

The systematization of theoretical approaches, defining the role of innovations and elements of innovation systems in the economic growth and the empirical research performed gives us the possibility to conclude the following:

• The innovations nowadays have become the main driver of socio-economic development, playing the key role in improvement of economy efficiency and providing social benefits.
- There are two approaches to innovations in the theory of innovative development. According to the first, all components of innovative development form a set of elements, integrated in one socio-economic domain - so-called innovative field. According to the second, systemic approach, innovations arise within the framework of the innovation system of a certain territorial-spatial unit (municipalityy, district, region), as well as the entire national economy, where each regional innovation system is a subsystem of the national and has its own unique characteristics.
- The human capital is the key factor in modern innovation systems, as an individual with certain knowledge and skills is a main link between tangible and intangible elements of the innovation systems. The process of creating an innovation is primarily provided on the basis of the accumulated stock of skills, knowledge, abilities of the innovation creators. So it is necessary to note that human capital directly participates in the innovation formation. Moreover, the formation of human capital accompanies all stages of the process of innovation formation.
- ICT infrastructure enhances the economic growth, as it is the key tool in information processing and, thus the main facilitator of innovations beside the financial resources and other material infrastructure. But as the infrastructure is a tool, it can't be viewed as an independent factor. The utilization of ICT infrastructure depend on the quality of its users and, on the other hand on the quality of institutions, responsible for interactions between different components within innovation systems at different levels of economic space.
- The empirical study of the chosen indicators of economic development (GDP per Capita), human capital (Human Development Index) and ICT infrastructure (ICT Development Index) for 156 countries has shown a significant interrelation between the parameters, which proves human capital and ICT infrastructure to be the key factors of economic growth nowadays.
- The regression analysis of human capital development, ICT infrastructure and economic development aggregate indicators growth rates in Belarus has shown, that the ICT infrastructure component, which should serve as the facilitator of human capital influence on economic growth, do not correlate with two other parameters. The potential explanation of this fact may lie within the specific features of legal and organizational

framework of Belarusian innovation system and economy as a whole. Defining such specific features is a subject of further research in this field.

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The impact of internal and external usability on knowledge transfer by the means of mobile technologies: a theoretical framework

by

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ABSTRACT

Researchers in subject matter literature present a significant number of factors influencing on intention to use particular technologies. The vast number of technology acceptance determinants highlights that it is important to classify and group them and indicate existing interrelations. Many articles prove that variables connected with usability are key factors impacting on technology acceptance. Conducted extensive literature analysis showed a considerable number of usability determinants influencing intention to use technology. More importantly highlighted that acceptance of particular applications may not only depend on their usability but also on the usability of utilized environment consisting of used devices and their operating systems. An approach that explains the intention to use technologies by internal and external usability and interrelations between them does not exist in subject matter literature. Therefore a model explaining internal and external usability impact on technology acceptance with particular variables grouped from internal and external perspective was proposed. It has a form of a theoretical framework.

Keywords: Internal usability, External usability, Technology acceptance, Knowledge transfer, Mobile technologies, Employees, Theoretical framework.

INTRODUCTION

Usability has been a major subject matter in human–computer interaction (HCI) research. In spite of apparent ambiguity on the definition of usability, typically it has been simply associated with the notion of the ease of using a target object and ultimately achieved satisfaction by its user. In general terms, a widely recognized and accepted is a definition provided by the ISO Organization, where usability is a "degree to which a product or system can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use; it can either be specified or measured as a product quality characteristic in terms of its sub- characteristics, or specified or measured directly by measures that are a subset of quality in use" (ISO/IEC 25010:2011). In a more narrow sense, usability is the "extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified sense." (ISO 9241-11:2018).

The Technology Acceptance Model (TAM) (Davis, 1989) is widely used to investigate user adoption and acceptance of new technologies and systems, influenced by two internal factors: perceived usefulness (PU) and perceived ease of use (PEOU). The former is "the degree to which a person believes that using a particular system would enhance his or her job performance", while the latter is "the degree to which a person believes that using a particular system would be free of effort" (Davis, Bagozzi and Warshaw, 1989; Davis, 1989). The others two are attitude toward use (A) and behavioral intention to use (BI).

PU and PEOU are affected by external variables, such as management support, participation in training, tool functionality, task characteristics, prior similar experience and relevant skills (Legris, Ingham and Collerette, 2003). The former focuses on the benefits of technology and therefore is considered to be variable that related to use it (Scherer and Hatlevik, 2017), while the latter is associated with users' evaluation of the effort involved in the improvement of using the technology (Ozturk et al., 2016). In general terms, the relationship between them can be defined as cause-and-effect rule (PEOU \square PU), while in detail, believed effort to engage is a premise, and believed benefits to obtain is a conclusion.

In recent years, a large body of literature has documented attempts to develop alternate learning technologies for computer aided learning. The emergence of wireless

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networking technologies and a variety of mobile-device innovations have received a great deal of attention in the field of knowledge management. The features of mobile devices such as context sensitivity, portability, social connectivity are just a few reasons for the shift from desktop computers (Chinnery, 2006; Weichbroth, 2018). Mobile devices have made knowledge transfer movable, collaborative, gamified, real-time, and omnipresent (Kukulska-Hulme, 2009; Lai and Zeng, 2017). However, they have certain limitations due to hardware layer (bandwidth, display size, peripherals, storage capacity) and software layer (functionality, single window, user interaction). As a result usability, measured by efficiency, effectiveness, learnability and user satisfaction, suffer from these properties and obstacles. In this paper, we introduce a framework which grounds the theory on the impact of internal and external usability on knowledge transfer, performed by the means of mobile technologies. To the best of our knowledge, no study of HCI or information systems (IS) has comprehensively examined internal and external usability variables in the mobile settings. The findings of this research have theoretical implications for mobile usability research and practical implications for mobile usability research and practical implications for mobile user experience design.

Study of subject matter literature pointed out existence of many variables connected with technology usability, where a few of them have very convergent meaning. As a result theoretical framework includes ten of them. Exemplary assertion statements for variables proved that all of them have internal and external usability perspective and are probably interrelated. Therefore final model assumes that internal usability and internal usability directly impact on technology acceptance, as well as external usability influences internal usability.

The rest of the paper is organized as follows. In the second section, the related research is discussed in which usability variables are depicted and identified in existing models. The third section presents proposed research model and three stated research hypotheses. The last by one section points out futures research directions. The article finishes with conclusion.

RELATED RESEARCH

The reference search procedure proposed by Cooper (2016) was used to collect usability and technology acceptance relevant references. Electronic searches and manual reference list retrieval was used to collect valid data, including only written in English. The major databases used for the electronic searches were Elsevier, IEEE, Springer, and Web of Science. Based on the key model and key words in previous research of technology acceptance models (Marangunić and Granić, 2015; Kuciapski, 2017), knowledge management (Durst et al., 2012; Costa et al., 2016) and mobile usability (Harrison et al., 2013;), the three following sets of key words, and combinations thereof were used to construct queries, executed against specified scientific databases: (1) TAM, technology acceptance model, technology acceptance, perceived ease of use, perceived usefulness, (2) knowledge management | transfer, education, teaching, training, learning, and (3) usability, mobile usability | device | technology, portable. The three sets of keywords were integrated systematically with Boolean operators, using the "OR" operator within the set and the "AND" operator between the sets. The manual reference list retrieval was performed only for full-text papers, after reviewing their abstracts. In summary, bringing together gathered qualitative data in a study subject, another round of searches was conducted again using extracted reference lists to find any neglected but relevant work.

According to presented research method, Table 1 presents the set of identified 19 usability variables and corresponding models, which served as the foundations to construct the theory of the usability framework to be verified in the context of knowledge transfer facilitated by mobile technologies.

Publication	Basic model	Usability variable	Variable definition (explanation)
Shu-Sheng et al., 2010	Activity theory	System satisfaction (SS)	Enjoyment of using the system for retrieving and gathering online content.
		System activities (SA)	Convenience of using the system for reading and retrieving online content

Table 1 Usability variables with definition and corresponding model

		System functions (SF)	Easiness of using the system for gathering and retrieving online content
Park et al., 2012	TAM, Social motivational theory	System accessibility (SAC)	Easiness of getting and accessing information (content); compatibility with other computer devices
Cheon et al., 2012	Theory of planned behavior (TPB)	Perceived self- efficacy (PSE)	Confidence and comfort of using device
Park et al., 2014	ТАМ	Satisfaction (S)	Perceived benefits and fulfilled expectations of using device (external) and system (internal)
		Perceived control & skill (PCS)	Justified belief in a device and the system control and manipulation
Kuciapski M., UTAUT 2017		Relative usability (RU)	Effort expectancy and performance expectancy to use a given technology in relation to other solutions
		User autonomy (UA)	Perceived autonomy and flexibility in technology use
Burney et al., 2017	ТАМ	Learnability (L)	Perceived efficiency and easiness in learning application.
		Memorability (M)	Perceived understanding of the application capabilities. Ability to recreate the understanding of the application capabilities over time
Praveena and Thomas, 2014	ТАМ	Perceived enjoyment (PE)	Intrinsic motivation that emphasizes the usage process and reflects the pleasure and enjoyment associated with the using a system
Echeng and Usoro, 2016	TAM, Theory of reasoned action (TRA), UTAUT	Perceived usefulness (PU)	Belief in improvement and progress of self-performance through using technology
McKenna et al., 2013	Theory of organizational information	Self-efficacy (SE)	Personal judgement to use a technology to accomplish given job or task.

	services (TOIS), UTAUT		
Chiu and Wang 2008	UTAUT	Computer self- efficacy (CSE)	Personal self-evaluated ability to use a technology to accomplish job or task reflected
Venkatesh et al., 2003; Awadhi and Morris 2008;	UTAUT	Facilitating conditions (FC)	"The degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system"
Nassuora 2013;		Effort expectancy (EE)	"The degree of ease associated with the use of the system"
		Performance expectancy (PE)	"The degree to which an individual believes that using the system will help him or her to attain gains in job performance"
Hadie and Muhamad, 2016	Cognitive Load Theory (CLT)	Cognitive load (CL)	Internal: "the difficulty level of the instructional content, resulting from the amount of inter- correlation between essential elements in the instructional material" External: "the unnecessary load imposed by poorly designed instruction" Germane: "the mental effort that is consciously invested by the learners while processing elements of the internal load"

According to the results of the performed literature study, some variable definitions were not defined accurately and in a few cases were not even provided. The analysis and synthesis, applied both the internal and external usability facets of the knowledge transfer let us formulate the adequate definitions which encompass the context-specific setting of mobile technologies using to knowledge transfer (Table 1).

Technology acceptance variables connected with usability exist in many proposals based on theories or models regarding technology acceptance: Activity theory, Social motivational theory, Theory of planned behavior, Theory of organizational information services, Theory of reasoned action, Technology acceptance model and Unified theory of acceptance and use of technology (Table 1). Moreover, subject matter analysis points out that new variables explaining technology acceptance that are connected with applications and devices usability are positively verified during the significant time spent starting from 2003.

RESEARCH MODEL AND HYPOTHESES

Study of subject matter literature conducted in the second point of the article highlights the existence of a number of variables that might be also used to explain usability of mobile technologies. There are no reasons to exclude any of them. However, some of them will not be included in proposed model only due to convergent meaning with others. In a such situation it was assumed that model will enclose variables:

- covering a broader meaning,
- with more general character,
- more widely presented in subject matter literature.

This applies to the variables presented in Table 2.

Table 2 Omitted	variables
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Omitted variable	Convergent variable	Omit reason
system satisfaction (SS)	perceived enjoyment (PEJ)	Less general character
system activities (SA)	activities availability (AA)	Less presented in the subject matter literature
perceived control & skill (PCS) effort expectancy (EE)	cognitive load (CL)	More narrow meaning
perceived self-efficacy (PSE) self-efficacy (SE) computer self-efficacy (CSE)	performance expectancy (PE)	Less general character Less presented in the subject matter literature

As a result of omitting variables juxta positioned in Table 2, research model will integrate the following determinants, positively verified in subject matter literature:

- perceived enjoyment (PEJ) in (Praveena and Sam Thomas, 2014),
- activities availability (AA) in (Shu-Sheng et al., 2010),
- system accessibility (SAC) in (Park et al., 2012),

- cognitive load (CL) in (Hadie and Muhamad, 2016),
- performance expectancy (PE) in (Venkatesh et al., 2003),
- user autonomy (UA) in (Kuciapski M., 2017),
- relative usability (RU) in (Kuciapski M., 2017),
- learnability (L) in (Burney et al., 2017),
- memorability (M) in (Burney et al., 2017),
- facilitating conditions (FC) in (Venkatesh et al., 2003).

As the aim of the article is to propose model explaining internal and external usability impact on technology acceptance, variables have to be grouped from internal and external perspective, where:

- internal perspective is connected with usability of application;
- external perspective concerns usability of application's use environment, as device and operating system.

To decide which variables can be appropriate to measure impact of internal and external usability of technology on intention to use it, for each variable, exemplary assertion statement was prepared (Table 3) with taking into account mobile technologies.

Variabl	Assertion statement			
C	Internal	External		
PEJ	I enjoy utilizing mobile applications.	I enjoy utilizing mobile devices and their operating systems.		
AA	Mobile applications allow to realize activities in a convenient way.	Mobile devices and their operating systems allow to realize activities in a convenient way.		
SAC	Access to resources with the use of mobile applications is easy.	Access to resources with the use of mobile devices and their operating systems is easy.		
CL	During using mobile applications it is possible to conduct other activities.	During using mobile devices and their operating systems it is possible to conduct other activities.		
PE	The use of mobile applications increases efficiency in realization	The use of mobile devices and their operating systems increases efficiency in		

 Table 3 Exemplary assertion statements for variables' internal and external context

	of activities.	realization of activities.
UA	Mobile applications allow for conducting activities in individual way.	Mobile devices and their operating systems allow for conducting activities in individual way.
RU	Use of mobile applications is at least as convenient as with alternative solutions (e. g. desktop).	Use of mobile devices and their operating systems is at least as convenient as with alternative solutions (e. g. desktop).
L	Learning how to use mobile applications is fast and easy.	Learning how to use mobile devices and their operating systems is fast and easy.
М	Even after long time it is still possible to use mobile applications efficiently.	Even after long time it is still possible to use mobile devices and their operating systems efficiently.
FC	Mobile applications are easy solution to implement.	Mobile devices and their operating systems allow for convenient use of mobile applications.

Table 3 points out that for all of variables it is possible to construct logical assertion statements, both from internal and external usability perspective. Therefore both groups – internal usability and external usability – contain all variables. As particular variables have been confirmed by researchers to directly impact on the intention to use technology, elaborated model includes connections between internal and external groups of variables and dependent variable, that is behavioral intention to use mobile technologies. It seems probable that environment of using application expressed by utilized devices and operating systems impacts on perceived usability of application. Therefore connection between external usability and internal usability is integral part of developed model. Highlighted assumptions caused the proposed model to have a form as shown on Fig. 1.

The impact of internal and external usability on knowledge transfer by the means of mobile technologies: a theoretical framework



Fig. 1: Model of internal and external usability impact on technology acceptance

According to Fig. 1, assumed relationships between the variables will be verified by three stated hypotheses presented in Table 4.

Hypoth. no.	Connection	Description
H_1	IU→BI	Internal usability directly influences on the intention to use mobile technologies.
H_2	EU→BI	External usability directly influences on the intention to use mobile technologies.
H ₃	EU→IU	External usability directly influences perceived internal usability of mobile technologies.

 Table 4 Research hypotheses

Validation methodology of proposed model, based on the verification of stated hypotheses (Table 4) is presented in the fourth point of the article.

FUTURE WORK – VALIDATION METHODOLOGY

Validation of stated hypothesis and therefore proposed model requires to obtain research data via a survey among mobile technologies users. According to technology acceptance approach proper questionnaire will consist of 3-4 assertion statements per each variable with 7-point Liker scale as it is more precise in measuring opinions than 5-point Liker scale.

Structural equation modelling (SEM) will be utilized for data collected via the survey, to validate the model of internal and external usability impact on the intention to use mobile technologies. SEM can be used, as it has also been widely tested in the field of technology acceptance. The advantage of SEM is that it considers both the evaluation of the measurement model and the estimation of the structural coefficient at the same time. A two-step modelling approach, recommended by Anderson and Gerbing (1998), as well as McDonald and Ho (2002), followed such that the confirmatory factor analysis (CFA) is carried out first to provide an assessment of convergent and discriminant validity.

Inter-construct correlation coefficient estimates should be examined along with a particular item's internal consistency reliability, by using Cronbach's alpha coefficient estimates (Cronbach and Shavelson, 2004). If reliability values are be greater than reference 0.6 (Zhang and Sun, 2006) and Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) has value greater than the 0.7, model quality will be measured with key CFA fit indices, such as:

- χ2/d.f.,
- GFI (Goodness of Fit Index),
- CFI (Comparative Fit Index),
- AGFI (Adjusted Goodness of Fit Index),
- RMSEA (Root Mean Square Error of Approximation),
- NFI (Normed fit index).

In case of CFA fit indices having values within recommended range, stated hypotheses will be verified through regression analysis with SEM through significance levels and standardized β -coefficient. Obtained study results will be an important contribution for technology acceptance by supporting or rejecting internal usability and internal usability direct impact on technology acceptance, as well as external usability influencing internal usability. If hypotheses will be confirmed, research results will also point out which kind of usability has stronger impact on intention to use technology – internal or external.

CONCLUSION

Study of subject matter literature highlighted the existence of many variables connected with technology usability, where a few of them having very convergent meaning. As a result theoretical framework included ten of them, as: perceived enjoyment (PEJ), activities availability (AA), system accessibility (SAC), cognitive load (CL), performance expectancy (PE), user autonomy (UA), relative usability (RU), learnability (L), memorability (M) and facilitating conditions (FC).

Exemplary assertion statements created for listed variables were logically consistent, proving that all of them are connected with internal and external usability of technologies. Moreover it is reasonable to assume that external usability perspective of variables impacts on their internal usability perspective. Therefore final model of technology acceptance that has a form of theoretical framework assumes that internal usability and internal usability directly impact on intention to use technology, as well as external usability influencing internal usability.

Further research should be conducted, to verify elaborated model by validation of connections between variables, through survey tailored to specifics of technology acceptance and with a proper statistical approach like structural equation modelling. Measuring significance levels and standardized β -coefficients of paths would allow to support or reject internal usability and internal usability direct impact on technology acceptance, as well as external usability influencing internal usability. Results will be an important contribution to technology acceptance research field especially in case of confirmed paths between model variables.

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Young IT Users in the context of family relationships. Initial report.

by

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ABSTRACT

State of the Art and Purpose

The goal of the paper is to explore how young adult IT Users perceive family relationships. The analysis followed in terms of two variables: an ethical behavior in the family (Family Ethical Behavior

FEB) and satisfaction with family relationships (Family Relationship Satisfaction - FRS). It is assumed that young IT Users (Y-ITU) at work are guided by the values that have been "vaccinated" in their family environment. We can point out the similarities and differences between the generation of young IT Users and parents generation (PG) and grandparents generation (GG).

DESIGN/METHODOLOGY

The research was carried out in 2017 in groups of multigenerational families selected in a network manner. 357 people from 67 families participated in the study. Differences between the three generations were tested (Young IT Users - 117 people, their parents - 142 people and their grandparents' generation - 98 people). Two own questionnaires were used: the Family Behavior Questionnaire (FBQ) and the Family Satisfaction Questionnaire (FSQ). The qualitative and quantitative methods were used in the research of hypotheses testing.

RESULTS

The differences of the FEB and of the FRS of IT Users were examined between generations, with consideration of age.

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Young IT Users in the context of family relationships. Initial report.

The questionnaires obtained quite good results for matching the theoretical model and satisfactory reliability indicators. There are significant differences between generations in the perception of family behavior on individual dimensions. Survey of relations in the intergenerational family allows concluding that there is an intergenerational transfer of behavior and level of satisfaction.

LIMITATIONS

Research should be continued on more numerous intergenerational groups. Studies should be continued in other transition and developed countries for more numerous research samples.

PRACTICAL IMPLICATIONS

Conclusions from the research may be addressed to managers, family educators, and sociologists, psychologists (both to researchers, as well as therapists or educators), to parents and to those responsible for shaping social policy and IT staff.

Demographic changes are taking place towards the aging of Polish society, so there is a need to update knowledge about young people entering the IT labor market.

ORIGINALITY / VALUE

The presented research fills a gap in the area of observation and characteristics of young IT Users who are already in the labor market. Research shows the important role of shaping ethical behavior in the family environment. The presented project gives the opportunity to empirically verify the author's methods (Family Behavior Questionnaire and the Family Satisfaction Questionnaire).

Keywords: IT Users, generation of children, parents, and grandparents; ethical behavior in the family, satisfaction with family relationships.

Triggering Students' Interest in Mental Calculations with the Mental Calculator Trainer

by

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ABSTRACT

The design and development of a game-based mental calculation application aiming, among other things, at improving students' interest in mental calculation is a challenge for educators and developers. We have designed and developed a Mental Calculator Trainer (MCT), which is a computer-based gamified application aiming to foster students' use and flexibility of mental calculation strategies. So far, there have been no studies showing which aspects of the design might be more crucial for increasing students' interest in mental calculation. In this current study, we were keen to test which aspects of the design and development of the MCT could trigger students' interest in mental calculation. This evidence could contribute to deciding that will improve the MCT. The participants of the study were 66 students (34 females) from Greece and Germany (the mean age was 10.91, SD = 2.29). The experiment took place during a 50 minute session, where students engaged with the MCT. After the engagement with the application, students completed an online questionnaire adapted from the Intrinsic Motivation Inventory, a multidimensional questionnaire for assessing participants' subjective experience related to a target activity measuring motivational factors such as interest, perceived competence, perceived value and effort (Ryan, 1982). Moreover, participants were asked to denote their subjective experience about

the likeability, use and usability of different aspects of the MCT. Independent sample t-tests revealed a significant difference between the two countries only for the perceived value subscale. Additionally, a series of hierarchical regression analyses showed that the perceived evaluation of the different aspects of the MCT explained an essential variance of the perceived interest, competence and value of the activity (MCT). The design of the MCT and the competition aspects contributed to the perceived value of the MCT, while the competition contributed to their perceived interest. Although the small number of the participants does not allow us to make inferences beyond the MCT, the results have implications for the design and development of the current application, emphasizing the importance of the design and competition aspects for the MCT. Moreover, they showed which weak elements need improvement.

Keywords: Mathematics, Mental Calculation, Interest, Perceived Competence, Perceived Value, Gamification, Training, Self-Determination Theory

INTRODUCTION

Mental calculations are a component of number sense (Lemonidis, 2015). Students and even teachers use a very limited repertoire of strategies to make calculations mentally. In a recent study with in-service teachers showed that the majority of them use only one strategy and only a few, use two or three strategies (Lemonidis, Tsakiridou, & Meliopoulou, 2017). Other studies also have found similar results (Lemonidis, Mouratoglou, & Pnevmatikos, 2014; Tsao, 2005; Yang, Reys, & Reys, 2009). The main strategy they use is the written standard algorithm. The lack of different strategies is a constraint for individuals to think mentally, and thus they are reluctant to use mental calculation as an effective way of calculations. Additionally, easy access to calculators in our everyday life discourages individuals having any interest to enrich their mental calculation repertoire. The design and development of an innovative mental calculation application that could allow for both the increase of the mental calculation efficiency and the interest on the further engagement with mental calculations is a challenge for the educators.

Triggering Students' Interest in Mental Calculations with the Mental Calculator Trainer

THE MENTAL CALCULATOR TRAINER

For the current study, a Mental Calculator Trainer (MCT) was designed to combine among others, a generator of arithmetic questions, gamification and calculation elements. As a training tool, the MCT generates questions for users, differentiated according to operations and numbers. Additionally, questions are personized to users' ability of mental calculation and the level of difficulty is increased according to users' improvement on the application (see Image 1).



Image 1: The interface of the Mental Calculator Trainer

Of particular interest for the current study are the elements of social connection, gamification, training duration and overall design. The *social connection* refers to the need of students to know where their scores and achievements stand in relation to their peers and schoolmates. Therefore, a leaderboard was developed to show students' points and amount of solved calculation problems. Additionally, users have the ability to share their results with the peers they wish. Therefore, the leaderboard, among others can facilitate connectedness and interaction with other users of the MCT (see Image 2). Moreover, *gamification elements* add value to the MCT as users collect points through their participation and training. Hence, a competition is initiated between the user and his former achievements as well as between the user and other participating peers. Eventually, this competition could engage users in constant

training, which could then lead them to self-improvement. In addition, the *training duration* of the application is essential for triggering user's interest. Considering that repetition of the training can lead users to disengagement, the length of the application is concrete (i.e., three minutes). Further, the duration and continuity of the training period are important aspects to consider in the design. Finally, the *overall design* of the MCT could affect users' perceived likeability of the application.

Ir. User	name	Credits	Add Friend
1	Dan	293(268questions solved)	+ Friend
2	Arseniy	165(174questions solved)	+ Friend
3	Timonsimon	155(175questions solved)	+ Friend
4	ltsMi	149(163questions solved)	+ Friend
5	D U KNOW DA WAE	122(131questions solved)	+ Friend
6	marianne	117(120questions solved)	+ Friend
7	lena	103(110questions solved)	+ Friend
8	lvan	101(540questions solved)	+ Friend
9	asp	96(99questions solved)	🔶 Friend
10	mari	92(99questions solved)	🔶 Friend

STUDENTS' LEADERBOARD

	This table lists accuracy in d	ifferent operation.	
Addition	0.00%	Subtraction	0.00%
Multiplication	0.00%	Division	0.00%
	Question R	esults	

Correctness

Duration

Accuracy Results

Image 2: The leaderboard of the Mental Calculator Trainer

User answer

THE SELF-DETERMINATION THEORY

Question

Answe

One of the most used motivational theory in educational settings is the Self-Determination Theory of motivation (SDT) constructed by Deci and Ryan (2002). The main idea of SDT is that humans have three basic psychological needs to fulfil in order to feel motivated and engage in an activity, namely autonomy, self-competence and social relatedness. However, social environments' can either facilitate or impede these inherent predispositions (Ryan & Deci 2002). Moreover, individuals' motivation is a result of the interaction between a particular social context and individuals' needs system that seeks fulfilment (Ryan & Deci 2002; Vansteenkiste et al, 2012). Thus, the continuous interaction

with the social environment determines whether the latter and particularly its elements, will satisfy individuals' basic psychological needs by promoting motivation or not (Vansteenkiste et al. 2012).

THE CURRENT STUDY

The current study aimed to test the MCT regarding the development of interest in mental calculations. Particularly, we were keen to examine which of the key elements of the MCT could affect different motivational components as they have been described by the SDT (Ryan & Deci, 2000). Particularly, we tested whether in what extent the four categories of elements (eight elements in total) of the MTC, namely, the social connection (connectedness, interaction and leaderboard), the overall design, the gamification elements (competition), and training duration (length of application, duration, and continuity) could explain the perceived interest, perceived competence, perceived value and perceived efforts of students after a small familiarizing period. Finally, we were interested to examine whether these relationships are constant among students from different educational systems. For this purpose, we used students from Germany and Greece.

METHOD

Participants

Sixty-six elementary school children (mean age 10.91, SD = 2.29) from Germany (n=26, 8 were males) and Greece (n=40, 23 were males) participated in the study.

Measurements

For the purpose of the current study, two questionnaires were used. The first measured the users' perception after their familiarization with the MTC. Participants were asked to denote in a seven-point Likert type scale their agreement with the statements about the Continuity, the Duration, the Leaderboard, the Disconnectedness, the Interaction, the Competition, Length, and the Design.

The second questionnaire measured the perceived interest and motivation components participants experienced after the familiarization with the MCT. Particularly, we use the four

subscales from the IMI questionnaire adapted from the Intrinsic Motivation Inventory, a multidimensional questionnaire for assessing participants' subjective experience related to a target activity measuring motivational factors such as interest, perceived competence, perceived value and effort (Ryan, 1982). Participants were asked to denote in a seven-point Likert type scale (1: strongly disagree to 7: strongly agree) their agreement with the statements about the four subscales of the IMI. The items within subscales were randomly ordered in the questionnaire, and the wordings of some questions were reversed. The items from the perceived effort subscale had a non-acceptable reliability and were excluded from the further analyses. The remaining three subscales had acceptable reliability (Cronbach's alphas >. 69).

RESULTS

A mixed design repeated measures with the three motivational components as the within factor and the country as the between factor showed a marginal significant effect of the component, F(2,128)=3.16, p = .046, MSE=1.93, $\eta_p^2=.047$. Post-hoc comparisons using Bonferroni criterion showed that participants showed greater (p = .012) perceived competence (M = 5.76, SD = .92) than value (M = 5.41, SD = 1.04) of the MCT. No significant interaction was found between the participants of the two countries, F(2,128)=

.46,
$$p = .630$$
, $MSE = .283$, $\eta_p^2 = .007$.

The One-way ANOVAs with the three motivational subscales as dependent variables and the country as the independent variable showed a significant difference in the perceived value subscale, F(1,65) = 5.153, p = .027. The perceived value of the PCT found to be higher among the German (M = 5.76, SD = .91) than the Greek (M = 5.18, SD = 1.07) students.

Three Hierarchical Regressions with the IMI components as the dependent variable tested the possible contribution of the eight evaluated elements of the MCT to the perceived interest, competence and value of the MCT. The eight elements introduced on the first block (enter method) and the country on the second block. Table 1 presents the Beta coefficients and the explained variance of each motivational component from the NCT elements. The analysis showed that the eight components explained a significant amount of the total variance of the three motivational components. Particularly, the eight elements explained the 17.9% of the

perceived interest, the 11.9% of the perceived competence and the 31.5% of the perceived value of the MCT. After the insertion of the country on the second block, the explained variance changed on the perceived value (increased on the 35.4%), while it has remained unchanged on the two other components. Nevertheless, the competition element was the only significant contributor for the perceived interest (B = .294, p < .05), which did not change significantly (B = .296, p < .05) after the insertion of the country. Those who endorsed higher the competition element showed a greater perceived interest for the MCT. The element of interaction was found to explain significantly the Perceived Competence component (B=

.308, p < .05) which remained significant contributor even after the contribution of the country at the second block (B = .289, p < .05). Those who denoted greater scores on the interaction element (namely that they would like more often to interact with their peers participating on MCT), evaluated higher the perceived competence after the experience with the MCT. Finally, the competition element had a significant contribution to the perceived value of the MCT (B = .275, p < .05) which remained a significant contributor even after the insertion of the country in the analysis (B = .279, p < .05). The competition element was associated with the higher perceived value of the MCT, (B = -.216, p < .05). This denotes that the contribution of the competition on the perceived value was greater for the Germans than for the Greeks.

	Perceived Interest	Perceived Competence	Perceived Value
1 st Block			
Continuity	.015	348 *	097
Duration	.077	034	.126
Leaderboard	063	.115	.218
Connectiveness	.048	.015	.029
Interaction	.153	.308 *	.071
Competition	.294 *	.112	.275 *
Length	051	122	.078
Designei	.233	.081	.237

Table 1. Summary of Beta coefficients from the three Hierarchical Regressions

Triggering Students' Interest in Mental Calculations with the Mental Calculator Trainer

R^2	.179	.119	.315
F	2.77 *	2.097 *	4.745 **
2 nd Block			
Continuity	.015	348 *	096
Duration	.056	049	.095
Leaderboard	059	.119	.224
Connectiveness	.048	.015	.028
Interaction	.127	.289	.033
Competition	.296 *	.114	.279 *
Length	047	119	.084
Design	.230	.080	.233
Country	147	107	216 *
R ²	.188	.116	.354
F	1.63	.795	4.376 *

DISCUSSION

The current study contributes to our understanding for the unique contribution of different elements used on the design and development of a Mental Calculation Trainer (MCT) to the perceived interest, competence and value of the MCT. The analyses showed that the participants' evaluations of the eight elements explain an important variance of the perceived motivational components. Additionally, the findings highlighted three more aspects.

- First, not all of the elements had equal contribution. The interaction and the competition element were the only elements with a significant contribution to the perceived motivational components.
- Second, the interaction element predicted only the perceived competence of the MCT.

• Third, the competition had a greater impact on the German than on the Greek students.

These findings might be indicative that some elements, although important for the MCT have not any impact on the perceived motivational components. Alternatively, it might be indicative that the way we designed and developed these elements is not the optimal solutions and further modifications are needed in order to reach the optimal standards for an efficient innovative trainer for mental calculations.

ACKNOWLEDGEMENTS

This work was supported by the < European Union's Horizon 2020 research and innovation program, Science Technology Innovation Mathematics Engineering for the Young 2016-2019> under Grant < No 709515>.

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The perception of occupational burnout prevention model conducted within the international EU project Time2Grow and perspective of the employers and employees from the education, higher education and medical care sectors in Poland.

by

Magdalena Ślazyk – Sobol Dorota Kwiatkowska – Ciotucha

Urszula Załuska

The main goal of the Time2Grow Model concentrates on occupational burnout prevention by using the idea of lifelong learning and soft skills development. The basic foundation of the model is the statement that occupational burnout is a shared problem of an employee and an employers, and therefore, given parts of the model are directed to both these groups.

Time2Grow Project contains scientific-applicational activities in the international cooperation nr POWR.04.03.00-00-W300/16 cofinanced by the Social European Fund. The partners are: Dobre Kadry, Centrum badawczo-szkoleniowe (Poland), Trendhuis CVBA (Belgium) i South–Eastern Finland University of Applied Sciences – Xamk, (Finland).

Unfortunately occupational burnout is still tabu in Polish reality, and the situation when an employee has admitted that they suffer from it, is perceived as a indication of weakness, and not of organisational maturity or of awareness of personal and institutional consequences. Quantitative research was conducted in the project, using an original questionnaire of social perception of burnout and the Link Burnout Questionnaire by M. Santinello (153 employees). Additionally two types of qualitative primary research were carried out: in-depth interviews (IDI) among the representatives of employers in education, higher education, medical care areas and of occupational medicine doctors and focus group interviews in each of these groups. There were 26 IDIs. The secondary sources and the results of our research show that occupational burnout in medical health, education and higher education sectors in Poland is present among the employees and, unfortunately, is characterised by a growing tendency. The results were used to design a complex preventative program which is being tested in three professional groups.

Towards a hierarchical usability model for mobile applications: a mapping between usability attributes and quality criteria

by

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ABSTRACT

Mobile applications design and development have brought a new setting of requirements expected by their users. Among them usability plays a major role in their perception of the quality of use. However, the majority of studies conceptualize usability attributes for mobile applications by only providing formal definitions, neglecting explicit quality criteria. To address this issue, based on the systematic literature review and analysis, we developed a hierarchical usability model (HQM4APP) that is made up of a total 12 attributes and 45 quality criteria. In order to validate its correctness and reliability, we have respectively performed three interviews with the domain experts and the survey (n=838) among the mobile applications users. The model has gained positive feedback from both groups of evaluators, confirming its theoretical construct and demonstrating its initial relevance. The results give insights about the importance of usability attributes and secure a mobile application design and development.

Keywords: Usability, Mobile Applications, Quality Management.

INTRODUCTION

Any software product (application or system) has to fit to the users' requirements in terms of high usability, which concern effective tasks' performance, efficient data processing and the perceived satisfaction during the usage (ISO 1998; Sikorski 2003). Usability is

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critical for user system acceptance (Ferre et al. 2001; Redlarski and Weichbroth 2016; Schmettow 2008). Therefore, during almost the last five decades, usability has brought explicit attention both to the academia (Miller 1971; Nielsen 1993; Seffah et al. 2006; Weichbroth 2018) and business communities (Google 2018b; IBM 2018; Microsoft 2018b). However, the usability attributes are still the subject of intensive studies, in particular because of a shift from desktop to mobile computing.

Mobile devices (smartphones, tablets and e-readers) are the significant technology breakthroughs of the last decade. Since the introduction of the first iPhone in 2007, the landscape changed completely. As is well known that "reinventing the phone" has resulted in combining hardware capabilities with software features, advancing quality of use to new frontiers. Aside from the obvious benefits of carrying them in a pocket, allowing mobility around the working and living space with up-to-date information and providing a variety of ways to communicate in and out, mobile devices have physical limitations, where a size of a touch screen is one that the most influence on the user's performance (Colle and Hiszem 2004), being in the same time a default input and output device.

From the software vendors perspective, the mobility paradigm introduces a different setting for applications, requiring the significant changes in their design and development (V. Lee, Schneider, and Schell 2004; Wasserman 2010). Thus, usability needs to be reconsidered in the light of facing limited resources on the one hand, and different user's requirements on the other. However, the majority of studies conceptualize usability attributes for mobile applications by only providing formal definitions, neglecting to formulate explicit quality criteria, which can be used to measure and evaluate particular application properties and user's performance. So, the need for a systematic and deliberate study of usability is crucial, while it has a direct impact on the success (failure) of a mobile applications on the market (Duh et al. 2006; Gebauer and Shaw 2004; D. Lee et al. 2015; Zhang and Adipat 2005).

The aim of this study is to fill this gap which requires a comprehensive approach which investigates current state of knowledge in this area on the one hand, and evaluate the obtained outcome with the usability experts and the end-users, on the other. For usability practitioners, the term "usability" as an objective is the equivalent with quality of use, which means that the product is used by the real and satisfied users. Therefore, usability has two equivalent roles in design: as an attribute which must be designed into a product, and as the highest level quality objective which eventually aims to user satisfaction. In this paper, we focus on the first role, and explore the usability of the mobile applications considering four research questions:

RQ1: Which attributes contribute to the mobile application usability?

RQ2: Which quality criteria are core attributes constructs?

RQ3: Which attributes and quality criteria are valid in achieving mobile application usability?

RQ4: Which attributes and quality criteria affect the most perceived usability of the mobile applications by their users?

Concerning the first question, following our previous research considering in general usability in software engineering (Weichbroth 2018), we identify and define a set of twelve distinct attributes, studying their relevance both theoretically and analytically in the mobile context.

Concerning the second question, for each usability attribute we define and assign a set of core quality criteria both to measure and evaluate application properties and user's performance.

Concerning the third question, we present evidence on the novelty and validity of the preliminary usability model, based upon the conducted interviews with three experts working in the software manufacture industry.

Concerning the fourth question, we provide results of the evaluation survey, conducted using convenience sampling method among mobile applications users (n=838), showing which criteria the most and the less influence on the perceived usability of mobile applications.

Having gathered answers to the questions, we build a hierarchical usability model (HQM4APP) devoted to manage quality of mobile applications which can be used both during their development and maintenance as well.

The rest of the paper is unfolded as follows. Section 2 provides research methodology. According to the methodology, Section 3 outlines the related work which concern usability definition, attributes and models. Section 4 presents attributes' definitions and respective

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quality criteria. These two sections together underpin the HQM4APP model, which validation and evaluation results are accordingly discussed in Section 5 and Section 6. Section 7 depicts and describes the HQM4APP model. Section 8 is a discussion of the performed study, pointing out its theoretical contributions, practical implications, and limitations along with future research directions. Last Section provides a final conclusion.

RESEARCH METHODOLOGY

The research methodology consists of seven steps, which are described below.

Step 1 aims at identifying related work that concerns a systematic search on Scopus, on the topic of mobile application usability. The outcome of this step is described in Section 3. Step 2 aims at identifying in the text referenced usability definition by the Authors, in association with subject and scope analysis, together provides a useful reference point to discuss its adoption in the mobile setting. The outcome of this step is described in Section 3. Step 3 aims at identifying a set of usability attributes by reviewing existing usability models for mobile applications from relevant documents. The outcome of this step is given in Section 3. Step 4 aims at identifying and assigning a set of quality criteria to each attribute along with its precise definition, considering mobile application design guidelines and development practices. The outcome of this step is given in Section 4. Step 5 aims at discussing and validating the attributes and quality criteria by interviewing three external usability experts, selected from the available social network web community. The outcome of this step is given in Section 5. Step 6 aims at evaluating the quality criteria by the mobile application users, using the self-prepared and self-conducted survey. The outcome is described in Section 6. Step 7 aims at prioritizing and layering attributes which together advance the assembling of the HQM4APP model, obtained by logical construction from the input submitted by Step 5 and 6. The outcome is described in Section 7.

RELATED WORK

In line with the research methodology, Step 1 involves a systematic search of the scientific literature on the topic of mobile application usability. Performed on Scopus, the largest abstract and citation database of peer-reviewed literature, counting over 71 million records (Elsevier 2018), a search strategy aims at identifying indexed publications. The

inclusion criteria were defined by the presence of "usability" and one of strings "mobile application" or "mobile system" in titles, abstracts and keywords. In total, the search queries produces 935 documents (830 and 105 respectively), published between 2000 and 2019. To this volume, the following inclusion criteria were applied, while the numbers in brackets indicate the total number of publications: (a) published in English, (b) the subject area is alternatively from: computer science (839), decision sciences (28), engineering (215), mathematics (200), and social sciences (112), and (c) document type is conference proceedings (706), journal articles (203) or book chapter (26). The peak year being 2017 (140), followed by years 2015 (112), 2016 (110) and 2013 (94), with the average 72 documents published annually between 2007-2017. The majority of documents has been published by Springer in Lecture Notes in Computer Science (158), while the largest contributors among journals is Personal And Ubiquitous Computing (9).

USABILITY DEFINITION

Step 2 in the research methodology involves reviewing and analysing the existing body of knowledge. Based on the content analysis focused on identifying definition of the usability in the mobile context, we found that Authors have usually referenced to the ISO norms. The most frequent is the ISO 9241-11 which states that usability is "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" (ISO 9241-11 1998), while in a few cases others reference to the ISO 9126, where the term is defined as "the capability of the software product to be understood, learned, used, and attractive for the user, when used under specified conditions" (ISO 9126-2 2001). Surprisingly, in majority the papers lack of any definition at all, while the rest only point to these attributes or heuristics, which are the subject of testing. It is worth noting, to the best of our knowledge, still there is no formal definition of usability associated with an application (system) running on a mobile device. However some authors argue that mobile usability is widely referred to as a specialized usability in the context of software products whose key resources, such as screen size, input method and power, are greatly limited (Lee H-J. et al. 2017).

USABILITY ATTRIBUTES

Next step in the research methodology relates to recognizing usability attributes in existing models devoted to mobile applications. The following review procedure was systematically applied:

- 1. Attributes identification and analysis: it is the process of reviewing and reading the input, submitted by the database engine.
- 2. New attributes identification and evaluation: it is the process of collecting information about the worth and merit of an first introduced attributes, which were put forward to contribute to the usability of mobile applications, for the purpose of its qualifying (disqualifying) to the work-in-progress list.

The paper was classified as relevant if: (a) the subject of research was addressed to the usability of mobile applications, and (b) was not biased by a context (user-specific attributes such as: age, occupation, sex or system-specific support features like visually impaired, disability), and (c) was related to computer science, and (d) at least one usability attribute being the subject of study was explicitly defined. So far, the review of the list produced 41 relevant documents, which some are referred later in this section to describe the state of the art in mobile usability.

In the ISO 9241-11, the usability is broken down into four dimensions, given as follows (ISO 1998):

- *effectiveness*: "the accuracy and completeness with which users achieve specified goals";
- *efficiency*: "the resources expended in relation to the accuracy and completeness with which users achieve goals";
- *satisfaction*: "the comfort and acceptability of the work system to its users and other people affected by its use";
- *context of use*: "characteristics of the users, tasks and the organizational and physical environments".

In another ISO norm, i.e. 9126-2, usability is subdivided into four different attributes (ISO 9126-2 2001):

• *understandability*: "the capability of the software product to enable the user to understand whether the software is suitable, and how it can be used for particular tasks and conditions of use";

- *learnability*: "the capability of the software product to enable the user to learn its application";
- *operability*: "the capability of the software product to enable the user to operate and control it";
- *attractiveness*: "the capability of the software product to be attractive to the user".

In 2008 the ISO/IEC 25010-2 was released (ISO/IEC 25010-2 2008) revisiting quality model introduced in 2001 by the ISO 9126 norm. The model is composed of two parts: (1) the internal and external software quality model and (2) the quality in use model. Including similar attributes of the software quality, however with some modifications, in more specific way defines the quality of use that is divided into *usability in use*, *flexibility in use* and *safety*. The usability in use includes the *effectiveness in use*, the *efficiency in use*, the *satisfaction in use* and the *usability in use compliance*.

The ISO 25010 (2011) standard on quality models updates and brings together previous standards, defining three views of quality: internal quality, external quality and quality in use (Weichbroth 2018), and two quality models. Product quality model encompasses internal and external qualities of the system, and is composed of 8 characteristics and 31 sub-characteristics (Table 1).

Characteristics	Sub-characteristics
Functional suitability	 Functional completeness
	 Functional correctness
	 Functional appropriateness
Performance	– Time behaviour
efficiency	 Resource utilization
	– Capacity
Compatibility	– Co-existence
	– Interoperability
Usability	 Appropriateness recognizability
	– Learnability
	– Operability
	 User error protection
	- User interface aesthetics
	 Accessibility
Reliability	– Maturity
	– Availability
	– Fault tolerance

 Table 1. Product quality model according to ISO/IEC 25010

	-	Recoverability
Security		Confidentiality
	-	Integrity
	-	Non-repudiation
	-	Accountability
	_	Authenticity
Maintainability		Modularity
	-	Reusability
	—	Analysability
	—	Modifiability
	—	Testability
Portability	_	Adaptability
	—	Installability
	_	Replaceability
Courses ICO 25010 (2011		

Source: ISO 25010 (2011).

A quality in use model is composed of five characteristics, some of which are further subdivided into sub-characteristics that relate to the outcome of interaction when a product is used in a particular context of use (Table 2).

Characteristics	Sub-characteristics				
Effectiveness	none				
Efficiency	none				
Satisfaction	– Usefulness				
	– Trust				
	– Pleasure				
	– Comfort				
Freedom from risk	– Economic risk mitigation				
	– Health and safety risk mitigation				
	- Environmental risk mitigation				
Context coverage	 Context completeness 				
	– Flexibility				

Table 2. Quality in use model according to ISO/IEC 25010

Source: ISO 25010 (2011).

The result of comparison the definitions of quality in use and usability shows that the latter is defined as a subset of the former consisting of effectiveness, efficiency and satisfaction, deprecating users' needs and their freedom from risk.

A number of authors favour these two models by combining and including selected properties into their frameworks and models (Przybyłek 2018), providing directions and guidance for others while developing usability models for mobile applications. For instance, (Seffah et al. 2006) proposed the QUIM (Quality in Use Integrated Measurement) model which includes 10 factors, namely: efficiency, effectiveness, productivity, satisfaction, learnability, safety, trustfulness, accessibility, universality and usefulness.

The PACMAD (People At the Centre of Mobile Application Development) usability model identifies three major dimensions which affect the overall usability of a mobile application: user, task and context of use (Harrison, Flood, and Duce 2013), while the last one plays a crucial role as an application may be used in multiple and very different contexts (e.g. environment, physical location, user's state or performing activity). The model encompasses seven attributes which together reflect the usability of an application: effectiveness, efficiency, satisfaction, learnability, memorability, errors and cognitive load. By many, the model has been adopted to set up a testing and evaluation frameworks (do Nascimento Mendes and Dias-Neto 2016; Saleh et al. 2015). The contribution of this model is its inclusion of cognitive load as an attribute of usability. It can be observed that users of mobile applications often perform additional tasks, such as walking, while using the mobile device. Authors claim that for this reason it is the impact of these additional tasks the user's performance, arguing by the example of a walking user who in the same time is texting a message, which reduces walking speed as s/he is concentrating on typing (sending) the message. Cognitive load has been also recognized and included by others authors (Chuan et al. 2017; Parsazadeh, Ali, and Rezaei 2018) to usability testing. It is also worth noting that one way to measure the level of cognitive load is through the NASA Task Load Index (TLX) (Hart and Staveland 1988).

On the other hand, some authors (Botha 2014; Sroczyński 2017) have simply adopted and adapted attributes defined by (Nielsen and Budiu 2012), which concern application: efficiency, satisfaction, learnability, memorability and faultlessness. These five attributes are still the baseline to evaluate usability while some are top-ranked in the context mobile application. Table 3 shows the percentage of studies that include attributes and metrics, which either indirectly or directly constitute the usability measures.

Table 3. The percentage of studies which evaluated each attribute.

Attribute	(Coursaris et al. 2007)	(Harrison et al. 2013)
effectiveness	62%	51%
efficiency	33%	55%

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satisfaction	20%	58%
errors	0%	33%
learnability	11%	21%
cognitive load	0%	23%
accessibility	7%	0%
memorability	2%	2%
operability	4%	0%
flexibility	2%	0%
acceptability	2%	0%

Source: own elaboration.

To sum up, the provided results indicate that on average the top five attributes in mobile usability studies are effectiveness (57%), efficiency (44%), satisfaction (20%), errors (17%) and learnability (16%), in addition to the context of use which is also an important factor to consider.

A MAPPING BETWEEN USABILITY ATTRIBUTES AND QUALITY CRITERIA

Step 4 in the research methodology involves identifying and assigning a set of quality criteria to each attribute along with its precise definition, considering mobile application design guidelines and development practices.

EFFECTIVENESS

Effectiveness (ES) is the ability of a user to complete a task in a specified context (Harrison, Flood, and Duce 2013; Parsazadeh et al. 2018). Typically effectiveness is measured by evaluating whether or not participants can complete a set of specified tasks (Miguel-Hurtado, Guest, and Lunerti 2017) in order to estimate task completions rate. Other measures concern such heuristics like: a number of double taps unrelated to an application operation, a number of times that a back button is used by the mobile device (not the application) (Shirogane et al. 2018), a number of detected errors or number of assists during performing a task (Miguel-Hurtado, Guest, and Lunerti 2017). From the user perspective, the ability to perform a given task is supported by such application properties like:

- total number of steps required to complete the task (ES1),
- autofill form feature (ES2),

- automatic login (ES3),
- access to frequently used functions (ES4).

The first property can be measured, while the rest can be verified during application usage. The goal of their implementation is to reduce the total physical effort of performing tasks by a user.

EFFICIENCY

Efficiency (EF) is the ability of the user to complete their task with speed and accuracy (Harrison, Flood, and Duce 2013; Parsazadeh et al. 2018). This attribute reflects the productivity of a user while using the application (Bevan 2008). Efficiency can be measured in a number of ways, such as the time to complete a given task, or the number of keystrokes required to complete a given task. These requirements are supported by such application properties like:

- duration of the application starting and closing (EF1),
- duration of content loading (EF2),
- application performance continuity (no deadlocks) (EF3),
- duration of the application response to the performed action (EF4).

All four properties can be measured, and their proper implementation will downsize total operation time, with the lowest number of single tap selections and duration of user scrolling, which eventually positively affects perceived satisfaction of use.

SATISFACTION

Satisfaction is the perceived level of comfort and pleasantness afforded to the user through the use of the software. This is reflected in the attitudes of the user towards the software. This is usually measured subjectively and varies between individual users. Questionnaires and other qualitative techniques are typically used to measure a user's attitudes towards a software application (Harrison, Flood, and Duce 2013; Parsazadeh et al. 2018). Thus, satisfaction as such being subjective in its nature, measured by answers provided by users to questions included in a questionnaire, after performing given tasks (Miguel-Hurtado, Guest, and Lunerti 2017), cannot be an applied as a design objective, and further specified by literal application properties.

ERRORS MANAGEMENT AND PREVENTION

Errors Management and Prevention (ER) has replaced Errors, because the original naming is terse, and does not reflect the true meaning, while proposed provides concise self-description that indicates the desired application quality properties. Originally, errors simply reflects how well the user can complete the desired tasks without performing errors, while estimated rate of users may be used to infer the simplicity of a system (Harrison, Flood, and Duce 2013). Such information allows developers to identify the troublesome areas for users and eventually to improve these areas in subsequent iterations of development. On the other hand, users should make few errors during the use of an app and that if they do make errors they should be able to easily recover from them (Nielsen 1993), being provided with context-sensitive help and meaningful feedback when error occurs (Seffah et al. 2006). By understanding the nature of these errors it becomes feasible to prevent these errors from occurring in future versions of the application (Harrison, Flood, and Duce 2013; Parsazadeh et al. 2018). Having said that, the following application properties materialize this construct:

- ability to withdraw the last performed action without losing the already input data (ER1),
- messages to prevent possible errors (ER2),
- performing a wrong gesture does not result in application errors (ER3),
- verification of the correctness of the input data (ER4).

All four properties can be verified during application testing. The aim underlying them is to facilitate application tolerance to the actions undertaken by a user, and advancing the communication between them.

LEARNABILITY

Learnability (LA) is the ease with which a user can gain proficiency with an application (Harrison, Flood, and Duce 2013; Parsazadeh et al. 2018). It typically reflects how long it takes a person to be able to use the application effectively (Miguel-Hurtado, Guest, and Lunerti 2017). In order to measure learnability, a user's performance during a

series of tasks is observed to measure how long it takes these participants to reach a prespecified level of proficiency. In this case, below properties externalize the ability to learn:

- intuitive use (LA1),
- learning duration of how to use the application functions (LA2),
- changes resulting from the application update (LA3).

The first and the second are intangible properties, and depend on user's experience and skills. The third is a rule of thumb that is valid only in case of user interface redesign.

COGNITIVE LOAD

Cognitive load (CL) refers to the amount of cognitive processing required by the user to use the application (Harrison, Flood, and Duce 2013). In traditional usability studies a common assumption is that the user is performing only a single task and can therefore concentrate completely on that task. In a mobile context users will often be performing a second action in addition to using the mobile application (Parsazadeh et al. 2018). Cognitive load includes mental load and mental effort, reflecting users intrinsic load which is a combination of extraneous and germane load (Sweller, van Merrienboer, and Paas 1998). For such dimension, application properties reflecting its nature are as follows:

- application allows other activities to be performed at the same time (CL1),
- no user interaction required while the app is running in the background (CL2),
- ability to use other applications or device functions while the app is running in the background (CL3),
- duration of mental effort during interaction with the application (CL4),
- ability to perform another activity without having to stop one already started (CL5).

It is worth noting that metrics related to cognitive load are learnability and memorability (Miguel-Hurtado, Guest, and Lunerti 2017). The aim to implement above properties is to reduce the total mental load and effort necessary to use application effectively.

ACCESSIBILITY

ISO 25010 (2011) defined accessibility as a degree to which a product or system can be used by people with the widest range of characteristics and capabilities to achieve a specified goal in a specified context of use, while operability as a degree to which a product or system has attributes that make it easy to operate and control. We have decided to merge operability has with accessibility (AC), because in practice if an app is easy to operate and control then it can be used by a wide audience of users (e.g. children, middle-age and seniors). Moreover, it can be observed that accessibility has been in use by both software vendors (Apple 2018; Google 2018a; Microsoft 2018a) and research community (Moumane and Idri 2018; Moumane, Idri, and Abran 2016), capturing their attention in accordance with its relevance. Application accessibility has been materialized in such properties like:

- ability to personalize (customize) the screen functions to individual preferences (AC1),
- available options: close, undo and redo (AC2),
- off-line application availability (AC3),
- auto-switch between two Internet connection modes (WiFi and LTE) (AC4).

All four properties can be verified during application use, incorporating built-in capabilities and features of the native operating system and the device. A mobile user expects to have instant connection to the Internet, and if possible the fastest, because perceived performance of the mobile apps usually highly depend on the bandwidth speed. Yet, the personalization feature is another rule of thumb; by design, it enables a user to adjust the content and its location, positively affecting the perceived level of the user's effectiveness.

MEMORABILITY

Memorability (MA) is the degree to which users can remember how to use an application effectively (U.S. Department of Health and Human Services 2018). Generally, some applications are used sporadically while some are used on a regular basis. However, both are expected to be used without the need to learn and remember how to use them. Human perception is developed by a combination of attention, eye movements and memory (Lahrache, Ouazzani, and Qadi 2018). Thus, memorability can be measured by asking users to perform a series of tasks after having become proficient with the use of the application,

and afterwards asking them to perform similar tasks after a period time of inactivity. To determine how memorable the application was a comparison can be made between the two sets of results (Harrison, Flood, and Duce 2013). Application memorability has been materialized in such properties like:

- using the application does not require memorizing its specific options, messages and symbols (MA1),
- using the application does not require memorizing previously input data (MA2),
- displaying task hints (MA3),
- description (metadata) of locally stored data (MA4).

These four properties play a key role in confident and instinctive responses and positively contribute to the perceived level of application understandability, leading to higher user's effectiveness.

AESTHETICS

Aesthetics (AE) is the degree to which a user interface enables pleasing and satisfying interaction for the user (ISO 25010 2011). Being the synonymous of attractiveness is particularly significant for user satisfaction and pleasure (Lavie and Tractinsky 2004), while some argue that aesthetics can even compensate for usability and vice versa, depending on the context (Goyal et al. 2018). Considering visual aspects of user interface, aesthetics is highly correlated with the application's perceived usability both before (Tractinsky 1997) and after the interaction, as well as with user satisfaction (Tractinsky, Katz, and Ikar 2000). To examine and evaluate aesthetics a questionnaire-based procedures are used (Lavie, Oron-Gilad, and Meyer 2011). In our study to materialize this application attribute the following properties have been conceptualized:

- conformity of colour, space and one-line buttons style corresponding to the app category (AE1),
- different (vertical and horizontal) screen modes (AE2),
- proportion of graphic elements to text (AE3),
- grouping information within the application page (AE4),

• user interface appearance (AE5).

The goal of these five attributes is to make the user's interaction as efficient and simple as possible in terms of accomplishing user goals. Proper user interface design facilitates performing the task at hand without expecting unnecessary attention to itself.

FEEDBACK AND GUIDANCE

By definition, feedback is reaction to a process or activity, or the information obtained from such a reaction while guidance is help and advice about how to do something or about how to deal with problems (Cambridge Dictionary 2018). In the context of this study, the feedback stands for an application responses to actions performed by a user in the form of graphics, text or a combination of both, and haptics, sounds and spoken messages as well. Typically, there are three types of messages recognized: input requests, status notifications, and error messages (Pfister, Wollstädter, and Peter 2011). The guidance includes application a brief documentation, context-aware help and wizards that actively or passively inform a user how to easily and efficiently use an application. Thereafter, the feedback and guidance are jointly one usability attribute of mobile applications. Due to the absence of traditional, long and detailed pages of help, the following properties are used to materialize this usability construct:

- availability of help or a user manual (FG1),
- autocomplete feature with default values (FG2),
- visual confirmation of the performed action (FG3),
- word completion feature (FG4),
- input data description (FG5).

Above properties being an application outputs, passively and actively support user confidence during tasks' performance. They should also avoid distraction, and not obscure the current display. Providing appropriate feedback and guidance leads to higher understanding of application functionality, that in return brings a higher perceived ease of use.

CONSISTENCY

By definition, consistency (CO) is the quality of always behaving or performing in a similar way, or of always happening in a similar way (Cambridge Dictionary 2018). In the context of this study, Nielsen defined the consistency and standards (Nielsen 1994), focusing on users who should not have to wonder whether different words, situations, or actions mean the same thing. Moreover, design standards and conventions should be followed, and there is also a must to follow real-word conventions, making information appear in a natural and logical order. A mobile application layout and schema should match to the following properties:

- position of the application menu and the option buttons (nav icon, filter icon) (CO1),
- styles of the app and bottom bar, toolbars and text headers (CO2),
- user interface design based on a similar layout structure to other apps (CO3).

In general, consistency refers to having similar operations and objects for achieving analogous tasks which in practice means that an application must maintain the components at the same place and in the same configuration throughout the interaction (Cunha, Machado Neto, and Pimentel 2013). Be assumption, above properties mitigate recognition effort, shirking memory load by operating on the analogical user interface patterns.

VISIBILITY

Visibility (VI) is the degree to which objects can be seen and understood by a user. Visibility is also called perceived affordances or signifiers (Norman and Nielsen 2010). An affordance is the design aspect of an object which suggests how the object should be used (McGrenere and Ho 2000), while signifiers are visual cues which signify the affordances of an application. Due to physical limitations of mobile devices, the complexity of graphics and icons, have been decreased to the minimum, while the elements of user interface must have size which allow a user to easily manipulate them by performing particular touch gestures on the one hand, and have to be understood by preserving the true meaning. To materialize this attribute, the following application properties are externalized:

- location of text boxes and buttons (VI1),
- size of text boxes and buttons (VI2),

- language used to describe text boxes (VI3),
- current progress of the task being performed by the application (VI4).

In practice, the elements on the screen must be adequately aligned and contrasted (Cunha, Machado Neto, and Pimentel 2013). Taking into account physical limitations of the mobile devices applying these properties leads to an increase in the effectiveness of the user in completing the task.

Both flexibility and acceptability were not the subject of the mapping. By definition, flexibility means that the users themselves should be able to continuously adapt the systems to their needs (Lieberman et al. 2006). However, it is one of such concept that is simple to say but very tough to conceptualize and implement. The mobile applications hardly exhibit such properties so far with no harm to their usability. Acceptability is a part of satisfaction defined as "the comfort and acceptability of the work system to its users and other people affected by its use" (ISO 1998). This claim is also argued by the fact that during usability testing, both flexibility and acceptability are not the explicit subject of users' evaluation (Nayebi, Desharnais, and Abran 2012). It is also equally important to note that safety has not been considered along with the usage of mobile devices and the associated effects, risks and benefits of these technologies on their users (Chittaro and De Marco 2004).

MODEL VALIDATION

Step 5 in the research methodology involves validating the usability attributes and their quality criteria during the three independent in-depth interviews with domain experts. The first version of the quality model for mobile application (QM4APP) was assembled. The validation was performed in two iterations in which HCI experts separately participated in both iterations. Each participant was given the full model specification, which was divided into two parts: a brief version (a list of defied attributes) and a detailed version (a list of described attributes and the respective quality criteria mappings). The validation's objective was to obtain feedback from experts to confirm the theoretical construct of the model.

The interviews were one to one in structured form that lasted in total for around 40 to 60 minutes. Preliminary questions concerned basic demographic information, usage of various mobile devices and applications and professional experience. Next, a brief version was introduced following by a short description of the study and research goals. Each

attribute was the subject of discussion, focusing at the recognition and relevance during designing, developing and maintaining mobile application. Afterwards, the model was given to an interviewee who was ask to read the content carefully. Being acquainted with the subject, three tasks were submitted to carry out: 1) for each attribute, evaluate the adequacy, feasibility and validity of each attribute and assigned quality criterion, (2) prioritize attributes in order to maximise the perceived usability by the end-users of mobile application, (3) allocate each attribute on the mobile application development life cycle. As the baseline a generic Software Development Lifecycle (SDLC) was proposed, embodied on the sequence of five stages: analysis, design, development, testing and maintenance.

First part of task 1 involves qualitative evaluation of the attributes and criteria that focus on their adequacy and feasibility properties. In a wide array of projects, including a review of each attributes and related quality criteria, along with practical issues, requirements, and hardware considerations, a semi-structured interviews was conducted to provide experts with an opportunity to elaborate on their preferences. Second part of task 2 involves quantitative evaluation of each attribute separately from each quality criterion, which took place afterwards, using a five-point response scale, from very low (1) to very high (5).

The relationship between expert assessments, measured by the estimated average of experts' scores, show that five major attributes contribute to the usability: efficiency, effectiveness, error management, visibility and aesthetics. The distribution is marked by a blue line on the Figure 1. On the other hand, for each of the twelve quality criteria sets the average of experts' scores was also estimated. The distribution is marked by a orange line on the Figure 1.

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Now, if we compare results based on the brief version (blue line) and based on the detailed version (orange line), it can be noticed that the average of the eleven attributes, evaluated based on the quality criteria, is lower than the average based on their definitions. The exception is cognitive load, primary pointed to be highly important by all experts (4 points on the scale) while later the average estimated based on the five quality criteria is higher and equals almost 4,7.

The following four criteria were pointed as rarely expected and used by the users with the lowest estimated average of 2,33:

- AC1: ability to personalize (customize) the screen functions to individual preferences,
- AC2: available options: close, undo and redo,
- CO3: user interface design based on a similar layout structure to other apps,
- FG1: availability of help or a user manual.

Besides, the last criterion with the average below 3 is the MA3 – displaying task hints (2,66). The average of nine other criterion is below 4, where each stands for a different attribute. Another twelve have the average equals or higher than 4, while the rest of twenty equals 5.

Task 2 involves prioritizing attributes which were dimensioned by quality criteria in order to maximise the perceived usability by the users of mobile applications. In other words, each expert was asked to answer the following question: which of the twelve attributes are the most affective for perceived usability of mobile application? The top three ranked are:

efficiency, effectiveness, and error management and prevention. In justification, they emphasised mental and physical actions, user's interest of application speed and faultless working, expected easiness and effortless of use.

Task 3 involves dividing attributes among the stages of mobile application development life cycle. Three experts failed to differentiate unique design and development processes which concern only particular attributes. However, the discussions revealed the attributes that arise from the design and development context exclusively. The former is a case of assembling and prototyping user interface in which learnability, visibility, accessibility, memorability and aesthetics are encoded into the overall app design, while the latter being a case of app coding concern efficiency, error management and prevention, feedback and guidance. As for other attributes, one said that "somewhere between application user interface and the source code lays effectiveness and cognitive load". Although this issue has not been entirely solved, at the moment several possible solutions are under consideration.

To close this section, we provide brief remarks expressed by two different experts. In the opinion of the first expert, "creating user experiences is the effect of combination of various factors that are efficient, pleasant to use, and enjoyable. By and large, the model seems to be complete, covering all aspects necessary to facilitate mobile application quality, and eventually advance user experience by securing major design principles from my perspective". Second expert claimed that "key usability issues with mobile applications have been the subject of the reports submitted by the users, usually exposed in the beginning of using first app release. So far we haven't used any specific checklist during usability testing before the app release, but now it seems that it may be changed while such introduced is a promise to reduce the number of our clients' complaints".

To sum up, conducted interviews have revealed that three attributes i.e. effectiveness, efficiency and error management and prevention have received direct recognition, while others have been praised for their contribution to embrace usability in complete frames.

EVALUATION STUDY

Step 6 in the research methodology involves evaluating the quality criteria by the mobile application users.

SURVEY DESIGN

The survey was divided into six sections. The first section requested demographic information including age, sex, education background, and the professional experience in number of years. In next section, respondents were asked to select the types of mobile devices and their respective operating systems which are being in personal use. The third section requested to select mobile applications which are being in use longer than three months. The fourth section of the survey examined respondents' attitude towards usability of mobile applications being in use. The next section consisted of four questions which respectively concern: the duration of using mobile applications, the frequency of encountered usability problems, the importance of using mobile applications in professional life, and in private life. The final section of the survey contained a list of 46 items (quality criteria) requested to be evaluated. The fourth and the sixth sections use the measurement scale which was divided into five categories: (1) very weak, (2) weak, (3) moderate, (4) strong and (5) very strong.

DATA GATHERING AND PRE-PROCESSING

Data gathering was carried out both on the paper and electrically, by the means of the wellknown free online tool. The survey duration was 6 months viz. March-August 2018, using convenience sampling method. All paper-based responds were manually input into the database. The gathered data was exported in the plain text format, and processed in the spreadsheet desktop application.

Next the data was analysed to exclude unreliable respondents who have selected: (a) all possible answers in the section 2, OR in the section 3, OR (b) the same answer in the section 6. In total, six respondents were excluded, being classified as unreliable. Thus, the total amount of respondents is 838 while the exclusion rate is very low and less than 0,7% (see Table 4).

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Observations	Ν	%		
Valid	838	99,30		
Excluded	6	0,70		
All	844	100		

PARTICIPANTS

Participants age ranged from 16 to 65 years, among them 354 females (42,2%) and 484 males (57,8%), who was divided into four age groups (see Table 5). The majority of participants were middle-age (71,24%), if we take into account the second and the third group, while the average of respondents' age was $25,5 (\pm 8,00)$ years.

Table 5. Participants age distribution

Age group	n	%
16-20	190	22,67
21-30	480	57,28
31-40	117	13,96
41-65	51	6,09
All	838	100

The basic education was declared by 68 (8,1%) respondents, secondary by 483 (57,6%), while higher education by 287 (34,2%). Professional experience under 3 years was declared by 64,7% respondents. The most popular mobile device was a smartphone (75,2%), running under the Android OS (75,7%), iOS Apple (23,8%), Windows (4,6%) and other not specified operating system (0,6%). In this case, some respondents declared using more than one smartphone. The percentage of survey respondents that have a e-book reader (12,8%) and tables in their household (11,9%) is almost the same.

RESULTS

Results of the survey (n = 838) indicated that the top three attributes (Table 6), measured by particular sets of quality criteria, that impact of perceived usability of mobile applications are: efficiency (4,07 ± 0,95), cognitive load (3,74 ± 0,88) and error management and prevention (3,72 ± 0,87). Ten attributes demonstrate internal consistency, measured by Cronbach's alpha (α column), at the acceptable levels (equal or higher than 0,75).

Attribute	Items	AVE	SEM	S.D.	α
Efficiency	3	4,0686	,0328	,9509	0,916
Cognitive load	4	3,7353	,0304	,8814	0,884
Error Management and Prevention	4	3,7151	,0300	,8692	0,850
Learnability	4	3,6185	,0288	,8324	0,679
Visibility	4	3,6044	,0267	,7739	0,816
Effectiveness	4	3,5794	,0282	,8155	0,792
Accessibility	3	3,5588	,0292	,8441	0,762
Memorability	4	3,4612	,0289	,8362	0,842
Aesthetics	5	3,3434	,0291	,8417	0,862
Consistency	5	3,3194	,0282	,8165	0,763
Feedback and guidance	5	3,3012	,0287	,8304	0,851

Table 6. The summary of descriptive statistics and reliability of the model attributes

The results of the survey revealed the different perceptions of the impact of particular attributes. For the respondents the highest rank properties are:

- EF3: application performance continuity $(4,13 \pm 1,06)$,
- EF4: duration of the application response to the performed action $(4,07 \pm 1,03)$,
- EF2: duration of content loading $(4,04 \pm 1,06)$.

Respondents praised the most all efficiency properties, and feedback and guidance, consistency and aesthetics had been pointed to have a moderate impact on mobile application usability.

HQM4APP MODEL

Having identified 12 attributes, the hierarchy of the model construct is as follows. Firstly, we split usability attributes between two abstract layers: a system and a user. Within the former another two abstract layers are distinguished: design and capability. The design layer contains four attributes: aesthetics, accessibility, consistency and visibility. Therefore, it is a high level view on the user interface (UI) properties. The capability layer is made up of three attributes: efficiency, errors management and prevention, feedback and guidance. Hence, it is a high level view on application performance, fault-tolerance and interaction proficiency. The user layer is made up of the five attributes: effectiveness, learnability, memorability, cognitive load, and satisfaction. Thus, the user layer is the high level view on user performance, mental effort and cognitive-affective attitude towards application. Figure 2 below shows the schematic diagram of the model hierarchy as the final outcome of our study.



Fig. 2. The HQ4APP usability model for mobile applications

Dichotomizing system layer into two distinct layers enables to conceptualize application structure and dynamics autonomously which benefit in advancing quality criteria. This view is not standardized, however it can be customized to show attributes of interest to the particular user or group of users, and can be sorted to show high-priority application properties. In such manner, incorporating different measures as discussed above is also possible, being a case of identified users' preferences.

DISCUSSION

In our previous study (Weichbroth 2018) in which we have investigated existing usability models and standards to provide answers for two research questions: (1) what is usability? and (2) which attributes most frequently contribute to the software usability? Based on rigorous literature search, a set of 27 usability attributes has been identified where the most frequent are: efficiency and satisfaction (both with 59%), learnability (53%) and effectiveness (47%). The least frequent are understandability and operability (18%), memorability, errors, attractiveness and accessibility (12%), while the rest attributes occur less than 6%. Taking into account the results obtained from the literature study, one can say that in large extent, the legacy of usability established in a desktop setting has been transferred to a mobile setting.

THEORETICAL CONTRIBUTIONS

This study contributes to the literature in several ways. The HQM4APP model constituted a blueprint for computer science and software development communities. Our criteria make a substantial contribution toward defining explicit quality criteria for measurement properties of mobile applications. This facilitates qualitative foundation to ascertain a holistic approach under which to perform usability studies. In the following passage, we contextualise two three areas design, development and maintenance, respectively for the interest of designers, developers and quality managers. New usability attributes have been introduced: visibility and consistency. The results from survey show that recognized quality criteria, to each assigned individually, demonstrate internal consistency at an acceptable level (alpha = 0,77 and 0,82). In general, the model system carries the promise to support the quality of manufactured mobile applications in a reliable (alpha = 0,96) and efficient way.

PRACTICAL IMPLICATIONS

This study was confirmed to offer implications for practitioners as well. In some way, by and large, the model was said to support quality management practices. Discussing model specification yielded important implications for design and development processes, such as "providing consistent and simply-structured checklist" and "facilitating quality during designing and implementing configurable app settings". Our criteria can be used in systematic assessment of quality, to detect shortcomings and gaps in knowledge of measurement usability attributes, and ultimately to provide feedback for designers and developers.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

Although this study provides some interesting findings concerning modelling usability for mobile applications, certain limitations exist within the design. Firstly, one of the major is that the quality criteria elaborated to represent particular attributes are not always considered to be included into application design by the experts, however indicated to be highly important by the users. Therefore, there is an asymmetry between users' expectations and requirements against mobile applications; in other words, users expect more while use less in reality. This is an acknowledged limitation of this study. As a consequence, there is a need to refine particular attributes and consider to add more in order to adequately and completely conceptualize and materialize the usability paradigm for mobile applications. Nonetheless, the findings highlight the importance of providing effective, efficient and faultless solutions with minimalized cognitive load, with aesthetic and consistent user interface that is easy to use, learn and remember. Moreover, the above quality criteria can be used to create a screening checklist to facilitate usability testing, and eventually serve as a method to manage the application quality in use. Secondly, the number of experts equals three who agreed to validate the model, may be seen as another limitation of this study. However, the obtained feedback have a close similarity to the design and development processes applied in the commercial software manufacturing environments, managed by those three active practitioners. Particular criteria being flagged to verify have been confirmed to be reconsidered, based on the analysis of the native apps available for iOS and Android platforms. Thirdly, the data in the evaluation study was gathered using convenience sampling method across users from a single economy - Poland, which constitutes a research setting

that introduces a number of considerations, highlighted by (Marcinkowski and Gawin 2018). It is not claimed however that the results can be generalized to all users in the Europe and elsewhere. In this case, to increase generalizability, further research needs to consider sampling views from more countries.

Future research will target to overcome these limitations. The major goal is to refine existing and include new attributes and then also specify novel quality criteria respectively. Therefore, an improved setting of the model will undergo evaluation by the larger group of experts. However, it is our concern that the future challenge will be to refine and complete the criteria and to reach eventually broad consensus, especially on quality criteria for appropriate measurement attributes.

CONCLUSION

Developing an understanding of usability for mobile applications by mapping quality criteria to its attributes mobile is an important endeavour for practitioners' and researchers' communities. This study does not pretend to be the last word on the subject matter, but still more studies are needed to extend the frontiers of knowledge in the area. Exploring the problem of preserving application quality in use might be extended by other factors that concern context-awareness, security and responsiveness. Studies in the area should seek to include perspectives from multitasking, device-specific capabilities and operating system (OS) constraints. Mobile devices are fairly homogeneous, however there are still some components that are optional and therefore require individual considering while coding. The model HQM4APP is generic and can be adapted to any hardware and OS setting to provide a basis for conceptualising and materializing usability attributes for mobile applications. On the hand, quality criteria may serve as the high-level design and development objectives that are not dependent on specific tasks or interface objects.

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The author declares that there is no conflict of interest regarding the publication of this paper.

Development and implementation of an innovative educational project for university teachers' competencies independent assessment based on the on-line tools

by

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ABSTRACT

The paper covers the results of scientific research being performed by the group of the Russian scientists engaged in the development of an innovative educational project at Peter the Great St. Petersburg Polytechnic University under the guidance of Professor E. M. Razinkina of the 2017/18 academic year. The goal of the research was the confirmation that the innovative concept of the educational project on independent assessment of competences of pedagogical workers can be represented as a system process with the three subsystems included. The first Subsystem aims to generation of new knowledge on independent assessment of competences of teachers on the basis of research activities. The second Subsystem is busy with the development of a project for independent assessment of teachers' competencies based on the results of the generated new knowledge. Finally, the third Subsystem relates to the implementation of the project on independent assessment of teachers' competences by means of professional development of trainees with individual knowledge about the process of implementation of the developed innovative project.

Keywords: Information technology in education, digital culture, technical university, educational process

INTRODUCTION

Due to the high social and social requirements to the system of higher education in conjunction with modern economic conditions the Russian higher education modernization leads to the Reed to improve the efficiency of the educational process, which in turn makes special claims to the level of competence of society teaching staff of universities. At the same time, there is a steady tendency to increase the requirements for the teaching staff (employees including in the teaching staff) of universities not only in terms of the availability of competencies in the professional field of knowledge, but also competencies in methodological, research, extracurricular areas, knowledge of the legislative framework in the field of education, skills and abilities to use modern information and innovative educational technologies, development of communicative competencies. The introduction of new educational standards that meet the modern requirements and demands of the society entail changes in the ideas about the structure of pedagogical skills, including a wide range of professional, social, personal, managerial and competencies, all this in General, creates the need for a new approach to the competence assessment system of teaching staff.

LITERATURE REVIEW

Development and implementation of the teachers' competences independent assessment system project is carried out in the educational organizations on the basis of the innovative concept of education, considered in the Russian scientific literature. Widely spread scientific approach [Bondarenko A.V. (2018); Druzhinina A.V. (2016); Kasikov K. A. (2016); Pazukhina S. V., Ignatovich V. G. (2016); Tskhvitaria T. A. (2016); Shabanova Yu. V., Akinshina I. V. (2016)] considers that innovative education should correspond to the research of innovative activity in professional education as a system approach to interrelated types of work. A group of the Russian scientists engaged in the development of an innovative educational project at Peter the Great St. Petersburg Polytechnic University under the guidance of Professor E. M. Razinkina [Gamayunova O., Vatin N., Rechinskiy A., Razinkina E. (2015); Kalmykova S.V., Pustylnik P.N., Razinkina E.M. (2017); Razinkina E., Pankova L., Trostinskaya I., Pozdeeva E., Evseeva L., Tanova A. (2018); Kalmykova S. V., Pustylnik P. N. (2016)]. One could prove that the innovative concept of the educational project on the

independent assessment of competences of pedagogical workers is set up as a system process including three subsystems:

Subsystem 1. Generation of new knowledge on independent assessment of competences of teachers on the basis of research activities;

Subsystem 2. Development of a project for independent assessment of teachers ' competencies based on the results of the generated new knowledge;

Subsystem 3. Implementation of the project on independent assessment of teachers' competences by means of professional development of trainees with individual knowledge about the process of implementation of the developed innovative project.

Thus, the literature review proves the lack of scientific publications covering the approach to innovative educational project in the modern digital culture with the independent assessment of competences of pedagogical workers being executed.

METODOLOGY

The methodology is based on the theory of both systems and innovations which considers the detailed research of essence of those subsystems mentioned above.

The SUBSYSTEM 1 generation of new knowledge on independent assessment of competences of teachers on the basis of research activities is due to the relevance of the task of developing an innovative approach to education. Modernization of higher education in Russia, due to the high social and social requirements to the system of higher education in conjunction with modern economic conditions, leads to the need to improve the efficiency of the educational process, which in turn makes special claims to the level of competence of society teaching staff of universities. At the same time, one could observe a steady tendency to increase the requirements for the teaching staff employees of universities not only in terms of the availability of competencies in the knowledge professional field, but also competencies in methodological, research, extracurricular areas, knowledge of the legislative framework in the educational field, skills and abilities to use modern information and innovative educational technologies, development of communicative competencies. The introduction of new educational standards that meet the modern requirements and demands of the society

entail changes in the ideas about the structure of pedagogical skills, including a wide range of professional, social, personal, managerial and competencies, all this in General, creates the need for a new approach to the competence assessment system of teaching staff.

The basic principles of formation of the system of independent assessment of competences of teaching staff (abbreviation PPS) are the following principles:

- the determination of the competences assessment main directions of the teaching staff (PPS), taking into account complexity and multidimensionality of pedagogical activity, on the basis of the requirements of the professional standard "the Teacher of professional training, professional education and additional professional education" (further professional standard) approved by the Order of the Ministry of labour and social protection of the Russian Federation of September 8, 2015 N 608n;
- the involvement of independent experts in the development of funds of evaluation means of competence of teaching staff (Federal teaching methodological Coordinating Council for education, abbreviation FUMO,);
- the system organization of teaching disciplines (modules) quality by means of the student evaluation.

At the same time, the main components of the independent assessment of PPS competencies are independent assessment of four main indicators:

- pedagogical competences of teachers (student survey);
- proficiency of teachers of the content of educational programs of higher education in the part of the implemented disciplines, including the assessment of formation of competences of the teacher in accordance with the employment actions and skills being mentioned in professional standard;

teacher's work activity of the (visit open classes);

• teacher's portfolio analysis.

With regard to the technology of independent assessment of competencies of teaching staff, the independent assessment of competencies of teaching staff is carried out in the form of voluntary certification. Certification is a periodic comprehensive assessment of the level of professional competence of employees holding positions of teachers belonging to the teaching staff. Certification is carried out on a voluntary basis in order to confirm the formation of competencies of the PPS in accordance with the labor functions, at least once every three years.

Voluntary certification is designed to promote:

- rational implementation of educational and creative potential teaching staff use;
- professional skills level raising;
- optimization of recruitment and placement;
- improving the quality and efficiency of work;
- development of initiative and business activity.
- Voluntary certification is also used in assessing of the work of teaching staff (PPS)in order to determine the rating.
- The main objectives of the voluntary certification are:
- job growth prospects identification, promotion of professional competence of employees;
- the need for professional development, training or retraining of the employee identification;
- formation of a reserve of personnel for promotion to senior positions, providing opportunities for job growth planning;
- increase of wages;
• development of staff skills with rising motivation.

Development of the project on independent assessment of competences of teachers regarding the SUBSYSTEM 2 is carried out on the basis of a logical sequence of stages, the Foundation of which are the results of the generated new knowledge. A group of researchers on the basis of the formulation of the principles and the main components of the independent assessment of competencies of the faculty formed a logical sequence of the project, which includes the following stages:

• Methodology development for independent evaluation of the faculty and of the socalled PPS assessment tools' bank (The authors suggest to use the special term «Fund»);

• Development of questionnaires of students on independent assessment of pedagogical competences of teaching staff and their approbation in high school;

• Approbation of implementation of the methodology for independent assessment of competencies of teachers and implementation of Governmental educational standard (acting in the Federal level and named FOS as abreviation) at the University;

• Implementation of the procedure for reviewing the results of the experiment on the implementation of the Governmental educational standard (FOS) and the methodology for independent assessment of PPS competencies by Federal training associations and Coordination councils.

As part of the procedure of voluntary certification of teaching staff formed the necessary number of certification commissions, including the structural units of the University. The quantitative and personal structure, terms and the order of work of the commissions approve by the order of the rector (Vice-rector) of higher education institution. Thus the structure of the certifying commissions forms taking into account need of the exception of possibility of the conflict of interests which could affect the decisions made by the commissions.

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Commissions generally consist of a Chairman, a Vice-Chairman, a Secretary and members of the commissions. The secretaries of the commissions may be granted equal rights with other members of the commissions by the decision of their chairmen. The Chairpersons of the committees lead and organize the work of commissions, determine the order of work organization and functions of each of the members of the Commission, shall decide on the participation in the meeting of heads of the certified employees, conduct personal reception of employees receiving certification, organize the work of the members of the Commission on consideration of offers, statements and complaints of the certified employees, carry out other duties directly related to the attestation procedure. By decision of the chairmen of the commissions, independent experts with the right of Advisory vote may be involved in the work of the commission is impossible for the valid reasons (illness, business trip, etc.), its replacement with introduction of the corresponding change in structure of the Commission shall be made.

The decision on carrying out certification, date, place and time of carrying out certification is accepted by the rector (Vice-rector) of higher education institution taking into account representation of the head of structural division and in writing is brought to the attention of teaching staff (PPS) as a rule no later than 30 calendar days prior to day of carrying out certification. An employee of the faculty, who wants to pass the certification, submits a written application to the rector (Vice-rector) of the University.

For carrying out voluntary certification the order in which it is specified is issued:

- date of certification (appraisal schedule for structural units);
- the compositions of the certifying commissions;
- surnames, names, middle names of the workers wishing to pass certification, their positions and names of structural divisions in which they work.

In the 2018/2019 academic year, it is planned to expand the conceptual basis of the innovative approach formed by the scientific team of SPbPU (honored in Peter the Great) by further spreading the positive practice of voluntary certification of teaching staff to other

Institutions, as well as the use of the results of certification in competitive procedures in the replacement of vacant positions of teaching staff.

The basis for further research is the best practices of an innovative approach to education, tested in the 2017/2018 academic year in the process of implementing the project on the independent assessment of the competence of teachers through the procedure of voluntary certification was carried out in the Federal state educational institution of higher education "St. Petersburg Polytechnic University of Peter the Great" in two Institutions-the Institute of civil engineering and the Institute of industrial management, Economics and trade.

The total number of teaching staff (PPS) who took part in the voluntary certification was 187 people, 92% of them successfully passed this procedure. According to the results of voluntary certification teachers received certificates.

It should also be noted that the successful completion of the voluntary certification allowed teachers to score 15 points in the scale of assessment of the quality of work of employees in accordance with the Regulations on the rating of employees holding positions of scientific and pedagogical workers assigned to the faculty of SPbPU.

Teachers who received insufficient points for one of the three certification modules were given recommendations for training in the framework of the competence approach in the professional field of knowledge.

The SUBSYSTEM 3 implementation of the project on independent assessment of competences of pedagogical workers by means of professional development of the trained individual knowledge of process of implementation of the developed innovative project assumes formation of tools of carrying out voluntary certification of teaching staff (PPS).

For carrying out voluntary certification the specification of PPS assessment tools' bank (Fund) which defines requirements, structure and other features of Fund intended for carrying out voluntary certification of PPS is formed. At the same time, assessment tasks should correspond to the specialty and qualification of certified workers. The abovementioned Fund is a set of methodological and evaluation tools designed to determine the level of formation of competencies and quality of teaching staff from among the teaching staff.

In designing the content of the PPS assessment tools' bank (Fund)take into account the following peculiarities of the procedure of evaluation of teaching staff (PPS):

- non-competitive evaluation (criterion-oriented assessment);
- activity character;
- sufficient evaluation tools for the optimal assessment of labor actions, skills;
- dichotomous estimation.

The structural components of PPS assessment tools' bank (Fund) include following modules:

- certification modules on the regulatory and legal block, the block of information technologies, the professional block being realized in the form of testing;
- certification module on the communication unit, implemented in the form of an independent survey of students on an objective assessment of the quality of teaching staff, aimed at providing feedback to consumers of educational services.

The process of certifying of teaching staff (PPS) being realized in the form of testing by means of the modules is carried out using the automatic devices or systems of testing. The test structure consists of tasks for the corresponding components of the PPS assessment tools' bank (Fund) is presented in Table 1.

Table 1: The test structure

The certification module	The number of processes	Process type
	executed	
Regulatory and legal module	10	Select one or more answer
		choices / matching
Information technology module	10	Select one or more answer

		choices / matching
Professional module	10	Select one or more answer choices / matching
The total number of modules: 3	The total number of processes: 30	

RESULTS

Approbation of the developed project on independent assessment of competences of teachers of educational organizations is based on information support by automated means of assessment and appropriate information support of certification modules.

The duration of the test is 60 minutes.

Certification of teaching staff on the communicative module, implemented in the form of an independent survey, is determined by the relevant local regulations of the University, regulating the procedure for conducting and recording the results of the survey.

Organization of information support of certification modules, the procedure and timing of the test tasks, other organizational and technical aspects of the formation and application of the PPS assessment tools' bank (Fund) for voluntary certification of teaching staff is determined by the relevant local regulations of the University.

All structural components of the assessment set are mandatory. A positive decision is made if the tasks meet the criteria set for them.

Assessment of the tasks is carried out by the attestation Commission on the structural units of the University.

LIMITATIONS AND FUTURE RESEARCH

Evaluation of tasks is carried out on the basis of the following principles:

– compliance of the contents of competitive tasks to requirements of the professional standard "the Teacher of professional training, professional education and additional professional education" (the Order of Ministry of labor of Russia of 08.09.2015 No. 608n), the Labor code of the Russian Federation, the Federal law of 29.12.2012 No. 273-FZ "about education in the Russian Federation", the Order of the Government of the Russian Federation of 08.08.2013 No. 678 " about the approval of the nomenclature of positions of the pedagogical workers of the organizations performing educational activity, positions of heads of educational organizations" and the Charter of the Federal STATE «SPbPU»;

reliability assessment stands for that the assessment assignments must be based on
 General and professional competences of workers of the faculty;

 adequacy of assessment means that the assessment of tasks should be carried out in respect of those competencies that are necessary for the effective implementation of the task;

 integrated assessment considers that a system of evaluation of assignments should allow integrative to assess the General and professional competence of workers from among the faculty;

- the objectivity of the evaluation calls for that evaluation of assignments should be independent of the peculiarities of professional orientation or preference of members of a certifying Commission.

The following basic methods are used to perform the job evaluation procedures:

- procedure of calculating the raw score;
- procedure of calculating cumulative scores;
- procedure of expert evaluation;

- procedure of aggregating the results of the voluntary certification of workers from among the faculty;
- ranking results of the voluntary certification of the faculty workers.

The results of the tasks are evaluated on a 100-point scale.

Evaluation criteria and maximum possible scores of certification modules are presented in Table 2.

Table 2: Assessment criteria of governmental educational standard structural elements (FOS)

Structural components of the GES	The maximum		
Structural components of the GLS	number of points		
Regulatory and legal module	20		
Information technology module	20		
Professional module	30		
Communication module: conduct an independent survey	30		
The total maximum number of points	100		
The total minimum number of points required for successful	60		
certification			

Evaluation of the results of the certification modules implemented in the form of testing is carried out by a simple summation of points for the correct answers to the questions.

Evaluation of the results of the communicative certification module, implemented in the form of an independent survey, is carried out by simple summation of points, based on the appropriate scale of evaluation (scale of translation of answers into points) of the questionnaire of the independent survey.

For implementation of accounting of the received results individual sheets of estimates of results of performance of tasks in which points for performance of tasks of each certifying module and a final assessment are entered are filled in. On the basis of individual statements formed a summary statement of evaluations of the results of the passage of voluntary certification of teaching staff (PPS) in the structural units of the University.

The results of passing voluntary certification of workers from among the faculty are approved by the Protocol review Board.

The survey procedure for the objective assessment of the teacher by students is carried out in accordance with the evaluation criteria:

- training courses: the relevance of the course for the future career of the student (practical orientation); the usefulness of the course for the future career of the student; the usefulness of the course to expand horizons and comprehensive development; the novelty of the knowledge (no duplication in different courses); the complexity of the course for successful completion;
- teacher: organization of the educational process (clarity of requirements for students on the current and final control; clarity and consistency of presentation; the use of interactive forms of organization of classes; the use of computer technology in the learning process); establishing communication with students (teacher contact with the audience; the possibility of classroom and extracurricular communication on educational and scientific issues).

PRACTICAL IMPLICATIONS

The results of the independent evaluation can be used:

• Educational organizations of higher education, in particular the administration of the University-to address personnel issues (competition teaching staff, certification of teaching staff, the appointment of incentive allowances in the framework of an effective contract); for the final certification of programs of additional education for the training of teachers who do not have pedagogical qualifications for the implementation of educational programs of higher education. The results of an objective assessment of the teacher by students can also be used by teachers to adjust the discipline program (module) and improve teaching skills. The student Council of the University can apply the total independent evaluation of teachers to resolve conflicts arising during the educational process in the interaction with students; developers of educational programs (heads of educational programs) – to adjust the content of programs.

• The Federal service for supervision of education and science – during the procedures of state accreditation, control and supervision activities within the framework of staffing the program and the requirements for the mechanisms used to assess the quality of educational activities and training of students.

VALUE/ORIGINALITY

Originality of the research's results is ensured by both Scientific and practical approaches on the use of the results of the innovation project for the independent evaluation of teaching staff (PPS) in Subsystems 1, 2, 3.

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Digital Culture of Students of a Technical University: Investigation of Modern Ways of Learning and Communication

by

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The paper is elaborated in the framework of scientific project №18-010-01119 supported by the Russian Foundation for Humanities

ABSTRACT

This paper presents the results of an investigation conducted at Peter the Great St. Petersburg Polytechnic University during the spring semester of the 2017/18 academic year. The goal of the investigation was to discovery the actual level of digital culture in the target group in the context of the process of education. The investigation throws some light on the matter on how vast the usage of digital tools is in the educational process of students studying Economics, Management and Business in a technical university.

Keywords: Digital culture, industrial development, technical university, educational process, digital skills

INTRODUCTION

The key destination of modern economy development is the process of digitalization in all spheres of human activity, in manufacturing industries in particular. However the main success factor for industrial digitalization is ability of employees to cope with the new challenges of modern technologies of industrial design and manufacturing. The problem is actually international. For instance, generalizing the overview of situation in the domain of digital skills development in Great Britain, the document (House of Commons, 2016) defined it as a digital skills crisis based on the fact that in Great Britain "almost 50% of employers have a digital skills gap, which includes specialist technical roles". The document recommends the following: "Digital skills should be one of the core components, alongside maths and English, in all apprenticeships, not just 'digital apprenticeships". The document confirms the conclusion that the future progress of the industrial digitalization depends on ability of future workforce to meet the new challenges of digitalization. The future workforce for manufacturing industries is studying at the moment in technical universities. Thus, the goal of the investigation was the discovery of actual level of digital culture of the students of technical university in the process of education as a model for their future professional activity. The investigation was conducted at Peter the Great St. Petersburg Polytechnic University during the spring semester of the 2017/18 academic year among students of Institute of Industrial Management, Economics and Trade.

LITERATURE REVIEW

There are few contemporary researches are focused on discovery of actual state of digital culture of students of technical universities in context of their future professional activity in industry. R. Fernandez-Pascual (2018) makes a focus on analysis of the informational behavior of a group of students in the domain of social sciences, in context of their competence in the communication– dissemination of information in the digital age. The authors of (Liventsova, Rumyantseva & Syryamkina, 2018) state that modern professions require technical and engineering specialists with advanced soft skills and propose to develop transdisciplinary skills of students in different specialties. The study (Podgornik, et. al., 2018) is looking for identification of factors effecting on information literacy of university students. The overall conclusion is that information literacy should be systematically promoted through hands-on and minds-on activities. The authors of (González & Martín, 2018) and (Vázquez-Cano, Meneses & García-Garzón, 2017) concentrate on gender aspects of digital competences of university students. The paper (Kozlov, Kankovskaya

& Miroliubova, 2017) analyzed the slightly different issue concerning not actual student digital skills but content of study plans and study programs from point of view of official requirements for usage of IT and digital tools and platforms in educational process. The only research of real usage and approaches of students to digital tools is presented by the paper of B.W. O'Bannon, G.J. Skolits, & J.K. Lubke (2017). However the study is limited by analysis of achievement when an interactive textbook (iBook) was used in place of lecture.

Thus the literature overview confirmed the lack of studies in the domain of digital culture and actual digital skills of students in technical universities.

METODOLOGY

The methodology is based on classic approach to researches proposing survey development, interviewing techniques and consists of the steps of investigation as follows (Ghauri & Gronhaug, 2010): (1) the formulation of the investigation goal; (2) target group identification: students of Institute of Industrial Management, Economics and Trade of Peter the Great St. Petersburg Polytechnic University; (3) survey development (18 questions were formulated); (4) the face-to-face interviewing of 176 representatives of the target group; (5) analysis of results obtained.

RESULTS

The analysis of demographic structure of respondents figured out that 71% of them are students of the bachelor programs, 29% are studying at the master level. Gender distribution is as follows: 40,3% of interviewees are males, 59,7% are females. The majority of respondents are citizens of Russian Federation (68%), the rest are foreign students (8% - France, 6,25% - Germany, 6,25% - China, 2,84% - Kazakhstan).

The most important results of interviewing are the following. 78,5 % of respondents are sure that e-learning and IT can't totally replace the traditional teaching methods (lectures, practical work, seminars, labs and so on) and may be just used as the additional tools in educational process. Only 63% of respondents use educational platforms (EP) in self preparation in educational process (the most popular is OpenEdu, Russian EP - 43,2 %, the next is Russian Lektorium - 8,14%, Coursera is the third - 4,8%). 52,5% of students are regularly using the specialized educational Apps, 28% prefer not to do it. The respondents prefer to use social networks for communications on private personal topics (46% of entire communication time). Communications with the other

students on the topics of study take 34% of entire communication time only. The same approach is to usage of messengers, the 58% of entire time is devoted to private topics, 30,8% of time is taken by communication with the other students on the topics of study and only 6% is devoted to communication with teachers.

Thus, this research discovers the fact that essential part of students can be described as rather conservative creatures in their approach to usage of e-learning, information and digital technologies in studying. The percentage of these conservators can be valuated as app. 30-35 % of the whole sample. They don't use modern tools in educational process and prefer to communicate with teachers directly and use social networks at the first rate for private personal communication not for educational purposes. The additional confirmation is the highest grade for hard copies of textbook among other options, electronic textbook and video course. The hard copy was evaluated by 3,84, electronic textbook by 3,66, video course by 3,29 (the 5 level scale was used, the "5" is the most comfortable source of knowledge, the "1" is the worst one).

Presumably they will keep the same conservative line at their future working places in industry.

It can be a serious barrier for industrial digitalization to overcome.

LIMITATIONS AND FUTURE RESEARCH

The investigation covered rather bounded sample from the whole population and it's limited by students of the only Institute of the University. Consequently the future research should be focused on wider sample covering more respondents from different Institutes. The other direction of the research is investigation of behavior of conservative students and analysis of barriers in their minds preventing to use of e-learning, information and digital technologies in study process with purpose to propose remedies to overcome these barriers.

PRACTICAL IMPLICATIONS

The results of the investigation are to be of interest to Russian Ministry of Education and university administrative bodies who are optimistically reporting about successes in digitalization of educational process. To improve the situation it is reasonable to use two ways. The first way is the further training of university teachers to master digital skills and use it in communications with students. The second way is to develop more friendly-to-use mobile Apps, educational platforms, digital textbooks and promote it among students.

VALUE/ORIGINALITY

Originality of the research's results is ensured on one hand, by usage of methods of primary data gathering through face-to-face interviewing of representatives of target group done in spring semester of 2017/18 academic year, on the other hand by coincidence of the sample design and the structure of the general set of students of the Institute of Industrial Management, Economics and Trade. The value is determined by discovering the lack of digital culture and existence of barriers to develop digital economy connected with conservative approach of future industrial workforce to usage of e-learning, information and digital technologies.

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The Possibilities and Mechanism of the Application of Blockchain Technology to the Protection of Intellectual Property Rights

The Possibilities and Mechanism of the Application of Blockchain Technology to the Protection of Intellectual Property Rights

by

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ABSTRACT

Blockchain technology is developing and successfully applied in various fields: cryptocur-rency, logistics, advertising, banking, payments and money transfers, cybersecurity, voting, car rental and sale, forecasting, copyrights and ownership of online music, stock trading, real estate and land sales, microinsurance, healthcare, cloud storage, energy management and oth-ers.

The literature review showed that technology is still not used to protect intellectual property rights, although it has the potential for development. In modern conditions, intellectual capi-tal is recognized as the main driver of society and economic entities development.

Based on analysis, synthesis, analogy and other methods, the paper considers the mechanism of a possibility of applying blockchain technology to the protection of intellectual property rights, namely the identification of scientific works (ideas, developments, research results and other valuable information) and the reduction of intellectual capital investment risk. The applicable blockchain technology is initially based to proved security at a database level. The most suitable is a private blockchain scheme designed to control the development of an innovative asset.

Keywords: Blockchain technology, intellectual capital, intellectual property rights, innovative asset, investment risk.

In modern conditions, intellectual capital is recognized as the main driver of society and eco-nomic entities development. Intellectual capital is "intellectual material, which includes knowledge, experience, information, intellectual property rights and participating in the crea-tion of values".

INTELLECTUAL CAPITAL

Intellectual capital is the collective concept, which contains, in essence, the part of the intan-gible assets, not taken into consideration in the accounting documents, but of paramount im-pact on performance indicators and forming competitive advantages. The structure of intel-lectual capital can be divided into three blocks:

Human capital - knowledge, habits and experience, workers, and also the ability of organi-zation to receive economic benefits from these knowledge, habits and experience. Human capital consists not only of collected together and trained labour, but also good management, contracts with the outstanding specialists in the sphere.

Organisational (Structural) capital - everything that remains inside, when employees leave but missing in the balance sheet. This is most heterogeneous part of intellectual capital. These include intellectual property rights (IPRs), information resources, instructions and methods of work, the system of organisation and the ability to receive economic benefit. It is more consistent with what is called intangible assets. Systematic knowledge, as well as know-how, separable from individuals and from the organisation, belong to structural capital.

Relational capital – these resources are connected with external relations of the organiza-tion, i.e. relationships with customers, suppliers, partners, creditors etc. and the ability to de-rive economic benefit from resources. This capital is usually attributed to: trademarks and service marks; brand names; business reputation; presence of people in partner organisations or clients; presence of regular customers; permanent contracts with customers etc.

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Like other components, cash and material assets are resources of intellectual capital formed by investments. For example, relational capital requires expenditures on advertisement, cor-porate governance. In this case investments into intellectual capital are made in a special way. In contrast to the traditional capital expenditures, investments into intellectual capital are not reflected in the balance sheet, but are disguised in other expenditures. Intellectual capital, or intangible assets are invisible in the traditional balance, because they are financed due to the investments, which formally come out in the calculation as current expenditures (advertise-ment, training, rewards and bonuses). This makes it difficult to measure investments into in-tellectual capital, it requires their extraction from the flow of current expenditures.

Three mentioned blocks of intellectual capital carry threats during the investment (risk fac-tors):

• all these components are not subject of direct estimation in the majority of the cases, they are not considered in the accounting documents, they require the special methods of meas-urement;

• they are non-liquid by themselves, separately from the organisation;

• they are capable of bringing income only together with the money and material resources, and also other components of intellectual capital.

Recent years have given new opportunities for the reduction of intellectual capital investment risk by the effective use of existing IT technologies. These technologies include, first of all, blockchain.

BLOCKCHAIN TECHNOLOGY

A blockchain is a continuous sequential chain of blocks (a linked list) that contains infor-mation according to certain rules. The blockchain technology initially incorporated security at the database level. Copies of blockchains are stored on many different computers inde-pendently of each other. Security in blockchain technology is provided through a decentral-ized timestamp server and peer-to-peer network connections. As a result, a database is formed and managed autonomously, without a single center. This makes block chains very convenient for registering events and operations with data, managing identity and authenticating the source. Satoshi Nakamoto proposed the concept of blockchains in 2008.

Blockchain technology is developing and successfully applied in various fields (presented in Table 1).

Table 1: Fields of blockchain technology application.

Field of appli-	Tool	Description	Coun-	Companies	Advantages
cation			tries		
Cryptocurren-	Cryptocur-	Digital currency	All	Bitcoin,	decentraliza-
су	rency	protected by cryp-	world	Ripple,	tion, anonymi-
		tographic technol-		Ethereum,	ty, not infla-
		ogy. No physical		Litecoin,	tionary
		analogue of these		NEO, EOS,	
		monetary units,		Monero	
		they exist only in			
		the virtual space			
Logistics	Blockchain	Tracking the loca-	China,	Port of	Solving the
	platform	tion and condition	USA,	Antwerp,	problem of
		of trucks, goods	Colom-	Port of Rot-	registration of
		transported by	bia, Sin-	terdam, Yo-	a variety of
		them; security sys-	gapore,	jee,	shipping doc-
		tems; supply chain	Australia	WalMart,	umentation;
		management; op-	Belgium,	Maersk, DP	increase the
		timization of logis-	UK,	World, DB	speed of in-
		tics processes	Nether-	Schenker,	formation
			lands	Hamburg	transfer
				Süd, IBM	
				Blockchain,	
				IBM Wat-	

				son, AOS	
Advertising	Blockchain	Control over the	All	Kellogg's,	Fraud preven-
	consortium	expenditure of	world	Kimberly-	tion. Increase
		funds allocated for		Clark, Pfiz-	the speed of
		advertising cam-		er и Unile-	information
		paigns; preliminary		ver, IBM iX	transfer
		analysis of online			
		advertising cam-			
		paigns			
Banking	Digitized and	Certification of	All	UBS, Bar-	Solving the
	protected	transactions with-	world	clays,	problem of
	from damage	out intermediaries		Сбербанк,	high costs of
	register.	and electronic ac-		Citigroup	servicing one
		counting		Inc.,	client, the
				Deutsche	problem of in-
				Bank, DBS	formation se-
				Bank,	curity; simpli-
				BBVA, So-	fication of ac-
				ciété Gen-	count man-
				erale	agement
Payments and	Cryptocur-	Direct flow of	All	Exmo,	High transac-
money trans-	rency ex-	payments that con-	world	LiveCoin,	tion speed;
fers	changes,	nects payers and		Youbit,	simplified in-
	trading plat-	recipients without		Poliniex,IB	ternational
	forms.	restrictions		M, SIG,	transfers; low
				Matbea	commission;
					security
Cybersecurity	Digital in-	Unconventional	USA,	Microsoft,	The ad-
	formation	approach to infor-	UK,	IBM, Lock-	vantages are
	security anal-	mation storage and	Ukraine,	heed Mar-	already in the
	ysis tools	transactions, estab-	Germa-	tin, Obsidi-	technology of
		lishing new trust	ny, Bra-	an, Remme	distributed reg-

		rules	zil, Aus-		isters; it is
			tralia,		trustless
			Japan,		
			China		
Healthcare	Decentralized	Creating a univer-	USA.	Gem.	The ability to
	database	sal structure for	Switzer-	Tierion	safely store
	uuuuouse	storing and verify	land	CareX	and share per-
		ing data	Singo	CalCA	and share per-
		ing data	Singa-		sonal data
~			pore		
Copyrights	Online music	Listeners' money	USA	PeerTracks,	For creators, it
and ownership	platforms	are sent directly to		Mycelia,	is an oppor-
of online music		content creators		Ujo Music	tunity to earn
					more on the
					production of
					their content
					and to make
					sure that the
					creator re-
					ceives money,
					not the record-
					ing studio.
Internet of	Synchroniza-	The blockchain	All	Samsung,	Offline soft-
things network	tion of devic-	serves as a public	world	IBM	ware updates,
	es without a	register for a huge			bug fixes and
	central data-	number of devices			power man-
	base	that no longer need			agement
		the central node as			5
		an intermediary			
Real estate and	Blockchain	Blockchain-based	USA	Ubitauity	Guarantee of
land calos	nlatform	real estate applica	Georgia	Bitfury Na	accuracy and
	Planoim	tions halp to rea	Swadan	tional mut	roliobility of
		and the large l	Sweden	uonai pub-	de energie st
		ord, track, and		nc registry	documents;

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			transfer land own-		agency of	security
			ership, property		Georgia	
			deeds, mortgages,			
			etc.			
Energy	man-	Creation of a	The blockchain	Germa-	RWE,	There is no
agement		new block-	technology pro-	ny, Swe-	Lo3enegry,	need for large
		chain system	vides the basis for	den,	VattenFall,	buyers and dis-
		based on the	creating a decen-	USA	Transactive	tributors
		existing one	tralized power sup-		Grid	
			ply system			

BLOCKCHAIN TECHNOLOGY APPLICATION FOR IPRS PROTECTION

The most suitable in case of intellectual capital in general, and intellectual property rights in particular, is the private blockchain scheme designed to control the development of an inno-vative asset. In this case, all actions of the project participants are recorded as transactions and become known to proxies - participants of the chain, excluding the possibility of third-party interference, making corrections, information theft and other ways of manipulating da-ta.

The introduction of blockchain technology into the process of creating an innovative asset will allow each participant to add his or her ideas, developments, research results and other information that may be of value to the system and every blockchain user will witness this. Thus, the database will store an ever-growing list of ordered records, called blocks. Each block will contain a timestamp and a link to the previous block, which guarantees the authenticity and security of the added information.

The author adds his idea or information to the blockchain, depending on the type of block-chain, this contribution becomes available for reading to everyone who has access to the blockchain, or, if the blockchain has limited access, then to those participants who have ac-cess to reading data. After adding work to the blockchain, all participants in the system become witnesses of the fact that a certain author added this particular block. A time stamp and

a link to the previous block are put on the block, which ensures the security of the block in the chain, since all blocks are interrelated and it is impossible for third parties to change the data block.

Further, the consensus mechanism is activated, depending on the chosen system architecture; the consensus can proceed in various ways. Consensus confirms the originality of the block. When a block is added to the end of the chain, it cannot be changed. Each block contains in-formation about everything that happened in the previous blocks, before it was created. Thus, the identification of the entire work takes place. For third party observers who do not have access to the block chain, the block will simply look like a set of meaningless symbols.

The blockchain technology is still not used to protect intellectual property rights, although it has the potential for development as the described mechanism is identical to effectively ap-plied online music platforms.

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Innovate Climate in schools and the engagement of teaching staff

by

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Keywords: innovative climate, engagement, educational institution, teaching staff

INTRODUCTION

Schools in the 21st century are constantly striving for innovation. Dynamic progress and technological changes, globalization, development of communication techniques and the need for lifelong education pose various challenges to contemporary education. Therefore, an innovative approach to management at the Polish school is necessary. This paper aims to clarify the meaning of the term "engagement" in the context of supporting the innovation climate in primary schools and defining the main dimensions and elements of the innovative climate. The aim of the article is to identify the determinants of the innovative climate of schools, and then to learn and define what is the relationship between the teachers' engagement in work and the innovative climate at school. Emphasizes that employee engagement is one of the key factors determining the effectiveness of the organization's functioning. It also indicates that engagement employees work with greater enthusiasm, which brings measurable and immeasurable benefits to the organization.

METHODS

The literature was reviewed using international bibliographic databases, such as Scopus, Google Scholar, Wiley Online Library, and the IBUK Libra electronic book platform. The research was carried out using the *UWES Work and Feeling Questionnaire* (Utrecht Work Engagement Scale) by W. Shaufeli and A. Bakker in the 17-item version and the *Innovation Climate Questionnaire*.

CONCEPTUAL FRAMEWORK

Teachers around the world are looking for new and innovative strategies, processes and structures to improve student performance. This indicates the importance of the so-called "innovative orientation" in schools. Interest in educational innovations is important in the context of promoting an innovative climate and has increased to a large extent over the last decade in the USA. Communication, sharing ideas and concentration on the greater organizational goals have crucial meaning to innovation orientation.

Ekvall and Ryhammar (1999) have distinguished the principles that determine the emergence of an innovative climate. First of all, the organization's goals must be treated by employees as challenges. An important condition is to provide the staff with a certain degree of freedom in how to perform their tasks. Management should also encourage employees to submit their ideas and show interest in the initiatives undertaken.

Correlation research on the innovative climate in public and private schools was conducted in 2014-2015 by Tuncer Fidan and Inci Oztürk (2015). Their goal was to discover the relationship between the level of teacher's creativity and their internal levels of motivation and the climate of schools for innovation. This research has shown that there is no statistically significant difference regarding support for innovation in public and private schools.

Research conducted by Rakowska A. and Lewicka D. (2016) shows that the connections of practices related to supporting innovativeness concern each of the three components of engagement, vigor, dedication and absorption. In addition, supporting innovation is most strongly associated with dedication to work. Thus, through the appropriate HR management practices, you can increase innovation and employee involvement.

Hakanen J. and his colleagues (2008) showed in their research that the involved employees show more initiative and submit more ideas to improve organizational processes. S. Sonnentag's research showed that the level of engagement made it possible to anticipate proactive behaviors and initiatives. On the other hand, research by Szabowska-Walaszczyk A. and colleagues (2013) confirms that with the increase of the level of engagement, the chance of increasing the efficiency of employees increases.

The aim of this research is to learn and define the relationship between teacher involvement in work and the innovative climate at school. The conceptualization of literature

on the innovation climate was also made. The study hypothesized that there is a connection between engagement to work and the innovation climate in primary schools.

CONCLUSION

The conducted analysis of the subject literature showed a great interest in the subject of engagement. However, on its basis, one can also conclude that there is a lack of comprehensive research and models that would describe the relationship between the involvement of employees and the innovative climate at school. Studies have been conducted on the relationship between commitment to the organization, involvement in work and innovation of the organization. There is a research gap in the literature regarding the innovation climate in primary schools. This article is an attempt to fill the research gap.

An important conclusion from the research is that teachers from schools with a higher level of innovative climate mean higher levels of vigor, absorption and dedication. Engagement especially in the form of work preoccupation, determines the level of attachment to an organization of an emotional, duration and normative nature.

LIMITATIONS OF RESEARCH

These are the preliminary results of the study. My research was limited to teachers working in primary schools in the Lublin voivodeship. In order to learn more deeply the relationship between commitment to work and the innovative climate in primary schools, it is also necessary to include teachers working in primary schools located in other voivodships.

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Who shops on the go: personality factors impacting mobile shopping in the context of the Polish market. Theoretical meta-analysis

by

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ABSTRACT

State of the Art and Purpose

The number of smartphone users in Poland has frequently increased, from 25% users in Polish population in 2012 to 64% in 2017 (POLSKA.JEST.MOBI 2018) and 48% of them use mobile devices more than 2 hours a day. The number of mobile devices users are still growing, and the possibilities of a new independent sales channel that emerges from it grow with it, parallely to socioeconomic growth (Kowal, & Paliwoda-Pękosz, 2017). M-shopping is one of many subsets of e-commerce, that requires making online sales transactions using mobile devices. This meta-analysis aims to identify major personal factors that impact mobile shopping adoption, attitudes towards mobile shopping, purchase intention, and use. We propose a research model based on the psychological personality theory – The Big Five (Neuroticism, Openness, Conscientiousness, Agreeableness, Extraversion) focused on the correlation between personality traits and attitude toward mobile shopping as well as the correlation between personality traits and m-shopping purchase intention.

DESIGN/METHODOLOGY

Theoretical meta-analysis provides basic insight into personality factors impacting mobile shopping acceptance, attitude, intention to use and patronage and providing a theoretical basis for future research. Papers took into this meta-analysis had to fulfill the following criteria: be accessible through EBSCO database or be available in open access, from the last 10 years, directly regarding personality factors impacting m-shopping.

RESULTS

Theoretical meta-analysis suggests that mobile shopping acceptance, attitude, intention to use and usage depend on: personal innovativeness (Kumar and Mukherjee, 2013; Assarut and Eiamkanchanalai, 2015; Manzano et al. 2009), personal optimism towards technology (Kumar and Mukherjee, 2013), perceived emotional value (Manzano et al. 2009; Assarut and Eiamkanchanalai, 2015; Kumar and Mukherjee, 2013), perceived security (Kumar and Mukherjee, 2013; Assarut and Eiamkanchanalai, 2015; Kumar and Mukherjee, 2013), self-efficacy (Assarut and Eiamkanchanalai, 2015; Kim et al. 2015; Kowal, Keplinger, Kapała, Mäkiö, & Stras-Romanowska, 2018), cognitive absorption (Lee, 2018), impulse-buying tendency (Lee, 2018) and the technology adoption tendencies of consumers (Kim et al. 2015). We argue that these characteristics are related to The Big Five personality factors and propose an explanatory theoretical model that requires an empirical study.

LIMITATIONS

In the field of interest of this meta-analysis, there is no research supported by psychological theories, despite the fact that personality is a well-studied psychological construct. Furthermore, studies took into meta-analysis sampled groups that are hard to generalize of. Mobile shopping is a new market section and it has not been studied well, therefore more research is needed to provide a better understanding of the subject.

RESEARCH/PRACTICAL IMPLICATIONS

Results of this meta-analysis provide a theoretical basis for future research about personality traits in the Big Five model impacting mobile shopping attitude and use, as well as practical implications. Mobile shopping is an independent sales channel and it is in its infancy, therefore it is a niche that still may be capitalized. Scientific insight regarding a connection between mobile shopping and personality can be used for better design and marketing of m-shopping services, as well as for planning market development with regard to psychological variables impacting consumer behaviour.

ORIGINALITY/VALUE

Personality impacting m-shopping attitudes and its use is a barely studied subject in Poland, despite the fact that it is still a non-capitalized sector of the e-commerce market, and it is being studied mainly by marketing specialists and not psychologists. Psychological insight into personality factors impacting m-shopping will help marketers understand better the relationship between personality traits and attitudes toward m-shopping and its use. rds: motivation of cognitive closure, decision-making participation, MIS users, Polish army, innovation capability for competitiveness, global development

KEYWORDS: SHOPS, PERSONALITY FACTORS, MOBILE SHOPPING, POLISH MARKET, THEORETICALMETA-ANALYSIS

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The smart city concept in the field of safety management - literature review

by

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ABSTRACT

This article is based on a literature review and concerns issues related to security management and analysis of potential threats resulting from the implementation of the smart city concept. The paper systematizes the terminology associated with smart city. The publication also presents an analysis of the potential benefits and threats resulting from the introduction of this approach in Polish cities. The article shows the main barriers and problems related to the implementation of this concept in Poland. The paper focuses on all of the smart city initiatives related to security management in Polish cities. It also describes the activities and good practices undertaken by city authorities to improve security in the analyzed cities. This article is based mainly on a review of available literature, analysis of reports and source documents using such bibliographic databases as Scopus, Web of Science and Google Scholar

Keywords: Smart City, security, information and communication technologies, safety management,

INTRODUCTION

Currently, in Poland, the need to develop cities under the Smart City concept is being talked about more and more often. Polish agglomerations are looking for solutions that will make it possible to use modern technologies to improve the urban space management process.
The increasing use of technologies in the field of Internet of things, Intelligent Transport Systems, and other equally advanced technologies is a potential source of threats related to leakage of confidential information. Therefore, the development based on modern technologies should be related to the analysis of potential risks that may result from the implementation of these innovative solutions. This article is a review and concerns issues related to the presentation of threats arising from the implementation of the Smart City concept to the real conditions prevailing in Poland and Europe. In particular, the publication focuses on Smart City initiatives to provide residents with an appropriate level of security and activities undertaken in Poland and abroad that relate to the area of public safety in the aspect of using Smart City technologies.

DEFINING THE SMART CITY APPROACH

The development of the "Smart City" concept is mainly due to technological changes that have occurred over the 21st century. The rapid technological progress made it possible to implement some modern solutions in many areas related to the functioning of cities.

Currently, polish and foreign literature lacks a systemic and unambiguous definition of the Smart City concept. In Poland, this approach is often referred to intelligence which in the opinion of J. Szołtysek is a statement that does not adequately reflect the idea of this concept (Szołtysek,2015). R.G Hollands defines smart cities as a phenomenon of "urban signage" and believes that most of the attributes of this type of city are hidden behind the authoritative attribution of this label(Hollands,2008). (Caragliu, Nijkamp,2011). Consequently, this enables a reasonable distribution of available resources and their sustainable development (Caragliu, Nijkamp,2011). K Kourtit and P. Nijkamp believe that Smart Cities is the result of the accumulation of knowledge and increased creativity in making strategic decisions regarding the improvement of socio-economic, ecological, logistical and competitive cities. Smart cities are based on an appropriate combination of factors such as qualified staff, infrastructure elements (modern communication technologies), social capital (connections between residents) and entrepreneurship of inhabitants (creativity and willingness to take risks). A city can be considered compatible with the idea of Smart City if it "systematically uses available data, communication technologies and resource saving technologies to reduce their consumption and for continuous improvement, in the quality of life of citizens or increase the competitiveness of the local economy" (Homeier, 2018).

The technology and data collection system used in Smart Cities enables:

The constant collection, analysis and provision of city data to optimize efficiency and effectiveness in the pursuit of building competitiveness and stability;

Communicating and sharing information in the town

Multifunctional activities that provide the opportunity to solve many problems from a holistic perspective (ManVille, Cochrane, Cave, 2018).

One of the main areas of Smart City is the use of information and communication technologies in many management processes. The purpose of this type of modern digital solutions enables cities to:

Creating data that increase the knowledge of people and the organization in the town;

Transformation of relations between the government and private business, public benefit organizations and citizens;

Ensuring synergy and interoperability throughout the city and in all areas of its operations (transport, education, healthcare, etc.);

Enabling cities to create innovative solutions (ManVille, Cochrane, Cave, 2018).

The management of Smart City activities by agglomerations may have a positive impact on their image in the eyes of residents. Cities that are "smart" can have a higher capacity to meet the needs of residents and attract creative human potential.

Building a positive image of the agglomeration can take place through:

Identifying the agglomeration with the smart idea, as well as creating the image of the city around this idea,

Building an inteligent brand,

Linking the intelligent strategy with the existing way of functioning of the town, Introduction of the smart approach to a long-term development strategy,

Using the intelligent name to link the city's activities with modern and smart technologies,

Creating advanced and intelligent solutions related to building the image of a smart town (Daszkiewicz,2015).

Smart City is a concept that covers a range of aspects related to the functioning of the city. Currently, in Poland, there is more and more talk about the need to develop the agglomeration sustainably while at the same time using the opportunities offered by new technologies. At present, it can be noticed that more and more Polish cities are beginning to pursue their policy based on the Smart City concept(Stawasz, Sikora- Fernandez, Turała,2012). However, many barriers limit the total possibilities of using this approach.

The main problems during the implementation of Smart City initiatives in Poland include:

- Lack of proper finances, which to a large extent limit the ability to conduct prodevelopment investments, characterized by high capital intensity and long-term character;
- Rotation at the level of authorities, because the change of the mayor or president is most often related to the reorientation of the city's current development policy. New managers usually have their vision of the development of a given agglomeration, which does not necessarily have to be consistent with the predecessor's. This kind of uncoordinated development is not conducive to large long-term investments;
- Lack of adequate awareness of residents regarding the need for rational use of available resources and the application of recycling rules;
- Resistance to new changes, which is a natural reaction to the attempt to introduce solutions, previously unknown to a given group of society.

For this reason, investments in Smart City should be preceded by broad social consultations that will make the inhabitants aware of their target and potential benefits.

METHODOLOGY OF RESEARCH

The study aims to review, analyze and evaluate polish and foreign research devoted to the problems of safety management. The article presents an overview of global activities aimed at improving security with the use of advanced information and communication technologies.

This article is based mainly on a review of available literature, analysis of reports and source documents using such bibliographic databases as Scopus, Web of Science and Google Scholar.

SMART CITY IN THE FIELD OF SECURITY MANAGEMENT

One of the most desirable needs according to Maslow's hierarchy is the need for security. A person needs a sense of well-being that is related to employment stability, access to qualified health care and feeling that appropriate services such as the police are watching over his safety. In the world more and more often talk about threats related to cyberspace or cyberbullying. The use of modern technologies in addition to obvious benefits may carry many risks associated with the safety of residents. In the case of urban space management, one can talk about security in the local dimension, which is one of the elements of social security, that is all actions carried out to protect the health and lives of citizens or to protect their property(Stawasz, Sikora-Fernandez,2016). For this purpose, cities must pursue their policies to meet the requirements of residents and improving safety in urban space. Security is one of the main criteria for the assessment of activities related to the design of the metropolitan area, which serves to assess the correctness of the actions carried out in the field of efficient urban development management in a situation of increasing uncertainty and constant civilizational threats (Zuziak,2011).

One of the main tasks of modern cities is a systemic solution problem related to crime, social pathologies and other phenomena that significantly reduce the sense of security of residents. If these activities are included at the strategic level and will be implemented consistently, they can bring benefits in improving the level of protection in the city.

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BENEFITS AND THREATS RELATED TO THE IMPLEMENTATION OF SMART CITY IN POLISH CITIES

Analyzing and assessing the underlying assumptions of the Smart City concept, can conclude that it is one of the critical issues in the aspect of the implementation of the process creating and implementing urban policy. Besides, it can contribute significantly to the development of Polish cities following the concept of sustainable development.

The Smart City, despite its unquestionable advantages, has also elements that may pose some risks. Building smart buildings in cities that are not sufficiently secured may make them vulnerable to various types of hacker attacks, where a person can break down and take over or change any data. In this way, there may be situations in cities such as unannounced alarms or contamination of water supply systems in smart buildings.

An intelligent building is one which integrates various systems to manage resources in a coordinated mode to maximize effectively: technical performance; investment operating cost savings and flexibility(Derek, D. Clements-Croome,1997). Intelligent buildings are based on automation and the use of the possibilities offered by data exchange using information systems. A significant challenge in the field of smart buildings is the design and implementation of cheap and an open source home automation system that will be able to stand alone control and automate the majority of household appliances.

One of such solutions is "Smart Home Security System," which consists of hardware and software. (Kumari, Pawar, Dhonde, Deshmukh,2016). In this system, a user receives remote control over ad household appliances by using the application for Android mobile phones. The signal is sent to a computer server via wifi connection. The server keeps a record of all log information which is provided to users on demand. In case if gas leakage or fire hazard occurs, it will send notifications to user's Android mobile phone about it, so necessary actions could be taken and risks can be avoided(Kumari, Pawar, Dhonde, Deshmukh,2016).

The challenge in the field of data security is also the spread of cloud computing solutions, where data is processed "in the cloud," which entails the following threats, that are shown in Table 1.

Threats	Description
Unauthorized	Middle-ware Layer provides different interfaces for the applications and data storage
Access	facilities. The attacker can easily cause damage to the system by forbidding the access to
	the related services of IoT or by deleting the existing data. So unauthorized access could
	be fatal for the system.
DoS	It is similar to the DoS attack discussed in the previous two layers, i.e. it shuts down the
Attack(Denial of	system which results in unavailability of the services.
Service)	
Malicious Insider.	This kind of attack occurs when someone from the inside tampers the data for personal
	benefits or the benefits of any 3rd party. The data can be easily extracted and then altered
	on purpose from the inside

Table 1: Potential threats related to Cloud computing

Source: M.U Farooq, M.Waseem, A. Khairi, S. Mazhar, A Critical Analysis on the Security Concerns of Internet of Things (IoT), International Journal of Computer Applications, Volume 111 - No. 7, February 2015,p.3

The Internet of Things, is based on a cloud computing and devices connected by millions of applications that support them, does not create a stable environment and is therefore exposed to numerous threats(Rot, Blaicke,2017).

Research carried out by the SANS Institute indicates the following risks related to the use of the Internet of Things:

Difficulties with patching and securing things, leaving them vulnerable,

Use of objects as the least secure entry points to networks for further infection or attacks, DoS attacks (Denial of Service), which in the case of infrastructure energy or equipment can lead to severe damage or loss of life, Intentional sabotage and destruction of connected things, User error(Pescatore,2014)

A comprehensive approach to the problem of security and data protection has been proposed by IBM as part of an integrated risk management system, which includes:

• Permanent and uninterrupted access to relevant data, which digitally requires access to them using audio and video technologies, the Internet and social media;

• A harmonized and unified data reliability system that provides an efficient information flow system in organizations;

• Greater situational awareness, which mainly concerns providing the persons responsible for the security of necessary information through appropriate access channels;

• A unified risk assessment system that allows quick response in the event of a dangerous situation .. as well as better coordination of cooperation, to increase the level of communication between emergency services and other units.

The concept of security management prepared by IBM is successfully used in many cities around the world. IBM also co-operated since 2010 with the Rio De Janeiro authorities to make city safer during the upcoming World Cup football championship. The risk management platforms implemented by IBM in the city of Davos enables the coordination of the various agencies that work on public safety(Privacy International, 2017).

The consequence of the development of new technologies and the implementation of the city strategy in accordance with the Smart City idea may be the growing problem of social exclusion of certain groups of people who, through low income, disability or other reasons have limited access to modern technologies(Czupich, Ignasiak-Szulc, Kola-Bezka,2015).

Other risk areas related to the implementation of the smart city concept are mainly: Determining the degree of citizens' participation in the city management process, their role in the planning, creation, and implementation of the Smart City vision in the city; Acquisition of data and protection of privacy, because intelligent solutions are based in no small extent on the use of data, which may to a certain size limit our confidentiality;

Providing unlimited and stable access to the Internet for all residents.

GOOD PRACTICES AND INITIATIVES TO IMPROVE THE SAFETY OF RESIDENTS IN SMART CITY

Currently, cities are taking action to solve current and future problems related to cyber attacks on Smart Cities. One of them is the "Securing Smart Cities" initiative, whose task is to provide relevant information on how to secure information inside the agglomeration. This initiative is also a series of recommendations that aim to offer practical suggestions for increasing the safety of cities.

Smart City solutions should also meet basic security requirements such as:

Use of strong cryptography both during data transfer and after its completion. All wired and wireless connections should be encrypted. A system that works on sensitive data should contain a mechanism to encrypt data encryption;

Define the authentication method in which all systems should require at least a username and password to access functionality. Other solutions such as a one-time password or biometric authentication should also be used to increase security;

Defining the authorization method, which should precede the user's access to perform any actions in the system;

Automatic updating of software that should be performed remotely and securely;

Implementing alerts and other elements during logging in, all data entered should be appropriately protected against unauthorized access,

Introduction of mechanisms to counteract data manipulation. The system should have functionality that protects against access from unofficial sources;

Eliminating unauthorized access accounts. Some of the suppliers create an arrangement with the possibility of back entry. These types of accounts have passwords that can not be changed;

Additional system functionalities that should be enabled at the recipient's request. The system should be offered in the basic configuration and adjusted to any other expectations of the contracting entity (Cerrudo, Hasbini, Russell,2015).

In Poland, many initiatives are also being undertaken to increase the safety of residents. An example of such a city may be Skarżysko-Kamienna, where, in cooperation with officials from the police station, the project "Safe City-Smart City" was created. The main objectives of the implemented initiative were:

Reducing the amount of destructive behavior,

Limiting the number of offenses committed and crimes within the city,

Increased the scope of cooperation and effectiveness of services responsible for public safety and public order,

Limiting pathological activities undertaken by people under the influence of alcohol or other intoxicants,

Limiting the number of drivers who violate traffic rules,

Increased trust in the Police, Fire Brigade and other services responsible for security in the city,

The heightened sense of security among residents,

Improving the image of Skarżysko-Kamienna, a safe and attractive place to rest and conduct business (Ministry of the Interior and Administration).

Increased safety in the implementation of the Smart City concept should focus on the implementation of objectives related to:

- Establishing a working group among stakeholders who will be committed to committing to transparent disclosure and joint responsibility for the success of all related projects and activities.
- Identifying priorities for improving public safety as one of the first goals to be achieved by determining the accuracy of intelligent data collection capabilities that will enable monitoring, detection, analysis and operation in line with community expectations and privacy standards. Also, the ability to handle technologies will be consistent with the program of engagement, education, and communication with the community. Addressing this goal ensures that all crimes and violent incidents are effectively tracked and neutralized.
- Creation of a central command center, equipped with the abovementioned possibilities, combined with the option of displaying real-time information, storing data in cloud-based systems, the ability to access data via secure mobile applications and connecting to law enforcement authorities, to the mobilization of these services as the first line of help. The headquarters' activities would involve the participation of many social groups, sharing resources in the implementation of mechanisms to supervise operations,
- Taking into account in the Smart City projects the role of security in the foreground stage of creating their concept (Tech Research Asia,2016).

CONCLUSION

Urban development based on the Smart City concept is currently a significant challenge regarding the safety of residents. The dynamic growth of technology enables fast and unlimited transmission, processing and storage of large amounts of data. The task of people involved in the design of data protection systems is their adequate protection against access by unauthorized persons. City activities in the field of security should be synchronized between individual units (departments, delegations, municipal services) to anticipate and prevent potential problems in advance(Stawasz, Sikora-Fernandez,2015).

In such a situation, close cooperation of all services will be necessary, which will facilitate the early detection of possible threats. To ensure an adequate level of safety for cities, it is required to prepare for a potential danger to resist any risks (Mikulik,2017).

Smart City is a concept that on the one hand introduces many opportunities to improve the safety of residents, but brings new, previously unknown threats. It, therefore, seems that the development of new technologies in cities and the introduction of innovative solutions should go with their proper configuration and synchronization. Through this type of activities, it will be possible to ensure an adequate level of security in cities.

This article can be treated as a preface to the issue of using intelligent technologies in the field of safety management in cities. To thoroughly analyze this issue, it is necessary to conduct further analyzes and research in this area.

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The role of the Internet in the infantilization of young adults

by

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ABSTRACT

The aim of this work is to present the results of research on possible connections between identity styles of identity and infantile behaviors demonstrated by young adults.

Keywords: Internet, infantilization, identity styles, young adults

The Internet as a phenomenon has become an inseparable element of our lives. It has become the main cultural and social tool of globalization. Bottom-up socio-political initiatives allow citizens to influence what is happening, and not only in their own environment (Shirky, 2008). Psychology also notices the influence of the Internet and being in it on the functioning of the individual. Among others, the so-called network disinhibition effect is observed (Aboujade, 2012). Internet users have stopped feeling that there are limits to what can be achieved on the web. Everyone feels the influence of the Internet. The vastness of the Internet gives a sense of anonymity, which is followed by the freedom of revealing dark personality traits, regression (immaturity) or excessive impulsiveness and inhibition of drives, often easier to implement online (ibidem). It can be noticed that this type of functioning also affects the identity that the entity presents outside the network. So the Internet can also contribute to shaping immature, infantile forms of identity. The main purpose of our research is therefore to investigate whether and what kind of connections exist between the identity styles and infantile forms of behavior among young adults

This work is based on a model of identity styles, presented by M. D. Berzonsky, who looks at the identity of a man from the constructivist-social approach. He proposes a selfconstructed theory of self regarding the judgments about what an individual would like to be and who he is. Berzonsky also emphasizes individual differences in the processing of this information. Using the Berzonsky's model for our research, we estimated the informative, normative and diffuse-avoidant styles of identity. Regression visible in the network corresponds with the sociological term "infantilization". The wider perspective covers the postmodern climate of the globalized world. The authors talk about infantilization of America, pop culture, language, adults (Barber, 2008). Infantile adult is a narcissistic individualist, often still living with his parents, addicted to technology, whose childhood lasts a lifetime, is immersed in consumer culture, wants to be young forever. In addition, he does not take any responsibility, does not engage in relationships and wants to live in the present. There are attempts in the literature to describe who an infantile adult is, based on the dichotomies typical of a child and an adult (Barber, 2008, Bernardini, 2014).

We u used in our study two methods: the Identity Styles Inventory (ISI-5) and the Author's method "Predispositions on Infantile Behaviors" (DyZaIn). DyZaIn consists of 21 statements divided into three subscales, each of them has 7 items. Scales was named: Being in the world (α 0.65), Concentration on the present (α 0.68) and the Impaired (weakened) motivation (α 0.70).

103 people were examined, aged 23-38. The respondents are mostly residents of large cities over 200,000 residents and people with higher education or during studies.

The results obtained by means of correlation analyzes show that people displaying one of the three designated styles for infantile behaviors do not present the informative style of identity. In turn, behaviors focused on the present characterize people with a normative style of identity. Weakened motivation, on the other hand, characterizes people using the style of diffuse-avoidant and normative processing of identity, and also involves a lack of commitment. Further exploration of this topic can bring more knowledge about adult infantilization and about the cultural and personality conditioning for delaying typical roles assigned to adulthood. It would also allow to examine new tasks and roles undertaken by young adults at the area of globalization. This is particularly important due to the fact that generation changes are taking place. Probably the current generation Y differs from the so-called generation Z. Therefore, the research presented in our work allows to examine first manifestations of such differences.

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Decision-making participation and motivation of cognitive closure among military MIS managers in Poland

by

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ABSTRACT

The purpose of the research was determination of impact motivation of cognitive closure on decision-making participation among military managers of the Polish Army. I used two questionnaires in my research. I used "The Problem Set"- SET (by Mączyński, 1988, based on Vroom-Yetton, 1973), to assess what the decision-making style the participant prefers and the Shortened Scale of Need for Cognitive Closure (PPD), developed by Małgorzata Kossowska, Krzysztof Hanusz and Mariusz Trejtowicz (2012), based on the original version of Kruglansky's PPD scale (1989) to diagnose the motivation of cognitive closure. The research sample consisted of 168 randomly selected military managers from military units in the Lower Silesia region.

My findings showed that the majority of respondents were characterized by a high level of cognitive closure, which is associated with the use of authoritarian styles and may be the result of working in a military organization that requires quick decisions.

Keywords: motivation of cognitive closure, decision-making participation, MIS users, Polish army, innovation capability for competitiveness, global development

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Influence of the Internet of Things on Product Innovations

by

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ABSTRACT

Internet of Things (IoT) is a new and extremely important field of computer science in the technical, social, cultural and economic sense [23]. Currently, sensors, consumer products, durable goods, cars, industrial and utility devices, and everyday objects are increasingly connected to the network. Devices that use the Internet connection for communication and that use powerful data analysis capabilities, give the opportunity to change the way we work, live and enjoy entertainment. Projections regarding the impact of IoT on the Internet and the global economy are impressive. Some predictions say as much as 100 billion connected IoT devices and the global IoT economic impact estimated at over 11 trillion USD in 2025 [25]. The aim of the article is to examine how the Internet of Things enforces product innovations and thus contributes to the introduction of new products. For the purposes of the article, a hypothesis was formulated that the Internet of Things significantly influences the change of manufactured products and contributes to the emergence of new, innovative products. In order to verify it, the author analyzed selected types of products and indicated their dynamic evolution towards the Internet of Things.

Keywords: Internet of things, IoT, Industry 4.0, innovations, product innovations, new business models.

INTRODUCTION

The environment of current organizations is characterized by very high volatility and unpredictability [24]. New technologies are emerging, the speed of information and knowledge exchange increases drastically and the importance of innovation is growing. All Kralewski

this changes the rules of competing on the market. Currently, the durability of competitive advantage is losing its importance. The basis for maintaining a stable position on the market is the company's innovation, which replaces the existing concept of sustainable competitive advantage. A permanent competitive advantage is replaced by transient advantages. They are quickly implemented and replaced with new ones at the moment of devaluation. The ability to create such advantages gives the opportunity to protect against competition and becomes the basis for the strong position of the organization on the market. As a result, enterprises must include in their strategy actions that force the intensive development of innovation, which translates into a series of innovations implemented by them, including product innovations.

The Internet itself is also constantly evolving. Currently, it becomes the foundation of the Internet of Things, a network that connects people, processes, data, devices, applications and things connected to the Internet. Thanks to this, the connected material and social elements of the Internet of Things create connections, gathering and exchanging data and entering into constant interaction.

In the history of humanity, innovation is a key force for development and change in culture, behavior and systems [9]. In the past, but also today, innovation is seen as a source of evolution and a source of so-called modern practices [34]. From the creation of spoken and written language, printing press, steam engine, mechanization and WWW, we see that not only the world around us but also the concept of innovation changes. Innovation also exists in different spheres.

PRODUCT INNOVATIONS

The company's goal should be to strengthen its competitive position. In order to achieve such a goal, it is necessary to introduce continuous innovations which are beneficial from the point of view of the client [37]. Innovations now determine the competitiveness of the company. Lack of innovation can be a threat to the functioning of the company.

Product innovation is the introduction of a product or service that is new or significantly improved in terms of its features or applications. The contemporary form of competition is competition related to the introduction of new products, not competition based

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only on prices. Product innovations often automatically trigger new innovation processes [36].

The term 'new product' is not conclusive. Depending on the degree of innovation, there are several categories of a new product for the market or for a company [20]:

New product on the new market;

• New product on the existing market: complementary offer on the market, new for the company, old for clients;

• Improvement of the existing product: replacing the product with a more efficient replacement by a similar product with lower costs.

Determining the degree of product innovation is very complex. It is perfectly natural that innovations differ in the degree of modernity, but determining the scale of changes is difficult. Differences in the degree of novelty start with minimal changes through fundamental changes, up to radical changes that change the perception and use of a particular product. Sometimes changes are typical of a specific industry or business, but sometimes so radical that they affect the perception and use of a particular product and cause social breakthroughs.

Products and processes pass through the "life cycle" phases, from the moment of emergence and reaching maturity up to the end point in which a new generation is created. Different stages of product development emphasize innovation in various ways. In the early stages of development, intensive research on product innovation is carried out, and then there is a downward trend as the product ages. In the later phases, when the emphasis on product innovation is not so significant, process innovation is becoming more important, aimed at cost reduction [14].

The idea of innovation fusion is a variant, where the merging and merging of various innovation streams, which combine and cause changes in architecture. An example of this idea is the home automation system in which various technologies in the field of computational techniques (computers), telecommunications, industrial control and the basics of robotics are combined to create a new system comprehensively managing the audiovisual system, heating, security, communication and communication [31].

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SMART PRODUCTS

The Internet of Things is a system of connected devices that constantly communicates. In this system, human intervention is unnecessary [26]. Its elements are connected via the Internet, and data exchange between them takes place via the TCP / IP protocol. Examples of Internet of Things devices are: smartphones, tablets, computers and special electronic circuits and microprocessors, which can be mounted to virtually anything, connecting it in this way to the Internet. These devices are controlled by means of programs that allow objects to recognize their current situation and interact with people and the environment. These things sense, remember and interpret what is happening to them and the world around them, act on their own, communicate with other objects and people. Their characteristic feature is the possibility of identification in the network. As a result, objects will become "intelligent", carrying out most of the activities without human intervention, thus relieving it of routine activities. They form the ecosystem of Internet of Things devices.

The largest Internet companies (Cisco, Google, Microsoft, Amazon) are working on developing a technology that allows you to connect almost any object to the network [27]. Therefore, we expect a constant dynamic development of this type of products [5].

The Internet of Things can be seen as a global infrastructure for the information society, enabling the provision of advanced services by combining physical things (material things existing in the physical world) and virtual ones. The Internet of Things changes the environment and conditions of doing business, however, time is still needed to build infrastructure and create legal regulations.

Researchers dealing with the Internet of Things primarily indicate the autonomy of objects [12][4]. The ability to communicate, make decisions, and create product networks will make them more attractive to the user, because they will relieve him from a series of routine activities, thus offering him more free time. As a result, such products will supplant traditional products (at least in selected areas of application). It seems, however, that the changes in products will be much larger and will include not only the way the product operates (autonomy), but also the product structure.

Internet of Things creates great potential in Industry 4.0 [1]. Automation, processing and data exchange, implementation of new technologies allowing for the change of manufacturing methods, cooperating robots. Industry 4.0 is using the potential of several new

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technologies at the same time IoT, AI, big data, cloud computing, augmented reality. Benefits include decisive improvement of the work flow, change of the production management system allowing to achieve a very economical and high-performance system, reduction of downtime and service time and costs, improvement of quality, increase of productivity, identification of threats in real time.

In the future, enterprises, together with consumers, will contribute value by individualizing experiences that are unique to every consumer. A person will be placed in the center of creating value, and employees and technologies will play a supporting role [10]. There will be a departure from focusing on the transaction, in favor of maximizing the value for the client. The customer will become a prosumer actively involved in the creation of the product. All these changes will result in a departure from routine, mass products. In return, there will be flexible products, individually tailored to the customer, and even dynamically changing with the client (eg smartphones, which with the help of appropriate applications can be constantly adjusted to what the client expects). This will result in the emergence of new smart connected products [16].

Always connected with the Internet, autonomous products, so-called smart connected products, will consist of three elements [29]. The first is a real product, the so-called hardware, which will include the physical elements of the product. The real product will be supplemented with smart components: sensors, controllers, software, operating system, whose main task will be to link the physical product to the environment and the Internet. Finally, the third, very important element will be the so-called product cloud, i.e. the platform of operations, applications, information available through the network as the current needs, thanks to which the product will gain additional usefulness [29]. The product cloud will probably become the most important element of the product. The attractiveness and quality of the product will depend on the number, availability and usability of the application. These applications will allow new applications of products and thus its individualization. Each user, choosing the applications for their needs, personality traits, where they are located, will be able to adjust the form of the product to their personal requirements. It will co-create the product, shaping it in terms of its own needs and experiences. The perception of product quality will change. It will depend not only on its traditional elements, but also to a large extent on the quality of product communication with the environment, the quantity and quality of applications, etc [15].

The virtual part of the product (product cloud) will give unlimited possibilities for implementing product innovations [34]. Each application can add new product applications or increase its value from the customer's point of view. On the product, the user will download only those applications he currently needs. Each of these applications can be treated as a product innovation that serves to build an advantage.

In many cases, these products will be combined with others (similar or complementary uses) in a new product system consisting of a network of complementary and cooperating products. Individual systems can also cooperate with each other and complement each other, creating a system of product systems [18]. Therefore, the ability to establish relationships and partnerships will be important [32].

Applications will increase the value of products and offer new applications. As a result, some products may be unnecessary (eg smartphones have largely replaced classic car navigation thanks to navigation applications). Therefore, producers should look for new applications of the product through applications to strengthen their position on the one hand and enter the markets on the other.

Smart network products will constantly collect data about users [33]. This data can be used in the analysis of customer behavior. The company will learn how, when, why, etc. the product is used by individual consumers. This will allow you to gather valuable knowledge that can be used to improve the product, and therefore to propose further innovations, thanks to which the company can build an advantage. On the other hand, the clients themselves should be interested in sharing some of their private data, because they will receive products tailored to their individual needs instead [17].

TRANSFORMING DEVICES INTO AN SMART NETWORK PRODUCT

Nowadays, products are being transformed (in a revolutionary or evolutionary way) towards smart network products [2]. IoT is the next stage of the information revolution. Cars, kitchen appliances, home furnishings, lighting, cell phones, heart monitors can be connected via the Internet of Things. IoT by definition includes any item that can be connected to a worldwide network [3].

IoTs include solutions that can be divided into two groups. The first is solutions for end users, both individual and business. Using them, among others improve the quality of life

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or maximize benefits and revenues. The second is solutions dedicated to companies, enabling first and foremost minimizing costs and better use of resources.

Thanks to the Internet of Things, many "smart home" solutions have developed, the aim of which is to save energy, to use our resources more economically, and to improve the quality of life. An example may be intelligent thermostats to facilitate heating management. Such a thermostat will turn off, for example, a given radiator, if it senses the opening of a window in a given room. Thanks to the possibility of remote control, we can also set a convenient temperature at home, eg by leaving work. Building automation already creates great potential for companies that would like to propose solutions in this area. The development of IoT has also caused that more and more cities are interested in using its potential for automation and creating solutions that make life easier for residents. Transport, security, management of urban services systems, lighting, energy are just some of the aspects of an smart city using IoT. New York, Dubai, Taipei are examples of cities referred to as Smart City [8] [9].

Although the idea of Smart City or Smart Home today is only at the beginning of its path, it certainly has a lot of potential for development. Today it is not hard to imagine that our fridge will know that you need to replenish your supplies and order the products you need in the online store [13]. There are many examples of what the near future may look like or what the potential value of IoT might be. Let's say we have an appointment, our car can have access to our calendar and already knows the best route to overcome. If the traffic is high, without our participation, our car can also send text to the other side informing that we will be late. An alarm clock notifying the coffee maker that he would start brewing coffee because we just got up. Machines that know they need to be repaired and report it to the change manager at the right time. Office equipment, which orders supplies itself, because he knows that these are just about to end. Trash bins that inform you that they are full. Doctors always receive up-to-date information about the patient's health. Autonomous cars communicating with each other and a central traffic management system to increase safety. These are potential examples of IoT applications.

The example of a mobile phone shows that transforming it into an smart network product has changed the phone market. The thesis is also confirmed that the product structure has been transformed, and in its competition the most important element has become the product cloud. The versatility of the system, availability and diversity of applications largely determined the success on the market. At the same time, the mere networking of products gave manufacturers the opportunity to create a series of innovations that allow them to gain advantage. Each application is a potentially new application of the phone, some of which is the opportunity to meet completely new needs. Changes in the product are not limited only to its physical elements, but mainly to virtual elements, which significantly increases the possibilities of their introduction. The competition between other smart network products in the future (eg TVs) may look similar [19]. The deciding factor may be the popularity of the system and the variety of applications, not the quality of the material product.

CONCLUSION

In the next three years, the Internet of Things and Artificial Intelligence will be the main carriers of digital changes in the economy and social transformation [21]. The development of modern technologies would be even faster if there were no legal regulations in force, which in the opinion of managers employed in technology companies are the main barriers to the development and implementation of innovations in organizations.

The idea of Industry 4.0 currently being implemented is based on the use of the Internet of Things for monitoring and intelligent control of production processes. Technology will play a key role in the process of industrial change in the coming years [11]. In turn, robots support human work in the implementation of an increasing number of repetitive activities, providing cost savings while improving the efficiency and quality of work. On the other hand, artificial intelligence combined with data analytics enables quick and effective solving of very complex problems, using mechanisms of learning that until now were used only by living organisms.

The above changes will force the necessity to change traditional business models and adapt to new rules [22][28]. In an increasingly competitive market, the main factor that motivates consumers to choose the supplier's offer becomes the customer experience offered by individual brands. Currently, the trend of connecting devices to the Internet of Things is observed [6]. The above examples even indicate that the Internet of Things forces the producers to create new, innovative, intelligent products. It is a chance for companies to gain or maintain a competitive advantage. The analyzed examples indicate that in the near future

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all (or almost all) manufactured products will become things on the Internet of Things in the near future.

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The Use of Google Translate in Electronic Business Correspondence. A Case Study in Poland and an Examination of the Implications.

by

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ABSTRACT

Since its release in 2006, Google Translate has quickly become the world's most popular translation tool. It currently handles hundreds of millions of search queries on a daily basis and has become a very popular translation tool in private and public businesses all across the globe.

Machine translation is treated with mixed responses by professional translators. Some see machine translation as a positive tool to facilitate their jobs, whereas others see it as a technological replacement, akin to the motor car replacing the horse-drawn buggy. Nevertheless, the fact is that machine translation, best exemplified in Google Translate, is here to stay. Moreover, it seems logical to assume that as technology progresses, the power and the role of machine translation is only set to increase. If this is true, then what will be the role of traditional foreign-language skills in the future? Will machine translation increasingly replace the need for workers to possess a second language in the case of electronic business correspondence?

This paper aims to examine the use of Google Translate in electronic business correspondence (email and online messenger applications). The study focuses on a sample of workers from a collection of companies who routinely correspond with foreign clients and suppliers via electronic correspondence. These respondents were chosen because all of them are required to have foreign-language skills in the target language of the country with which they cooperate. The companies are all located in the area of the town of Zielona Góra, Poland.

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This study hopes to examine a number of questions and then address the implications from them, namely:

- Do the respondents routinely use Google Translate in electronic business correspondence?
- Do the respondents trust the results of Google Translate?
- Do the respondents believe that Google Translate is improving with time?
- Do the respondents believe that eventually the use of Google Translate will replace the need for traditional foreign-language skills?

KEYWORDS:

Google translate, electronic business correspondence, polish workers, business english

Session: Research in progress

Development status, application areas, activity cost accounts in Polish enterprises

by

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ABSTRACT

State of the Art and Purpose.

The aim of our research is to analyze the development and diffusion of activity-based costing (Activity Based Costing), as well as to identify and assess the scope and method of application of the cost of operations in Polish enterprises. Properly prepared scope and method of application of the cost of operations can increase the enterprise acitivity and support socioeconomic development (Kowal, & Paliwoda-Pękosz, 2017). The diagnosis of costs can be information potential for business process modelling notations (Gabryelczyk, & Jurczuk, (2015).

We plan to include the following analyses:

1) development of the concept of the cost of activities' calculation and the diffusion of this concept in the world as a basis for research into the functioning of activity-based cost accounting systems in enterprises in Poland,

2) the scope of implementing the calculation of activity costs in enterprises in Poland at the beginning of the 21st century in the light of ABC diffusion in the world;

3) factors determining the approach of enterprises operating in Poland to the issue of activity cost accounting

4) the process of implementing the calculation of activity costs in enterprises in Poland, the structure of functioning ABC systems and the ways of using information generated by these systems.

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We also plan to elaborate scientific and practical effects as

1. popularization and development of modern account and cost calculation systems and

2. assistance for Polish companies that plan to implement advanced cost accounting systems to increase the competitiveness of their products.

We plan two stages of our research:

I stage 2017 /2018: reports regarding the status and conditions for the development of activity costs accounting in Poland;

II stage: 2018/2019. Analysis of application areas and the prevalence status of activity costs in Poland.

We hope that the results of our research will support the development of accounting in Poland through market efficiency and adequated costs for earnings (Dobija, & Klimczak, 2010).

KEYWORDS:

Development status, application areas, activity, cost accounts, Polish enterprises

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Information technology in the development of small and medium-sized enterprises in Poland

by

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ABSTRACT

State of the Art and Purpose.

The work carried out under this program is aimed at acquiring up-to-date knowledge on the degree of use of information and communication technologies in the management systems of small and medium enterprises in Lower Silesia and determining the preferences of entrepreneurs in this respect. The research results will be used to develop an optimal program for computerization and automation of enterprises useful for socioeconomic development (Kowal,& Paliwoda-Pękosz, 2017).

Planned scientific and practical effects:

The results will be presented in the form of papers at national conferences, published in scientific journals and monographs.

I stage 2017/2018 will cover subject studies in the field of computerization and automation of business activities. development of the database of enterprises covered by the survey, meetings with IT companies, determination of the appropriate research methodology.

II stage 2018/2019 will be connected with the construction of the wuestionnaire and on-the-spot examination of the IT tool for the collection of the results obtained in the companies covered by the study, expert consultations (Kowal, Keplinger, & Mäkiö, 2018).

III stage 2019/2020 assummes development of research results and implementation, development of a management system for project and implementation activities in the field of computerization and automation of small and medium-sized enterprises (Roztocki, Weistroffer, 2016; Kowal, Mäkiö, & Jasińska-Biliczak, 2017).

KEYWORDS:

Information technology, the development of small and medium-sized enterprises, Poland

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Cultural heritage as a stimulator of economic development in Kłodzko region (Attractions of the Kłodzko region)

by

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ABSTRACT

State of the Art and Purpose.

The research on the heritage and tourist attractions of the Kłodzko region is aimed at conducting an inventory of the natural and anthropogenic tourist values of the Kłodzko region, as well as the condition and prospects of developing tourism infrastructure for the needs of the types of tourism studied (Leniartek, 2012). Particular emphasis will be led on the role of resources in creating tourism products that make the region unique, has been extended to include a utility aspect for the needs of the local economy (Kuzio, Kowal, & Wawrzak-Chodaczek (eds.), 2015). The result of the program implementation will be the promotion of knowledge and promotion of the Kłodzko region, helping companies and local government units to increase tourism that supports socioeconomic development (Kowal, & Paliwoda-Pękosz, 2017).

Planned scientific and practical effects

Research reports on:

1. Tourist attractions of the Kłodzko region. Conducting an inventory of the natural and anthropogenic tourist attractions of the Kłodzko region.

2. Environmental determinants of the development of selected types of tourism in the Kłodzko region, with particular emphasis on active tourism and agritourism.

3. The state and prospects for the development of tourist infrastructure for the needs of the types of tourism studied.

4. The state of preservation and prospects of infrastructure development for the needs of tourism in the opinion of tourists, on a representative sample of 1,100 people.

5. The development of a monograph.

6. Developing a tourism development strategy for the Kłodzko region along with proposals for branded products for the needs of the regional economic development.

Research results: each research stage will end with the publication of research results in peer-reviewed journals of national and foreign range and presentation of papers at national and international conferences.

KEYWORDS:

Cultural heritage, a stimulator of economic development in Kłodzko region, attractions of the Kłodzko region

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Teacher training and continuing education using multimedia

by

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ABSTRACT

State of the Art and Purpose.

The aim of the program is to analyze selected aspects of the education process of future English teachers in relation to the usage of multimedia. The program will, in particular, be devoted to such issues as shaping reflexivity, conviction of future teachers, their metacognitive knowledge, the role of pedagogical practices with the implemention of holistic methods of education (Mäkiö-Marusik, Mäkiö, & Kowal, 2017). The aim of the research is to gain knowledge about the effective preparation of students of philology and education to pursue the teaching profession that also support human development (Kowal, & Paliwoda-Pękosz, 2017). Quantitative and qualitative research will be carried out on students of English teacher specialization as well as education through questionnaires, interviews, and observations (Kuzio, Kowal, & Wawrzak-Chodaczek, 2015).

Planned scientific and practical effects:

I stage: collecting literature, preparing and conducting pilot and relevant research, addressing the development of new educational methods supporting human development

II stage: preparation of the publication, further research, and presentation at the conferences related to multimedia in education

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III stage: further research and summary, preparation of the publication

We plan to adapt the effective holistic teaching methods TCHAT ((Mäkiö-Marusik, Mäkiö, & Kowal, 2017) that can help to strengthen the teaching process with the use of multimedia. We hope to adapt, apply and assess an innovative task-centric holistic agile teaching approach (T-CHAT) in of English teacher specialization as well as education spezialization.

KEYWORDS:

Teacher training, continuing education, multimedia, students, pupils

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Functioning of the European Union, development of the economy and competition policy

by

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ABSTRACT

State of the Art and Purpose.

The aim of the program is to analyze the way the European Union operates in relation to the Lisbon Treaty. We will analyse different socioeconomic phenomena that can lead to economic growth in relation to different types of economies (Roztocki, & Weistroffer, 2016). The analysis will be carried out on the basis of quantitative and qualitative research, based on the subject literature and surveys (Kowal, & Paliwoda-Pękosz, 2017).

Planned scientific and practical effects

Stage I. Research and report on the premises of the development strategy and deepening integration in the European Union. The functioning of the European Union in the light of the Lisbon Treaty.

Stage II. Implementation. Research and report on the centers and peripheries of socioeconomic development in the European Union. Competitiveness of the economy and competition policy of the European Union

Stage III. Research task: Functioning of the European Union in the light of the Lisbon Treaty. Competitiveness of the economy and competition policy of the European Union.

The research related to the role of information technology and information systems in socioeconomic growth will be especially emphasized (Kuzio, Kowal, & Wawrzak-Chodaczek, 2015).

KEYWORDS:

Teacher training, continuing education, multimedia, students, pupils

REFERENCES

Kuzio, A., Kowal, J., & Wawrzak-Chodaczek, M. (eds.) (2015). Communication and Information Technology in Society: Volume 3. ISBN: 978-1-4438-7540-0. Cambridge Scholar Publishing

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Media in education. Computer games as educational tools

by

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ABSTRACT

State of the Art and Purpose. The aim of the program is to study the broad background of social and cultural determinants of the functioning of the mass media in society.

Planned scientific and practical effects

• Stage I. Preparation of research methods, techniques, and tools.

• Stage II. Initial pilot studies on critical media reception as information tools. Reports on: Computer games used by children and adolescents.

• Stage III. Mass media in shaping values and attitudes - qualitative and quantitative research. International conference.

The aim is to popularize the use of computer games in education as educational tools. We plan to make investigation on the use of serious games in school education in Lower Silesia district.

The study will be an attempt to answer the questions that games are played every day by pupils, are there educational games among them, and how much time does the youth spend playing online and whether the young generation sees the sense of using games in education and possibly what games might be (Kuzio, Kowal, & Wawrzak-Chodaczek, 2015).

The survey will be also conducted among teachers of schools in Lower Silesia district, and its aim is to obtain information on the impact of computer games on the education and social and emotional development of pupils. We will analyze the way teachers use serious games in education and their impact on the effectiveness of the learning process. We

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areinterested to find information on the perception of the teachers' justification for the use of educational games at school and their readiness to apply them to individual classes. We are wonder how these games can develop knowledge, skills and social competencies for human development (Kowal, & Paliwoda-Pękosz, 2017; Mazen, & AlHinai, 2013).

KEYWORDS:

Teacher training, continuing education, games, multimedia, pupils, students

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