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Faculty of Information Studies, Slovenia
bostjan.delak@fis.unm.si

Igor Bernik
Faculty of Criminal Justice and Security, Slovenia
Igor.Bernik@fvv.uni-mb.si

KM2022 Local Conference Organizers and Coordinators

Blaž Markelj
Faculty of Criminal Justice and Security, Slovenia
blaz.markelj@fvv.uni-mb.si

Simon Vrhovec
Faculty of Criminal Justice and Security, Slovenia
simon.vrhovec@fvv.uni-mb.si

KM2022 Conference Organizers and Coordinators

Yair Levy
Nova Southeastern University, FL, USA
levyy@nova.edu

Shonda Brown
IIAKM, USA
registration@iiakm.org

Michelle M. Ramim
Nova Southeastern University, USA
michelle.ramim@gmail.com

Nathan White
Central Washington University, USA
nathan.white@cwu.edu

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Stellenbosch University, South Africa
chm2@sun.ac.za

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Warsaw School of Economics, Poland
csolek@sgh.waw.pl

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levyy@nova.edu

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OJAKM Senior Editor
University of Economics in Katowice, Poland
ewa.ziemba@ue.katowice.pl

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ccurado@iseg.ulisboa.pt

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OJAKM Associate Editor
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nitzage@openu.ac.il

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HSF University of Meissen, Germany
oliver.jokisch@hsf.sachsen.de

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OJAKM Associate Editor
University of Pisa, Italy
federico.niccolini@unipi.it

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mcarlton@hbu.edu

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Jean-Henry.Morin@unige.ch

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Pre-Conference Industry Day
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Invited Keynote
The EU cybersecurity threat landscape

Dr. Apostolos Malatras
Team Leader of Knowledge and Information Team, ENISA, Greece

Abstract:

Cybersecurity is increasingly taking the front seat, from being considered as an afterthought to becoming a priority in policy, technical, economic, societal and even legal and environmental discussions. Given the increasing hyper-connectivity of everything and our growing online presence, the significance of cybersecurity cannot be overstated. We are constantly coming across new cyber threats and attacks, novel avenues are opening for adversaries, emerging technologies are changing the paradigm and cyber affairs are more and more linked to physical ones, leading to the notion of hybrid threats. ENISA, the EU Agency for Cybersecurity, has been monitoring the cybersecurity threat landscape for more than 10 years. In this talk, ENISA will discuss the current state of the EU cybersecurity threat landscape and discuss the methodological framework that the Agency utilizes to map the landscape, making use of efficient and effective knowledge management.

About the Speaker:

Dr Apostolos Malatras is the Team Leader for Knowledge and Information Team at the EU Agency for Cybersecurity (ENISA) where he is in charge of emerging technologies cybersecurity, threat landscapes and foresight. Apostolos has been a Cybersecurity Expert at ENISA responsible for many projects, including Artificial Intelligence, Internet of Things, Industry 4.0 and Smart Mobility. With more than 15 years of experience in the industry, academia, and the European Commission, Apostolos has a broad experience in managing and securing network infrastructures and connected and intelligent devices. He is the author and co-author of more than 60 research papers and scientific reports and regularly gives presentations on various international fora.

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Invited Talk
Cyber security at nationally important events

M.Sc. Dalibor Vukovič
Cybersecurity Specialist at Telekom Slovenia, Ljubljana, Slovenia

Abstract:

Cyber attacks and intrusions, cyber espionage, theft of intellectual property, the spread of false information, cyber crime and terrorism, and other forms of cyber threats may have a profound negative multi-domain impact on the economy and the financial system; the functioning of the political system; the international reputation of the state; the operation of critical infrastructure; public security; defense capability; the security of citizens; the provision of the basic necessities of life; and the operation of the system of protection against natural and other disasters. They are a key threat to the national information and communications infrastructure and to the critical information and communications infrastructure, and the data within them.

Cyber attacks on nationally important events always have a special purpose: “It can be about sowing fear, wanting to reduce trust in government or even proving the power of the attacker. Predicting who or what will be the target of an attack is practically impossible. Protecting at this level is an extremely big challenge.

About the Speaker:

Dalibor Vukovič – Telekom Slovenije
is a cyber security specialist with several internationally recognized certificates. He has more than 20 years of experience in the ICT sector. It is involved in the development and implementation of new security products in both the private and public sectors, including the largest work organizations, critical infrastructure and government institutions. He is the author of several articles and papers at professional conferences and a lecturer in the field of cyber security. His research interests include OSINT methodology and prediction of cyber attacks.

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Invited Talk
Cyber Security Upgraded: How to Achieve It

Uroš Majcen
Director, cyber resilience, S&T Slovenija d.d.

Abstract:

Society as a whole is in the midst of the digitalization revolution that changes not just how we work but also how we live and how we understand the future. Core of the success of the digitalization is in the trust in the information that we share and receive with all stakeholders. And the key of the trust is in the Security. Moreover, Cyber Security. There are several key paradigms that need to be addressed in order to achieve it, spanning from larger topics as resilience to nitty gritty technical details as attack path management and mapping. Presentation will try to explain these and provide a food for thougths.

About the Speaker:

Uroš Majcen is holding the function of the director of the cyber resilience for S&T Slovenija d.d., part of S&T Group. He is responsible for all cyber security related services in the portfolio of S&T Slovenija d.d. and the cyber security posture of S&T Slovenija. In more than 25 of his career that spans from the beginning in the development space to cyber security his main goal was to sucessfully introduce, implement and use the technology for the benefit of the users. Lately, he is strongly involved in the cyber security space, not just in the function in S&T but also as a Vice President of the Ready for the Future Commisision of Amcham and ExecutiveMember of the GZS ZIT Sekv.

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Invited Talk
Automotive cybersecurity: challenges and (some) solutions

Prof. Dr. Gianluca Dini
Director of the University Centre in Logistics Systems, Dept. of Information Engineering, University of Pisa, Pisa, Italy

Abstract:

Connected cars are part of the Internet of Things (IoT). While digitalization opens to new opportunities and services it also extends the attack surface with respect to a traditional vehicle. The presentation will initially introduce the cybersecurity issue in connected cars. It will present threats, the related risks, and real attacks. In the second part, the presentation will focus on the research activity on automotive cybersecurity at the University of Pisa with particular attention to attacks on keyless opening systems and securing over-the-air firmware/software update.

About the Speaker:

Prof. Dr. Gianluca Dini (male). Gianluca Dini is Full Professor of Computer Engineering at the Department of Information Engineering of the University of Pisa. His research interests are in the field of distributed computing systems with particular reference to cybersecurity. He has published 150+ papers in international conferences, books, and journals. He has participated to many projects funded by the Italian Government, private companies, and the Commission of the European Community (from FP6 to H2020), where he has also played roles of coordination. He teaches “Foundations of Cybersecurity” in the MS program in Computer Engineering of the University of Pisa and “Applied Cryptography” in the post-graduate Master in Cybersecurity of the same University. In 2016, he founded the post-graduate Master in Cybersecurity of which he used to be the director for five years. Finally, since 2018 he is the Director of the University Centre in Logistics Systems of the University of Pisa.

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Invited Talk
Information Security in NLB Group

dr. Blaž Ivanc
Group CISO – NLB Group

Abstract:

NLB Group is the leading banking and financial group with headquarters and an exclusive strategic interest in SEE region. In addition to NLB d.d., a main entity in Slovenia and a public company, NLB Group is comprised of seven subsidiary banks and several companies for ancillary services (asset management, real estate management etc.). We place our clients at the centre of everything we do. One of the key efforts is improved availability and inclusiveness for all clients. The NLB Group has made itself available anywhere and anytime by building a strong customer centre and upgrading its portfolio of digital sales channels. Nowadays, the Group is no longer just a banking group, but one of the largest Information Technology (IT) and data science companies in the region with an ambition to foster the evolution of a local flexible digital ecosystem that offers clients tailormade products and services. The Group is giving special focus to cyber security, and consequently assuring the confidentiality, integrity, and the availability of data, information, and IT systems that support banking services and products for clients. Cyber security in the Group is constantly tested and upgraded by security assessments, independent reviews, and penetration testing. Cyber security is regularly discussed at the Bank's Information Security Steering Committee, Operational Risk Committee, and Management Board meetings. NLB Group is aware that ensuring the long-term successful operation of banks, it is not enough just to comply with applicable laws and regulations, which represent the legal framework within which the bank operates. Banking must also consider its sustainable development responsibility, which always requires appropriate ethics and integrity standards to be met.

About the Speaker:

Blaz Ivanc is Group chief information security officer at NLB Group. He has strong international background in real-world cyber operations and cyber risk intelligence. As a pioneer of cyber operations (tailored access) tactics and techniques modeling, he has had the privilege to speak and give lectures at the top cyber tech centers abroad. In addition, he was the professional head of the 1st international conference in the field of intelligence and security informatics that took place in Slovenia.

Invited Talk

e@ser | Secure use of smart devices among the elderly: Towards education-based cybercrime prevention

Dr. Simon Vrhovec
Head of the project, University of Maribor, Faculty of Criminal Justice and Security, Ljubljana, Slovenia

Abstract:
The population in Slovenia and the European region is steadily aging. New technologies may support the well-being and enrich the everyday lives of the elderly. Smart devices and systems, such as wearable and mobile medical devices, ambient assistedliving technology, etc., are at the cutting edge of emerging technologies. The use of such devices inevitably results in an increased inclusion of the elderly in the cyberspace as smart devices are usually connected to a cloud account, mobile app or both. However, limited proficiency and fears about cybersecurity may hinder the adoption of smart devices by the elderly. The overall aim of project *e@ser* is to provide a comprehensive strategy for prevention of cybercrime related to the use of smart devices by the elderly based on cybersecurity training by generating the knowledge necessary to develop smart cybersecurity training that will enable the elderly to learn how to securely use smart devices and be adaptable to the varying needs of individuals. In this talk, we will report on a study identifying smart devices used by older adults in nursing homes in Slovenia and assesses their vulnerability. Results indicate that residents readily use only three types of smart devices. Smartphones and tablets are used individually, while smart TVs are commonly shared. Older adults in nursing homes are currently not highly vulnerable to cyberthreats since their devices are rarely connected to the internet however this may change in the future.

About the Speaker:

Simon Vrhovec received the Ph.D. degree in computer and information science from the University of Ljubljana, Ljubljana, Slovenia, in 2015. He is currently an Associate Professor at the University of Maribor, Faculty of Criminal Justice and Security, Ljubljana, Slovenia. His main research interests include human factors in cybersecurity, software security engineering, agile methods, and change management. He has been in the steering committee of the European Interdisciplinary Cybersecurity Conference (EICC), since 2019, and co-chaired the Central European Cybersecurity Conference (CECC), in 2018 and 2019. He is an Editorial Board Member of the Journal of Cyber Security and Mobility (JCSANDM), Frontiers in Computer Science, EUREKA: Social and Humanities, and International Journal of Cyber Forensics and Advanced Threat Investigations (CFATI). He serves or has served as a Guest Editor for IEEE Security & Privacy, Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications (JoWUA), and Journal of Universal Computer Science (J.UCS).

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Invited Talk
Status of the project: Development of a cyber security training programs

Assoc. Prof. Dr. Muhamed Turkanović
University of Maribor, Faculty of Electrical Engineering and Computer Science, Institute of informatics, Maribor, Slovenia

Abstract:

Cybersecurity is one of the key areas and focuses of the Slovenian, European as well as global governments and markets. Within the Slovene national project RUKIV, we address training and education in the field of cybersecurity, in order to produce a comprehensive way to tackle the deficiency of professionals in the cybersecurity field. The aim and objective is to provide additional knowledge and skills or competences through formal education and/or informal trainings in the field of cybersecurity in a structured and comprehensive way. This will offer a systematic development of competences to tackle the complex challenges in the field of cybersecurity. A systematic approach was taken, where firstly, an overview and analysis of the field of cybersecurity education was made, i.e., an analysis of curriculum and training guidelines, a review of existing study and training programmes in Slovenia and EU, and an overview of the digital competences needed by cybersecurity professionals. A comprehensive proposal for advanced higher education curricula as well as a training curriculum, taking into account the latest technological developments, will be made through consultation with ICT and cybersecurity experts.

About the Speaker:

Muhamed Turkanović received his PhD in the field of Computer Science and Informatics in 2016. He has more than 10 years of (international) industry experience as a developer, technical development manager, technical director and owner of IT companies, etc. In 2017, he started to work full time at the University of Maribor as a university lecturer/professor, teaching subjects related to data technology and cybersecurity. In addition to this, he is also an external lecturer at the University of Zagreb. In 2017 he established the Blockchain Lab:UM within the Institute of informatics, where he is also the Head of R&D. Since 2019 he is the Head of Operations at the Digital Innovation Hub at the University of Maribor and since 2020 the coordinator of the consortium DIGI-SI, which is also the Slovene candidate for the EDIH. He is also the Deputy Head of the Institute of Informatics, as well as the coordinator of the University Study Programme Informatics and Data Technologies. Furthermore, he is the president of the Blockchain Technical Committee at Slovenian Institute for Standardization, member of the Strategic Digitization Council for the Government of Slovenia, the University of Maribor's coordinator for the H2020 project Digital Europe for All, DIH-World, Adma Trans, Data4Food2030, as well as for the Interreg Alpine Space project SmartVillages, etc.

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1st Day Opening Keynote Lecture

COVID-19 Pandemic: A Brief History

Professor Dr. Bojana Beovič, MD

Professor of Infectious Diseases, Faculty of Medicine, University of Ljubljana, Slovenia

Keynote Overview:

COVID-19 pandemic was not completely un-expected from virologists' point of view but it's impact on public health, health-care systems, and society it is un-comparable to anything that most of the global population has faced during their life-time. The pandemic started with an increase of mortality followed by fear and more or less targeted and intuitively introduced restrictive interventions. The success of the control of the early phase of epidemic mostly depended on the speed of introduction of interventions and the elimination approach seemed more effective than mitigation. With the progression of the pandemic the elimination strategy became more and more antagonized by growing pandemic fatigue. The second year of the pandemic brought promise of relief. Several effective and safe vaccines have been developed at record speed as a manifestation of the strength of modern science. Problems in vaccination implementation and immune escape of novel variants of SARS-CoV-2 dominated the second year of the pandemic. The message that professionals provided to general public has changed from the expectation that vaccines will help us eliminate the pandemic virus to the role of vaccines in preventing severe diseases thus changing COVID-19 to "common cold". The omicron variant that spread to most countries by the end of 2021 brought new threat but also hope that its lesser virulence would help stop the pandemic. The cost of the stop in vulnerable population was expected to be high and variable depending especially on vaccination rates. The pandemic as we can describe it up to now was dominated by natural course of ever mutating coronavirus, by modern science but also culture and human behavior on the individual as well as national and supranational level.

About the Keynote Presenter:

Bojana Beović, MD, PhD is a full professor of infectious diseases and epidemiology at the Faculty of Medicine, University of Ljubljana, Slovenia, and chair of ID Consultancy Unit at the Department of Infectious Diseases, University Medical Centre Ljubljana. Since 2019 she is the chair of the Intersectoral Coordination Mechanism for Prudent Use of Antimicrobials at the Ministry of Health. From 2019 to 2021 she chaired European Working Group at the International Society of Antimicrobial Chemotherapy. At the European Society of Clinical Microbiology and Infectious diseases (ESCMID) Study Group for Antimicrobial Stewardship (ESGAP, former ESCMID Study Group for Antibiotic Policies) she served as honorary secretary from 2009 to 2014, and the chair from 2014 to 2018. During COVID-19 pandemic in 2020 she served as the chair of Scientific advisory group to the Ministry of Health. Since 2011 she has been the chair of the National Immunisation Technical Advisory Group. In 2021 she was elected the president of Medical Chamber of Slovenia. She was the organizer and co-organizer of several international and national scientific meetings and educational courses. She is the author and co-author of more than 300 publications published in national and international literature.

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1st Day Closing Keynote Lecture

Aspects of Digital Trust: Foundations, Framework and an Outlook

Professor Rolf von Roessing

FORFA Consulting AG, Switzerland

Keynote Overview:

Digital trust is an elusive concept which has been described in a wide variety of publications. The discussion follows trust as an attribute rather than a relationship, with an equally wide variety of technology-based solutions. In practice, the question of digital trust and trustworthiness remains a formidable challenge. The keynote will address foundations of digital trust which form the basis for the new Digital Trust Framework developed by ISACA. It will give an outlook covering further research and development, and the ecosystem developing around the DTF.

About the Keynote Presenter:

Rolf von Roessing is a partner and CEO of FORFA Consulting AG, a Swiss-based consultancy firm specialising in a range of disciplines such as security, resilience, GRC(S) and digital transformation. Prior to forming his own consulting practice, Rolf spent many years in global audit and advisory work as a partner at KPMG, and previously with EY. He teaches in related M. Sc. courses at Danube University Krems (Austria) and is a frequent speaker at national and international conferences. From 2009 to 2011, Rolf was International Vice President and member of the ISACA Board of Directors, to which he returned 2019-2021 as Global Vice Chair. In 2010, he was the author of ISACA´s publication "Business Model for Information Security"; he continued to support ISACA research work as the lead developer of several sequel works such as "Securing Mobile Devices" (2013), "Transforming Cyber Security" (2014) and the "European Cyber Security Implementation Series" (2014). In October 2021, Rolf was invited to lead the global task force for developing ISACA´s Digital Trust Framework.

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2nd Day Opening Keynote Lecture

Knowledge and Cybersecurity Implications in a Metaverse

Professor Bruce W. Watson

Chair of AI, Cybersecurity and Cyberwarfare, Stellenbosch University, South Africa

Keynote Overview:

Metaverses are comprehensive virtual worlds relying heavily on advances in computing power, social media, and most recently, Blockchain. While *the Metaverse* is a recently announced move by Facebook, the concept is decades old and we can expect numerous other metaverses to be developed (and populated) in the coming years. Aside from the appeal of no-holds-barred virtualization, they provide many profit-driven advantages – most of which arise from cryptocurrencies. Blockchains (as well as NFTs) already impact knowledge management and sharing, cybersecurity and intelligence analysis – where they are the foundation of modern digital proof of (unique or shared) ownership. They rely on various consensus algorithms (commonly known as "mining") such as proof-of-stake, etc. These concepts are already being built into metaverses to facilitate the (meta)digital economy, but whether such Blockchains must reside *inside the metaverse* or *in the real world* remains an open question, and our research specifically explores the implications of both. In particular, to avoid potential cheating by the metaverse owner (e.g. Facebook, or others), both meta and real Blockchains may be required, along with *bindings* between them. Cross-Blockchain bindings (using smart contracts) are already understood – but the implications of bindings crossing the *metabarrier* are ill-understood, especially if they subsequently cross back out into "real". Still deeper complexity arises when knowledge artefacts (e.g. AI's) cross the metabarrier, or are partially developed on both sides of the barrier. The discussion will round off consideration of mid-term issues such as: binding between two metaverses, smart contracts across barriers, and Blockchain on post-quantum cryptography.

About the Keynote Presenter:

Bruce W. Watson is Research Professor Cybersecurity and Cyberwarfare and the Director of the Centre for Artificial Intelligence Research in the School for Data-Science & Computational Thinking. His first Ph.D is in computing science from Eindhoven University of Technology, after studying discrete mathematics and computer science at the University of Waterloo. He later returned to Eindhoven as chair and head of Software Construction. Watson's second Ph.D is from the University of Pretoria. Parallel to his academic career, he worked as a compiler specialist at several high tech companies (e.g. Microsoft, Watcom, Visual Edge/IBM), and subsequently as an algorithmicist in cybersecurity and cyberthreat intelligence (e.g. for Cisco, Netronome and Computed Future). He regularly serves as a presenter or consulting scientist for a variety of governments, defense organizations, and companies – focused on deep technologies, tactics, and strategic trends in the intersection of AI, cryptography, intelligence analysis, and Blockchain. He has supervised dozens of graduate students, serves as an IFIP TC2 representative, is a member of ACM and SPIE, and has a diversity of publications and research grants, which include cybersecurity, software correctness and algorithmics, but also AI applied to long-COVID treatment, wine science, and astrophysics/cosmology modeling using quantum computing. Various companies' software projects have failed spectacularly, making his co-authored book on *Correctness-by-Construction* very topical. In his spare time, Watson collects and enjoys wine, and flies planes.

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Keynote Lecture

Advanced Methods of Hacking People

Anže Mihelič

Faculty of Criminal Justice and Security (FVV), Slovenia

Keynote Overview:

Hacking people is easier than hacking machines. Even though every human being has personality traits that make them unique and individual, people have common cognitive biases making them vulnerable to social engineering attacks. This lecture will discuss the principles and latest advances in techniques and methods in social engineering. The discussed topics will be illustrated with real-world cases and practical presentations of supportive activities of criminal acts in cyberspace. Hence, based on advances in the literature, attendees will be familiarized with the latest methods used by criminals and the most efficient approaches for mitigating and withstanding such attacks in organizational settings.

About the Keynote Presenter:

Anže Mihelič obtained his Master's degree in security studies at the Faculty of criminal justice and security, University of Maribor. He is a Ph.D. candidate at the Faculty of law and Faculty of computer and information science, both at the University of Ljubljana. He is employed as a teaching assistant at the Faculty of Criminal Justice and Security and as a research assistant at the FernUniversität in Hagen. He received Faculty and Rector's awards for study and research achievements (given by the University of Maribor) for his research work. Before pursuing an academic career, he was the owner and co-owner of two online-technology businesses. He authored and co-authored in more than 25 conference and journal papers in his academic career and chaired an organizing committee at the Central European Cybersecurity Conference (München, Germany). His primary research interests are human aspects of information- and cyber-security, privacy law, adoption of new technologies, and secure software development methodologies.

International Institute for Applied Knowledge Management

KM Conference 2022

29 June – 2 July 2022,

University of Maribor, Faculty of Criminal Justice and Security (FVV), Ljubljana, Slovenia

Themes: Knowledge Management, Cybersecurity, Learning, and Information Technology

http://www.iiakm.org/conference/

Conference Workshop

Knowledge Market and Collaborative Work

Dr. Celina Sołek-Borowska[1] and Dr. Christiaan Maasdorp[2]

[1]Assistant Professor, SGH Warsaw School of Economics, Poland

[2]Lecturer, Department of Information Science, Stellenbosch University, South Africa

Workshop Overview:

The workshop focuses on collaborative work, interdependent knowledge, and the knowledge intensity of products. The workshop simulates a knowledge economy with groups of participants acting as firms cooperating and competing. During the workshop, group members will need to coordinate and collaborate to produce products with significant knowledge components. Each group of participants receives startup capital and the workshop facilitators act as brokers for the market. The facilitators will signal what products are in demand and regulate the price of the materials needed for construction. The groups need to buy parts and apply their skills to produce the artefacts to sell back to the brokers. The winning firm is determined by overall profits at close of trading. Since trading hours are limited, groups need to decide on a strategy given the skills distribution in the group. Success will require an effective division of labor for interdependent group knowledge. Afterwards, reflection is invited about knowledge-intensive strategies and difficulties regarding teamwork and valuation.

About the Workshop Facilitators:

Celina Sołek-Borowska is an Assistant Professor at the SGH Warsaw School of Economics, in Warsaw, Poland, where she teaches: Knowledge Management, Organizational Behavior and Team building classes. She serves as a trainer for businesses, as an academic advisor in business projects, and runs a team building workshop in the CEMS program (elite program at SGH). She has taught in the Erasmus program for the University of Gran Canaria (Spain), the University of Hertfordshire (UK), and the University of Alicante (Spain). Her research interest are amongst: knowledge sharing and knowledge creation, team building and strategic alliance between Universities and businesses.

Christiaan Maasdorp is a lecturer in the Department of Information Science at Stellenbosch University in South Africa and director of the postgraduate programs in Information and Knowledge Management. He teaches Knowledge Management and Organization Theory courses at both undergraduate and postgraduate levels. He supervised more than 50 full research Masters theses on Management and Organization and Knowledge Management topics.

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Implementation of privacy by design model on eHealth information system

Matjaž Drev, National Institute of Public Health, Slovenia, matjaz.drev@nijz.si

Dalibor Stanimirović, Faculty of Public Administration, University of Ljubljana, Slovenia, dalibor.stanimirovic@fu.uni-lj.si

Boštjan Delak, Faculty of Information Studies, Slovenia, bostjan.delak@fis.unm.si

Abstract

This research in progress presents the process and results of the implementation of a conceptual model of privacy by design. The model itself was established on building blocks derived from a comparative analysis of approaches to privacy by design by different authors. The model was then implemented in the data processing operations of Slovenia's central health information system (eHealth). The main goal was to ensure personal data processing compliance with General Data Protection Regulation (GDPR) and privacy by design criteria set by the model. Additionally, findings were used to answer key research questions: is the proposed conceptual model general enough to be used in most personal data processing operations, regardless of context; does the successful implementation of conceptual model requirements in personal data processing operations lead to compliance with the requirements of the GDPR and with the additional requirements of privacy by design, and is the efficiency of achieving compliance of personal data processing higher when the conceptual model is used in comparison to other approaches. Current results show that the model is robust enough to be used on a complex system of personal data processing. It also enables a relatively quick assessment of the gap between the actual and target situation, while suggesting which measures should be taken to achieve compliance. However, in the future, the model will have to be tested in several organizations and different contexts of personal data processing, as only a comparative meta-analysis will provide reliable answers to the questions posed.

Keywords: Privacy by design, conceptual model, personal data, information system, eHealth.

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Assessing SMEs' cybersecurity organizational readiness: Findings from an Italian survey

Martina Neri, University of Pisa, Italy, martina.neri@phd.unipi.it

Federico Niccolini, University of Pisa, Italy, federico.niccolini@unipi.it

Rosario Pugliese, University of Florence, Italy, rosario.pugliese@unifi.it

Abstract

The Small and Medium-sized Enterprises' (SMEs) level of organizational cybersecurity readiness has been poorly investigated to date. Currently, all SMEs need to maintain an adequate level of cybersecurity to run their businesses, not only those wishing to fully exploit digitalization's benefits. Unfortunately, due to their lack of resources, skills, and their low level of cyber awareness, SMEs often seem unprepared. It is important that they address the digital threats that they face by using technology and complementary (and not alternative) factors, such as guidelines, formal policies, and training. All these elements trigger development processes regarding skills, awareness, the organizational cybersecurity culture, and the organizational resilience. This paper describes Italy's first multidisciplinary attempt to assess its SMEs' overall cybersecurity readiness level. The authors used a survey as its initial quantitative assessment approach, although SMEs can also use it as a cyber self-assessment tool, which prepares them better to navigate the digital ecosystem. Thereafter, the authors held semi-structured interviews to explore the critical points that had emerged from the study's first phase. The overall results show that SMEs have not as yet achieved high levels of organizational readiness have. SMEs are currently starting to set the stage for their organizational cyber readiness and will therefore take many more proactive steps to address their cyber issues.

Keywords: Cybersecurity, Small and Medium Enterprises (SMEs), cybersecurity organizational readiness.

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Pilot testing of experimental procedures to measure user's judgment errors in simulated social engineering attacks

Tommy Pollock, Nova Southeastern University, Florida, USA, tp809@mynsu.nova.edu

Yair Levy, Nova Southeastern University, Florida, USA, levyy@nova.edu

Wei Li, Nova Southeastern University, Florida, USA, lwei@nova.edu

Ajoy Kumar, Nova Southeastern University, Florida, USA, akumar@nova.edu

Abstract

Distracted users appear to have difficulties correctly distinguishing between legitimate and malicious e-mails or search engine results. Additionally, mobile phone users appear to have a more challenging time identifying malicious content due to the smaller screen size and the limited security features in mobile phone applications. Thus, the main goal of this research study was to conduct a pilot test and validate a set of field experiments based on Subject Matter Experts (SMEs) feedback to assess user's judgment when exposed to two types of simulated social engineering attacks: phishing and Potentially Malicious Search Engine Results (PMSER), based on the interaction of the environment (distracting vs. non-distracting) and type of device used (mobile vs. computer). This paper provides the results from the pilot test we conducted using recruited volunteers consisting of 10 participants out of 20 volunteers invited. Due to COVID 19 restrictions, all interactions in this pilot testing were conducted remotely. These restrictions somewhat limited our ability to control the testing environment to ensure a completely non-distractive environment during these parts of the study; however, a significant attempt was made to ensure such a non-distractive environment was genuinely adhered to during that part of the study. Our initial pilot testing results indicate that the results found were counterintuitive for the Phishing IQ tests. In contrast, results of the PMSER were intuitive with improved detection on a computer compared to mobile. We conclude the paper with a discussion on the study limitations and further research.

Keywords: Social engineering, cybersecurity, judgment error in cybersecurity, phishing e-mail mitigation, distracting environments.

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Handling of "unknown unknowns" - classification of 3D geometries from CAD open set datasets using Convolutional Neural Networks

Georg Schmidt, LIVINGSOLIDS GmbH, Germany, georg.schmidt@livingsolids.de

Stefan Stüring, LIVINGSOLIDS GmbH, Germany, stefan.stuering@livingsolids.de

Norman Richnow, LIVINGSOLIDS GmbH, Germany, richnow@livingsolids.de

Ingo Siegert, Institute for Information Technology and Communications, Otto von Guericke University Magdeburg, Germany, ingo.siegert@ovgu.de

Abstract

The paper refers to the application of Convolutional Neural Networks (CNNs) for the classification of 3D geometries from Computer-Aided Design (CAD) datasets with a large proportion of "unknown unknowns" (classes unknown after training). The motivation of the work is the automatic recognition of standard parts in the huge CAD-based image data set and thus a reduction of time required for the manual preparation of the data set. The classification is based on a threshold value of the Softmax output layer (first criterion), as well as on three different methods of a second criterion. The three methods for the second criterion are the comparison of metadata relating to the geometries, the comparison of feature vectors from previous dense layers of the CNN with a Spearman correlation, and the distance-based difference between multivariate Gaussian models of these feature vectors using Kullback-Leibler divergence. It is confirmed that all three methods are suitable to solve an open set problem in large 3D datasets (more than 1000 different geometries). Classification and training are image-based using different multi-view representations of the geometries.

Keywords: Open set problem, unknown unknowns, Convolutional Neural Networks, 3D geometries, metadata, spearman correlation, Kulback-Leibler divergence.

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Applying machine learning and text analysis to identify factors that may predict hypertensive heart disease patient outcomes in home healthcare

David Patrishkoff, Nova Southeastern University, Florida, USA, dpatrish@nova.edu

Stephen E. Bronsburg, Nova Southeastern University, Florida, USA, bronsbur@nova.edu

Mariah Ali, Nova Southeastern University, Florida, USA, ali.mariah19@gmail.com

Abstract

This research focuses on predicting the patient discharge disposition with initial patient assessment and therapy data as well as determining which therapy intervention text had positive impacts on hypertension heart disease patients in home healthcare environments. Older adults prefer to stay in their home, which is known as aging in place. Home healthcare is the last line of defense before advancing to other expensive healthcare options. This research used aggregate transactional data from 2,181 home healthcare patients in the United States from 2016-2022. We used the Centers for Disease Control (CDC) Patient Driven Groupings Model and focused on the cardiac circulatory patient's subcategory of hypertensive heart disease. Data was analyzed from Activity of Daily Life (ADL) assessment scores, the number of disease diagnosis codes per patient, the number of additional cardiac comorbidities, gender, age, standardized hospitalization risks, number of medications per patient, number of interventions per patient, and the length of stay in home healthcare. Machine learning and advanced text analysis were applied to determine which factors and therapy intervention text had the biggest impact on hypertensive heart disease patient outcomes. This research also identified those interventions with the best Signal to Noise (SN) ratios that are currently being piloted in home healthcare settings.

Keywords: Hypertensive heart disease, activities of daily living, therapy interventions, machine learning, text analysis.

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Towards the quantification of cybersecurity footprint for SMBs using the CMMC 2.0

Yair Levy, Nova Southeastern University, Florida, USA, levyy@nova.edu

Ruti Gafni, The Academic College of Tel Aviv Yaffo, Israel, rutigafn@mta.ac.il

Abstract

Organizations, small and big, are faced with major cybersecurity challenges over the past several decades, as the proliferation of information systems and mobile devices expand. While larger organizations invest significant efforts in developing approaches to deal with cybersecurity incidents, Small and Medium Businesses (SMBs) are still struggling with ways to both keep their businesses alive and secure their systems to the best of their abilities. When it comes to critical systems, such as defense industries, the interconnectivities of organizations in the supply-chain have demonstrated to be problematic given the depth required to provide a high-level cybersecurity posture. The United States (US) Department of Defense (DoD) with the partnership of the Defense Industry Base (DIB) have developed the Cybersecurity Maturity Model Certification (CMMC) in 2020 with a third-party mandate for Level 1 certification. Following an outcry from many DIB organizations, a newly revised CMMC 2.0 was introduced in late 2021 where Level 1 (Fundamental) was adjusted for annual self-assessment. CMMC 2.0 provides the 17 practices that organizations should self-assess. While these 17 practices provide initial elements of assessment, the specific level of implementation and how it impacts their overall cybersecurity posture is vague. Specifically, many of these practices use non-quantifiable terms such as "limit", "verify", "control", "identify", etc. The focus of this work is to provide SMBs with a quantifiable method to self-assess their Cybersecurity Footprint following the CMMC 2.0 Level 1 practices. This paper outlines the foundational literature work conducted in support of the proposed quantification approach of Cybersecurity Footprint for SMBs using the CMMC 2.0.

Keywords: Cybersecurity of SMBs, CMMC, Cybersecurity Footprint, cybersecurity self-assessment.

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Pilot analysis of ECGs data accuracy captured with at-home device by qualified healthcare professionals compared to patients

Michelle M. Ramim, Dr. Kiran C. Patel College of Osteopathic Medicine, Nova Southeastern University, Florida, USA, ramim@nova.edu

Janavi Patel, Dr. Kiran C. Patel College of Osteopathic Medicine, Nova Southeastern University, Florida, USA, jp3373@mynsu.nova.edu

Colin Pulickathadam, Dr. Kiran C. Patel College of Osteopathic Medicine, Nova Southeastern University, Florida, USA, cp1949@mynsu.nova.edu

Michael Shen, Duxlink Health, Florida, USA, mshen@duxlinkhealth.com

Rohit Vinod, Duxlink Health, Florida, USA, rvinod@duxlinkhealth.com

Abstract

Cardiovascular Diseases (CVDs) are a leading cause of death worldwide. General at-home care has been shown to improve patient outcomes, decrease hospital admissions, and prevent fatal arrhythmias. The purpose of this research-in-progress is to frame the use of at-home electrocardiograms (ECG) and the ECG readability across three groups. Preliminary results comparing at-home ECG readability measured by patients and their caregivers with those provided by healthcare staff caring for patients living in assisted living and nursing home facilities, as well as a control group represented by ECG readability taken by qualified healthcare professional during routine office visits. This research study will also evaluate pilot data for the accuracy level in ECG data using a 12-lead internal and three external leads. With the growth of modern healthcare technology, it is now possible for patients to be more proactive in monitoring their CVD by conducting at-home ECGs with real-time feedback from their cardiologist to identify any abnormalities. At-home medical-grade ECGs can lead to early identification of heart arrythmias and decreased hospitalization frequencies. Results from this study will support the need for effective coaching and training of patients and their caregivers in using at-home ECG.

Keywords: Knowledge sharing, at-home medical device, accuracy of at- home ECG device, improved patient care with wearable device.

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Is celebrity endorsement effective? Building customer social media brand engagement through associative network memory model

Joanna Krywalski Santiago, Universidade de Lisboa, ISEG – Lisbon School of Economics and Management, ADVANCE, Portugal, joannas@iseg.ulisboa.pt

Maria Francisca Cunha, Universidade de Lisboa, ISEG – Lisbon School of Economics and Management, ADVANCE, Portugal, kikafrcunha@hotmail.com

Abstract

This research aims to assess the impact of celebrity endorsement and brand credibility on consumer social media engagement and purchase intention of the endorsed brand in the light of associative network memory model. The particular focus of this study is on customer brand social media engagement, related to the consumer's consumption, contribution and creation of social media content related to the brand. The empirical part of this investigation is based on a quantitative study supported by an online questionnaire that counted with the participation of 441 respondents. To test the proposed hypothesis, we applied Partial Last Squares method of Structural Equation Modelling (PLS-SEM). The bootstrapping results indicated a strong positive relation between brand credibility and both customer engagement and purchase intention. The relationships between endorser credibility and both customer engagement and purchase intention were not supported, but we prove the endorser credibility influence on brand credibility. Accordingly, although celebrity endorsement is considered an effective strategy to promote brands, this study indicates the major importance of brand credibility (related to the brand expertise and trustworthiness) as it comes to creating customer engagement and purchase intention.

Keywords: Celebrity endorsement, endorser credibility, brand credibility, customer social media brand engagement, purchase intention.

International Institute for Applied Knowledge Management

Refereed Paper Proceedings - KM Conference 2022 – Ljubljana, Slovenia

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The business side of social signals and nonverbal communication

[Industry Paper]

Vered Silber-Varod, The Open University of Israel, Israel, vereds@openu.ac.il

Alessandro Vinciarelli, University of Glasgow, UK, Alessandro.Vinciarelli@glasgow.ac.uk

Baruchi Har-Lev, Substrata.me, Israel, baruchi@substrata.me

Abstract

In this industry-oriented paper, we highlight the interest business-to-business (B2B) companies reveal in social signals and nonverbal communication. We begin by describing the key social signals that top dealmakers or business leaders display consistently. This issue, although non-technological in nature, seems to attract B2B companies who wish to build technological scaffolds for the aid of salespersons. The core question we try to observe is if we can leverage nonverbal cues to persuade and to become more influential in business, and how systems that collect these subtle cues of human behavior help us but not invades our personal zones. We also show the connection between leadership and nonverbal communication and the contribution of such systems to other markets as well.

Keywords: Social signals, nonverbal communication, interpersonal, interaction, computer-mediated communication, B2B.

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Refereed Paper Proceedings - KM Conference 2022 – Ljubljana, Slovenia

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Cyberslacking in the academia: An examination of student's experience in an online classroom

[Research-in-Progress]

Eliel Melón, University of Puerto Rico, Puerto Rico, eliel.melon@upr.edu

Wilnelia Hernández, Independent Researcher, Puerto Rico, wiheca@hotmail.com

Abstract

The impact of the COVID-19 pandemic on the world affected several aspects of our daily life and change the way we live. Universities, schools, and all academic environments were not an exception. With those changes, students encountered different types of challenges for their academic success. Virtual environment represents a non-classroom setting that could result in a distraction for individuals during the period that they are in classes. Cyberslacking in the classroom is defined as the time that students spend doing personal activities on the Internet that are not related to class activities, like browsing social media, playing online video games, and sending SMS messages. It is possible that this kind of behavior has increased because since 2020, face-to-face students are taking classes from their homes, specifically those who were not using a virtual environment before. The visual supervising duty of the professor is limited in a virtual environment. This limitation occurred when professor has no visual contact with the students, there is no control when students access Internet during the class and the interaction between students and the professor are limited. This study will examine the cyberslacking behavior of these students and their academic success. Also, this study will compare the academic success differences between those that admit their cyberslacking behavior versus those that were not doing it. This study will use an anonymous survey as a methodology that includes cyberslacking activities and their academic success during that academic year. The study will contribute to the expansion of the cyberslacking knowledge base in academic. This knowledge should help to improve the learning process with the integration of intentional strategies that minimize cyberslacking behavior in the virtual environment.

Keywords: Cyberslacking, pandemic, behavior, virtual environment, COVID-19.

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An assessment of small to medium-sized enterprises' security posture and preparedness to respond to a cybersecurity attack

Stephen Mujeye, Illinois State University, Illinois, USA, smujey1@ilstu.edu

[Research-in-Progress]

Abstract

Small to Medium-Sized Enterprises (SMEs) play an integral role in developed countries like the United States. SMEs significantly contribute to the overall Gross Domestic Product (GDP). The number of cybersecurity attacks has been on the rise for a while. SMEs', unfortunately, have historically not been able to effectively respond to cybersecurity attacks like Fortune 500 companies and are losing revenue because of the negative consequences. SMEs have limited resources and insufficient training to thwart cybersecurity attacks. Nearly half of all cybersecurity attacks target SMEs. Therefore, this study seeks to assess SMEs' security posture and preparedness to respond to a cybersecurity attack before and after a security awareness training. A purposive sample of SMEs in central Illinois will be identified for this study. A pretest survey will be administered to individuals responsible for managing information technology at the identified SMEs. The survey questions were selected from the five functions of identity, protect, detect, respond, and recover in the NIST's Cybersecurity Framework. That will be followed by cybersecurity training. Raising awareness through training has proved to be helpful in changing behavior. Evidence-based cybersecurity training will be offered to personnel responsible for managing information technology operations at the SMEs. The training modules will also cover the same functions in the Cybersecurity Framework. A posttest survey will be administered after the training. The data will be analyzed using the multivariate analysis of variance. In this work-in-progress study, we seek to reveal if differences exist in the SMEs' ability to identify risks on assets, protect critical infrastructure, detect cybersecurity events, respond to detected cybersecurity events, and recover impaired services before and after the training. The results will help recommend the benefits of assessing an organization's security posture and training effects.

Keywords: Cybersecurity, SMEs, security training, cyber-attacks, data breaches.

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Human-machine collaboration in selecting features affecting 30-day mortality prediction of chronically ill patients

[Research-in-Progress]

Ofir Ben-Assuli, Ono Academic College, Israel, ofir.benassuli@gmail.com

Tsipi Heart, Ono Academic College, Israel, tsipi.h@ono.ac.il

Nan Yin, Carnegie Mellon University, Pittsburgh, USA, nanelmayin97@gmail.com

Robert Klempfner, Sheba Medical Center, Israel, Robert.Klempfner@sheba.health.gov.il

Rema Padman, Carnegie Mellon University, Pittsburgh, USA, rpadman@cmu.edu

Extended Abstract

Considerable obstacles exist for efficient and effective use of multi-dimensional, multi-sourced healthcare data for predictive analytics and risk assessment, particularly for practical decision support at the point of care. The objective of this research in progress (RIP) is to postulate and demonstrate the process of a collaboration between the computer and human experts in selecting features that best predict early mortality of patients with chronic diseases. We evaluate a two-stage process of human-machine collaborative loop, aimed at selecting optimal feature sets to predict likelihood of 30-day mortality of patients, using data on more than 10,000 Congestive Heart Failure (CHF) patients hospitalized during the years 2010-2017. CHF is a clinical syndrome characterized by comorbidities and adverse clinical events such as early mortality. Risk forecast to classify patients most likely to die shortly post discharge is vital to increase the quality of care. Health analytics and knowledge management affect medical decision-making effectiveness.

Our analytic process, using XGBoost as the classification algorithm, achieved Area under the ROC Curve (AUC) of 0.84 for the expert feature selection, 0.875 for the machine learning merged feature selection variable list and 0.89 for the collaborative list of both human expert and machine learning lists. These results outperform those of other risk classification tools such as ADHERE (Acute Decompensated Heart Failure Registry), with AUC 0.77, and the EFFECT (Feedback for Effective Cardiac Treatment) with AUC 0.81. Moreover, the Collaborative model performed significantly better than other human-only selected models. This study contributes to the call for process innovation by demonstrating four different machine-learning algorithms for feature selection and the performance of a merged list. It also suggests that a collaborative feature set that includes features selected by both experts and machine better predicts 30-day mortality of CHF patients.

Keywords: Human expert-machine collaboration, Congestive heart failure, Machine learning.

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UBI-NAO: A ubiquitous avatar tutoring on Talent Development Capability Model (TDC)

[Research-in-Progress]

Dan Kohen-Vacs, Holon Institute of Technology (HIT), Israel, mrkohen@hit.ac.il

Gila Kurtz, Holon Institute of Technology (HIT), Israel, gilaku@hit.ac.il

Aya Levy, Holon Institute of Technology (HIT), Israel, aya.levy274@gmail.com

Maxim Lantsman, Holon Institute of Technology (HIT), Israel, lantsmaxim@gmail.com

Extended Abstract

The metaverse represents the upcoming leap for the manner in which people experience the internet as they leisure, work, and learn. In recent years, researchers and practitioners increasingly consider learning and training processes exercised in the metaverse that is scaffolded by virtual avatars. There, the use of virtual avatars could enhance such processes and convert them to be appealing, immersive, customizable, and capable to encompass educational pathways practiced in the metaverse. In this study, we focus on the design and development of a training experience enhanced by UBI-NAO: a virtual avatar used for tutoring purposes in topics related to the ATD Talent Development Capability Model (https://capability.td.org/#/) that is available anywhere and anytime (see the clip here). The training experience was video recorded in two different and parallel channels focusing on the tangible environment as well on the virtual scene. The recording and following interviews conducted with 10 participants who evaluated the effectiveness of the mentioned experience. The results were very encouraging as participants point out the feasibility of UBI-NAO to serve as a virtual tutor capable to offer a groundbreaking training approach that could be exercised across contexts and settings of the practice in any organizational environment. This effort is the 3rd in a series of research projects initiated with tangible and humanoid robots used for learning and training purposes (Kurtz & Kohen-Vacs, 2020; 2021). In the current phase, we aim to examine advantages and concerns related to education enhanced by virtual avatars that are practiced in the metaverse. Furthermore, we aim to an innovative approach for training, providing practitioners with opportunities to alleviate challenges related to remote learning in light of emergent conditions and social distancing as imposed in times of COVID-19.

Keywords: Avatar, metaverse, learning and training, Talent Development Capability Model

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International Institute for Applied Knowledge Management

Refereed Extended Abstract Proceedings - KM Conference 2022 – Ljubljana, Slovenia

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How crosschecking self-report and actual behavior analyses can expand educational technology researchers' toolkit

[Complete Research]

Eyal Rabin, The Open University of Israel, Israel, eyal.rabin@gmail.com

Ina Blau, The Open University of Israel, Israel, ina.blau@gmail.com

Extended Abstract

Education research draws on multiple methods to answer key research questions. However, most of the research conducted in the Educational Technology (ET) field uses a single methodological approach. A study that examined research method trends in the ET field found that quantitative studies (36%) were most prevalent, followed by qualitative (27%), other (22%), and only 14% of the studies used mixed models. We claim that it is difficult to conduct a comprehensive exploration of a phenomenon by using a single research method. Moreover, this paper calls researchers of digital learning and training to combine self-reporting with behavioral data collection. For instance, analyzing digital behavioral data enables researchers to examine entire populations rather than a single sample. The research can be carried out without the limitations of the authenticity of data, selection bias, or response bias. However, used alone, behavioral data cannot provide information about the psycho-pedagogical dispositions of learners, such as their initial motivations and intentions and their attitudes towards the learning processes and outcomes. Thus, self-report tools (quantitative - such as questionnaires or qualitative – such as interviews, focus groups, observations, or content analysis) can provide supplementary information and triangulate behavior data. Quantitative studies can combine learning analytics methods with self-report questionnaires (e.g. Rabin et al., 2019); qualitative studies can combine interviews with participants with analysis of online learning activities (e.g. Shamir-Inbal & Blau, 2021); and mixed-method studies can crosscheck self-report and behavior data, while also combining different research paradigms. The advantages and disadvantages of each method will be discussed. We argue that the triangulation of methods is the most prominent way to benefit from both worlds and to explore more comprehensively, and in depth, digital learning and training.

Keywords: Educational technology, research method, crosschecking, self-report data, actual behavior data.

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What is the difference between peer assessment and an "objective" external assessment in an academic course?

[Complete Research]

Tamar Shamir-Inbal, The Open University of Israel, Israel, tamaris@openu.ac.il

Orli Weiser, Ben-Gurion University, Israel, orli.weiser@gmail.com

Ina Blau, The Open University of Israel, Israel, inabl@openu.ac.il

Extended Abstract

Peer assessment is a method in which learners evaluate the work of their peers according to a set of criteria relating to scope, level, quality, value, and success. These criteria are determined in advance by the teacher or together with the learners and specify the different levels of performance. Peer assessment has been documented as raising students' motivation, advancing their learning processes, and increasing student engagement. Moreover, peer assessment leads to a meaningful learning process that helps students develop self-regulated learning skills (Blau & Shamir-Inbal, 2017). By assessing their peers' outcomes, students may improve their understanding of the course material, as well as their metacognitive skills. Despite many pedagogical benefits, the peer assessment method is not being used enough. A major challenge in peer assessment is the concern among educators that such assessment may not be objective (Chien, et al., 2020). This mixed-method study was conducted among 168 students in an online education graduate level course. Over five years we examined how students used peer feedback to their course performance in a task of designing digital book. Two research methods were used: 1) a quantitative comparison of students' assessment results with those of an external evaluator – a specialist in learning technologies, and 2) a qualitative bottom-up coding of student reflections. The online assessment performed by students and by the external evaluator used the same rubrics. In general, peers' assessment was as accurate as the external assessment. However, for statements based on objective parameters of the artifacts, the assessment of the students was higher than that of the external evaluator. In contrast, for statements based on subjective parameters, the assessment of the students was lower than one of the external evaluator. In the reflections students detailed the contribution of the peer feedback and how they improved the artifacts based on their peers' recommendations. The results may enhance students' assessment skills, reduce teacher workload, and contribute to the integration of an optimal peer-assessment process in learning in general and in academic learning in particular.

Keywords: Peer assessment, reflection, digital book, performance task.

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Inter-organizational knowledge sharing at SMEs: Differences between patent holders and non-holders

[Complete Research]

Carla Curado, ADVANCE/CSG, ISEG – Universidade de Lisboa, Portugal, ccurado@iseg.ulisboa.pt

Tiago Gonçalves, ADVANCE/CSG, ISEG – Universidade de Lisboa, Portugal, tiago.goncalves@aln.iseg.ulisboa.pt

Mírian Oliveira, Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, Brazil; ADVANCE/CSG, ISEG – Universidade de Lisboa, Portugal, miriano@pucrs.br

Extended Abstract

This paper expands our understanding on inter-organizational knowledge sharing at certified Small and Medium Enterprises (SMEs). Particularly, addressing collaboration-oriented human resource management system and information technology support as antecedents of the phenomenon. We used a mixed methods approach to achieve our goals. We developed a quantitative approach to data to test hypotheses focused on the impact of collaboration-oriented human resource management system and information technology support as antecedents of the phenomenon. We run a hypotheses testing using a Partial Least Squares (PLS) method to confirm the proposed contribution of the antecedents to inter-organizational knowledge sharing. Then, we run a configurational analysis using fuzzy-set qualitative comparative analysis (fsQCA) to explore the complex interplay of both antecedents and SME size contributing to inter-organizational knowledge sharing between patent holder and non-holder SMEs. Our data comes from a survey to 226 Portuguese exporting manufacturing SMEs, certified on the use of standards of operation (ISO or related to the International Certification Network). Quantitative results support the hypotheses regarding the antecedents' contributions to inter-organizational knowledge sharing among certified SMEs when considering all SMEs in the sample. Qualitative findings show that patent holders share knowledge among them as a result of a set of combinations of circumstances that are different from non-holders. Additionally, firm size influences sub samples in opposite ways, when addressing patent holders SMEs vs non-holders, contributing to the argument that the two type of SMEs present different internal rationales. Qualitative results also show the importance of collaboration-oriented human resource management systems and information technology support to both the presence and absence of inter-organizational knowledge sharing. Both antecedents contribute (either alone or combined) in all configurations leading to the presence and absence of inter-organizational knowledge sharing. Consequently, the complex interplay leads to different patterns for not sharing knowledge between firms when comparing certified SMEs patent holders against non-holders. This study delivers implications for managerial practices regarding inter-organizational knowledge sharing in both patent holder and non-patent holder certified SMEs.

Keywords: Inter-organizational knowledge sharing; Collaboration-oriented human resource management system; Information technology support; SME; Patent, Mixed methods.

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Analyzing software languages and libraries life cycle

[Research-in-Progress]

Benny Bornfeld, Ruppin Academic Center, Israel, bennyb@ruppin.ac.il

Extended Abstract

The software development domain is constantly changing. New software paradigms, frameworks, languages and libraries emerge, often replacing previous ones which fade and eventually disappear. A typical life cycle of a new software library or framework is the following: it is "born" in one of the world's high-tech centers located companies (e.g. Facebook, Silicon Valley), gradually spreads and adopted by other companies around the globe, integrated into different software packages, and eventually declines due to the rise of a newer, popular alternative, and can be found mainly in support centers, in charge of maintaining legacy software.

Understanding and measuring the dynamics of this process, the temporal and geographical diffusion and decline, may provide insights to academic models such as Roger's Diffusion of Innovation. Understanding and measuring this process may also be instrumental for the software industry and teaching establishments, assisting in the decision to prefer a specific software technology over its alternative.

This study aims to find the common patterns that govern the dynamics of software diffusion and decline and identify related characteristics that affect these patterns.

The main data source of this project is Stack Overflow (SO) Q&A site. SO questions, answers, views and votes can serve as a proxy to the popularity and usage of software artifacts. SO data holds topical, temporal and geographical information that can be harvested for this study's goals. Within the scope of this study, we're developing software that allows temporal and geographical analysis of different software artifacts.

Keywords: Software, life cycle, stack overflow, dynamics, diffusion, international.

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The nature of knowledge in knowledge risk modelling

[Research-in-Progress]

Boštjan Delak, Faculty of Information Studies, Slovenia, bostjan.delak@fis.unm.si

Christiaan Maasdorp, Department of Information Science, Stellenbosch University, South Africa, chm2@sun.ac.za

Extended Abstract

Durst and Zieba (2019) offered the best developed model of knowledge risks faced by organizations derived from a systematic review of prior research. The model maps knowledge risks as human-, technological-, and operational risks and whilst useful, such an approach prioritizes the risk component over the knowledge component. For this reason, we add to the model's current contextual perspective by also considering knowledge risks from an epistemological perspective.

The advantage of our approach is that it brings the knowledge component of the risk into sharper focus and makes differences in risk severity and likelihood more visible. Instead of just asking in which domain the risk is to be found, we try to show the nature of the knowledge component of each risk by considering it in terms of (1) Carlile's (2004) three levels of syntactic, semantic, and pragmatic knowledge boundaries, and (2) what knowledge processes are affected, for instance, knowledge-creation, -codification, -sharing, or -integration (Newell et al., 2009). We maintain these considerations are useful for the identification of the contextual aspects of the risk that represent the likely leverage points for risk mitigation.

Our preliminary results show that most of the risks are at the syntactic level and concerns knowledge content problems. Furthermore, over half of the risks map to knowledge sharing and over two-thirds map to knowledge integration problems. We conclude that considering the semantic and pragmatic levels and the processes of creation and codification are ways to make the knowledge risk mapping more comprehensive.

Keywords: Knowledge management, knowledge risk assessment, risk management.

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A methodology for creating user-generated educational materials via crowdsourced resource gathering

[Research-in-Progress]

Rina Zviel Girshin, Ruppin Academic Center, Israel, rinazg@ruppin.ac.il

Julia Ostanina-Olszewska, Pedagogical University of Krakow, Poland, julia.ostanina-olszewska@up.krakow.pl

Extended Abstract

The use of crowdsourcing for creating educational resources, understood as the gathering of collective intelligence for pedagogically-related tasks, has been gaining increased attention over the past few years. Evolved internet technologies enable learners and educators to co-create learner materials which in effect should improve learning. Crowdsourcing has emerged as a vital aspect of education on the web, however, the scale of using crowdsourcing for creating user-generated educational materials is not researched enough.

In current study we present a developed comprehensive methodology, which is aimed to be used for the designing the crowdsourced resource gathering system for creation of custom-tailored user-generated content-controlled educational materials. Crowdsourcing in education is defined as a type of an (online) activity in which an educator or an educational organization proposes to a group of individuals via a flexible open call to directly help learning or teaching. However, there is the rub - this approach does not necessarily produce a content-controlled version of the materials. The proposed methodology which consists of three phases solves this problem by adding a content approval phase to the process. Thus, it includes three major stages of content development: 1) definition of the topic and subtopics; 2) content creation; and 3) content approval.

The approval process is a vital phase for this methodology, that distinguishes this procedure from other methodologies. Crowd-rating process happens twice, first for approval of sub-topics in phase 1, which allows for a custom-tailored content creation, and later in phase 3, which produces a controlled version of materials. In case of disagreement between crowd raters several solutions are provided: either by majority voting or by sending the whole item or a part of it to experts in the field.

The proposed methodology is currently under construction by a team of computer science experts and will later be tested by language students, involved in creating a specialized dictionary. We believe that this methodology, it's principles and phases could be applied to generating any kind of educational materials in various areas and disciplines. When applied in the right context and to the right crowd, crowdsourcing can deliver considerable benefits in terms of inputs and contribute to providing relevant content.

Keywords: Crowdsourcing, educational resources, crowd-creation, crowd-voting.

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An exploration of the HIPAA compliance for federal and state telehealth regulations before and during the COVID-19 pandemic

[Research-in-Progress]

Michelle M. Ramim, Dr. Kiran C. Patel College of Osteopathic Medicine, Nova Southeastern University, Florida, USA, ramim@nova.edu

Shonda Brown, Middle Georgia State University, Georgia, USA, shonda.brown@mga.edu

Abstract

Since March 2019, a nationwide public health emergency has arisen due to COVID -19. The existence and emergence of COVID-19 pandemic has required healthcare providers to consider expanding alternatives for in-person visits to reduce exposure and transmission of COVID -19. A 2021 report by the United States (U.S.) Department of Health and Human Services (HHS) indicated a 63-fold increase in telehealth utilization. Consequently, the accelerated adoption of telehealth technologies during the pandemic has been beneficial by removing barriers to maintain access to care, expanding care capacity in rural areas particularly for behavior health services. Most patients perceive telehealth as a viable modality for their care, with pediatric services and pharmacy retail as the leading modality. Physicians continue to favor telehealth services, some provide a discount rate to virtual care. The Health Resources and Services Administration (HRSA) of the U.S. HHS defined telehealth as the use of telecommunications and information systems to enable clinical health care services, patient and professional health-related education, as well as health administration and public health. Moreover, the use of telehealth for diagnosis, evaluation, and treatment also contributes to effective utilization of scarce medical supplies and health care capacity. Telehealth requires significant consideration to ensure the protection of Personally Identifiable Information (PII) and electronic Protected Health Information (ePHI). The Health Insurance Portability and Accountability Act of 1996 (HIPAA) requires the compliance with privacy, security, and breach notification rules, enforced by the Office for Civil Rights (OCR) at the U.S. Department of Health and Human Services (HHS). Prior to the public health emergency, both federal and state regulators vigorously regulated, while imposing penalties for telehealth HIPAA non-compliance. Since the pandemic, some penalties for violations appear to relax until HHS will declare the end of the pandemic. Thus, the aim of this work-in-progress study is to explore the following research questions:

RQ1: What are the differences in HIPAA compliance criterion for telehealth regulations prior to the COVID-19 pandemic compared to that during the COVID-19 pandemic?

RQ2: What is the estimated volume of non-compliance penalties prior to the COVID-19 pandemic compared to that during the COVID-19 pandemic?

Keywords: Telehealth, HIPPA compliance, COVID-19 pandemic, Office for Civil Rights non-compliance penalties.

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Effects of remote process control on communication and knowledge sharing in aqua farming

[Research-in-Progress]

Ove Taranger Nesbø, Nord University, Norway, ove.t.nesbo@nord.no

Extended Abstract

This study is intended to be the start of a major effort to identify and explain how Information and Communications Technology (ICT)-driven changes affect communication, knowledge management and decision-making in aquaculture firms. It is expected by industry strategists that remote autonomous feeding in a few years will be the industry standard driven by continuous digitalization, image detection, Machine Learning (ML) and Artificial Intelligence (AI). Media Richness Theory is a theoretical framework for describing a communication channels ability to transport information without loss or distortion. Through media channels with high impact of media richness, the communication actors may use vision, speech, and hearing in synchronous sequences. Demanding and ambiguous group tasks is more effectively solved when actors can give and receive feedback in real time and the communication channel allow social interaction. Lack of visual media channels is negative for collective decision-making processes. Knowledge transfer theory described the knowledge transfer as a process by which one entity is influenced by another, and where knowledge is stored and transmitted from one format to another format, using technologies, practices, routines, rules, procedures, or individual connections. Later research claimed that knowledge transfer is a form of distributed social competence, and that knowledge cannot be separated from its cultural context.

Research questions are: RQ1: What are the qualitative differences between local and centralized feeding functions in aquaculture companies, in terms of communication within the company? RQ2: How do remote process control system effect the communication and knowledge sharing between feeding operators as a group? RQ3: How do remote process control system effect the communication and knowledge sharing between the fish health manager and her colleagues?

This is a qualitative study comparing two organizations located in the same area. The organization of production vary is in two dimensions: (1) Local vs remote feeding control and (2) Different organizational setup, which follows from (1).

The data analyze shows how differences between local and remote control system have impact on internal communication and knowledge sharing. Not surprisingly one of the conclusions of this study is that the communication between the feeding operators and the fish farm technicians is richer and has higher frequency in the local organized firm. The most significant finding is that that centralization of the feeding and operation control, open new and rich communication channels within (A) feeding operators as a group, (B) between the technicians on site, and (C) feeding operators and the veterinarians. This creates new opportunities for sharing knowledge.

Keywords: Fish farming, feeding functions, ICT, knowledge management, communication.

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The fourth industrial revolution and learning analytics

[Research-in-Progress]

Amir Winer, The Open University of Israel, Israel, amirwi@openu.ac.il

Nitza Geri, The Open University of Israel, Israel, Nitzage@openu.ac.il

Extended Abstract

The emerging field of Learning Analytics (LA) in Higher Education Institutions (HEI) can be associated as a sub-domain of the Fourth Industrial Revolution (4IR) (Penprase, 2018). Currently, the 4IR is triggering a myriad of foundational disruptions in most industries. Information systems of the 4IR represent humans digitally, by their metadata identifiers and by collecting, categorizing, and analyzing their actions within digital environments as indicators for various purposes. Similarly, Virtual Learning Environments (VLE) serve as a platform to digitally represent students and faculty members. LA within VLEs create a new ecosystem for lecturers and other stakeholders (e.g., researchers, instructional designers, technology developers, administrators, and students) to navigate the complexities of teaching and learning in this new digital reality (Dimitriadis et al., 2021). Within the context of the 4IR, this conceptual research inquires three dimensions. The first dimension contrasts instructor's agency and student's autonomy with automation processes of learning machines. The second dimension focuses on the growing divide between personalization technologies and traditional community-based learning. The third dimension addresses the inherent tensions between research-driven LA and practitioner-driven adoption of LA within HEI from an organizational perspective. We suggest a performance-based analysis as a theoretical foundation for these challenges (Winer & Geri, 2019). Particularly, we would like to evaluate the potential benefits and risks of performance measurement for the numerous applications of LA as part of the broader impact of the 4IR on HEI.

Keywords: Learning analytics, fourth industrial revolution (4IR), higher education, performance measurement.

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Examining team dynamics for success in Littlefield simulation

[Research-in-Progress]

Julita Haber, Fordham University, USA, jhaber7@fordham.edu

Jeffrey Butkowski, Fordham University, USA, butkowski@fordham.edu

Jinhui Wu, Fordham University, USA, jiwu@fordham.edu

Alex Leisenring, Fordham University, USA, aleisenring@fordham.edu

Extended Abstract

The Littlefield online competitive simulation, with its queueing network and inventory management mechanisms, serves as an experiential pedagogical tool in the operations and supply chain course. Given the complexity and round-the-clock nature of Littlefield simulation, students are typically assigned to work in teams. While it is a hands-on exercise for students to apply the relevant knowledge in a real and dynamic setting, it also provides us a unique opportunity to study the impact of team dynamics on team performance. Google's research found that a set of social norms created within a team's habitual behavior is a core component of a team's success or failure. The goal of this study is to assess how team communication and decision-making process affect team performance and how team composition creates an impact on team dynamics. For H1 and H2, we hypothesized that teams' synchronous communication and perception of communication effectiveness significantly predict simulation outcome measured by the actual cash holding amount at the end of the simulation. For our pilot study, we administered a survey after a final Littlefield run to 26 full time MBAs at Fordham University in the Fall of 2021 as part of their Operations Management class. In the survey we collected students' teamwork approaches prior and during the simulation. We also delved into issues such as frequency of personal conflicts and the level of collaborative decision making. Using regression analysis in SPSS we found for H1 that teams' primary synchronous (vs asynchronous, i.e., text) modes of communication prior to the start of simulation predict higher performance (β=-.530, p<=.008). For H2, members' perceptions of communication effectiveness predicted success (β =.421, p<=.036). In addition, we also found that members who have worked with each other prior to the simulation experienced increased personal conflict (β =-.397, p<=.050) and decreased collaborative decision making (β =-.405, p<=.045). Perhaps, participants that have already gone through "storming and norming" team phases early on, possessed the psychological safety net to be more comfortable with personal conflict and dividing tasks among the teammates to minimize collaboration in stressful and time-constrained environment. The study not only empirically demonstrates how team dynamics affect team performance but also provides some valuable guidelines for students to successfully form and manage teams in simulation games. We will also share some preliminary findings from a follow up study with 60 students in the Spring 2022.

Keywords: Team dynamics, mode of communication, communication effectiveness, Littlefield simulation.

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The effect of active learning in online courses during COVID-19 on student satisfaction, using models based on teaching surveys

[Complete Research]

Dizza Beimel, Ruppin Academic Center, Israel, dizzab@ruppin.ac.il

Arava Tsoury, Ruppin Academic Center, Israel, aravat@ruppin.ac.il

Zohar Barnett-Itzhaki, Ruppin Academic Center, Israel, zoharba@ruppin.ac.il

Extended Abstract

The times of the COVID-19 pandemic brought with it far-reaching changes, among others, also in the higher education section. Lecturers were required to teach online and incorporate digital teaching tools to overcome the challenges of online learning. Researchers have investigated the implications of this period, especially those arising from online learning imposed by the pandemic, on various aspects, such as students' satisfaction. This study focuses on online active learning in which various interactive learning methods were used. We examined the effect of using such methods on the student's satisfaction. Particularly, we wish to explore the effect of using active learning methods in an online course on the student's course assessment (i.e., her satisfaction).

The data source for the study was teaching surveys, distributed during 2020-21 (Semesters fall and spring) among ~4,800 students, women and men, in various faculties, curricula, first and second degrees, and in different years. The surveys included several statements designed to elicit students' assessments and specific perceptions regarding various courses (e.g., deliver the course content clearly). The Analytical Strategy of the study included (a) descriptive and inferential statistics using nonparametric statistical methods such as Wilcoxon unpaired test and (b) multivariate linear regressions and prediction models.

The results show that assimilation of interactive learning methods increases the students' satisfaction: courses with high use of interactive learning methods, in particular, courses that included short knowledge tests during lessons, get higher scores. Moreover, such courses were reported as courses with higher effectiveness of online learning than courses with low or no use of interactive learning methods. Beyond analyzing the data, we have built models that enable the prediction of students' course satisfaction based on the use of interactive learning methods alongside class characteristics (i.e., class size, character and sector of students, etc.).

This study is of high relevance, in particular, due to the transition of the academic world to online learning. A major outcome of this study pinpoints that using various learning methods can contribute to the student experiences; The more the student experiences a greater variety of learning methods, the more satisfied she is with the teaching process. Also, our models can assist academic staff to improve their integration of active learning and digital tools in online courses and help them choose the desired teaching methods, given different course characteristics.

Keywords: Active learning, student engagement, student performance, student satisfaction.

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The role of social humanoid in motivating undergraduate students for healthy lifestyle

[Research-in-Progress]

Michelle M. Ramim, Dr. Kiran C. Patel College of Osteopathic Medicine, Nova Southeastern University, Florida, USA, ramim@nova.edu

Ioana Scripa, Dr. Kiran C. Patel College of Osteopathic Medicine, Nova Southeastern University, Florida, USA, iscripa@nova.edu

Ian Raynshteyn, Dr. Kiran C. Patel College of Osteopathic Medicine, Nova Southeastern University, Florida, USA, ir413@mynsu.nova.edu

Abstract

Throughout their freshman year, undergraduate students gain an average of 15 pounds. This phenomenon is known as the "Freshman 15". There are many confounding variables on weight gain amongst undergraduate students such as: high stress levels, lack of healthy dietary practices (i.e. healthy snacks, food portion), decrease exercise activity, and an overall lapse in awareness of Healthy Lifestyle (HL). This study showcases a proposed experiment to employ a revolutionary HL intervention using an Artificial Intelligence (AI) in the form of a social humanoid. Social humanoids are small human-like robots capable of exhibiting emotions such as relatable empathetic expressions. Studies investigating the effect of empathic expressions have shown to improve the caregiving experience of patients. In simulated empathy experiments AI was shown to recognize cues from human beings, interpret cause and effect relationships that trigger emotions, respond to situations similarly to human empathy expressions. The humanoid expressions can be displayed through voice, body movement, gestures, stare, and facial expressions. In this study, we utilize Pepper©, the social humanoid robot, to promote HL, and aide in creating awareness for HL practices amongst undergraduate students. Three scripts were developed and validates with Subject Matter Experts (SMEs) from the field of nutrition, coaching, communication, and Health Informatics. Subsequently, Pepper© were programmed to engage a group of 25 undergraduate students. A series of short surveys are utilized to assess a change is awareness about HL choices related to healthy dietary practices, exercise, activity, and stress reduction. The initial phase of this research focus on developing the three scripts and validating them with a team of SMEs. Subsequently, Pepper© was programmed with the scripts and engage with the students. Anticipated results from this research study will assess the outcome of HL awareness intervention using the humanoid. The aim of this study is to explore the following research questions:

RQ1: What is the empathy level that undergraduate students report in a social interaction with a programmed humanoid about HL awareness?

RQ2: What is the impact that a programmable humanoid has on undergraduate students' HL practices following a series of artificial empathetic interactions?

Keywords: Healthy lifestyle, freshman 15, artificial intelligence, social humanoid, artificial empathetic expressions.

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A preliminary study on voice-assisted interfaces in the German public administration

[Research-in-Progress]

Oliver Jokisch, Meissen Univ. of Publ. Administration (HSF), oliver.jokisch@hsf.sachsen.de

Kurt Brauner, Meissen Univ. of Public Administration (HSF), braunerkurt@icloud.com

Ingo Siegert, Mobile Dialog Systems, OvG University Magdeburg, ingo.siegert@ovgu.de

Extended Abstract

Voice-assisted interfaces are well established in everyday applications meanwhile, e.g. in search engines, navigation devices, and smart-home environments. The enterprises are recognizing the potential of speech technology as a customer-oriented instrument in multiple application domains, while considering legal hurdles, such as the sovereignty of personal data, anchored in the European General Data Protection Regulation (GDPR), and other issues. Some companies could demonstrate significant success by voice-assisted services already. Also in Germany, one can observe a trend to facilitate the use of appropriate voice assistants in near future.

Regarding the German public administration, a law to improve the online access to administrative services came into force in 2017 (Online Access Act, see Rackwitz et al., 2021), in which states and municipalities have been instructed to offer their relevant services digitally and to make them accessible online by the end of the year 2022 at the latest. Overall, the administrative services for citizens and companies shall become more attractive and efficient within the next few years. It is questionable, whether voice-assisted interfaces can effectively support the abovementioned legal requirements, and which challenges in typical administration scenarios might occur.

The focus of our preliminary study is on examining the application scenarios of voice assistants in administration, and on analyzing possible strengths, weaknesses, opportunities and threats (SWOT method). We practically test and evaluate a selected use case in administration, supplemented by a survey among administrative employees (Brauner, 2022), that shows a strong potential of voice interfaces, but also a skeptic mindset related to the available technology. Our preliminary study is completed by a short conclusion. The further results will be discussed in a full paper.

Keywords: Voice-assisted interface, public administration, usability, survey, data protection.

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Knowledge management in the Metaverse

[Research-in-Progress]

Vincent Ribiere, IKI-SEA Bangkok University, Thailand, vincent.r@bu.ac.th

Extended Abstract

The Metaverse is becoming a hot topic of discussion and speculation with potential positive and negative impacts. Its application in many fields is likely to affect the way we interact, socialize, get entertained, work, learn and even conduct research. The Metaverse offers shared immersive 3D virtual spaces based on the integration of various technologies, including Virtual Reality (VR) and augmented reality (XR). After a review of the literature of the use of XR technologies in Knowledge Management (KM), this research presents some scenarios where the Metaverse could help supporting KM. One of the main challenges of KM is to facilitate the transfer (and ideally the capture) of tacit knowledge. Experts know how to conduct tasks but can't always fully explain/articulate how they do it (tacit/embedded knowledge), or they may omit to mention some of the steps that are obvious/unconscious to them. Having an expert performing a task or making a series of decisions in the metaverse allows collecting a multitude of data regarding contextual information, human behavior, technical gesture/movement, etc. The experts can be equipped with headgear, a video camera, VR gloves, be speaking out loud describing what they are doing while doing it, being recorded simultaneously, and their actions/steps being converted into text and captured in real-time. These multitudes of data sources will help better understand, capture, model, and transfer experiential knowledge. Another potential benefit of the Metaverse will be the ability to call on digital assistants (elves). An elf is an advanced version of a ChatBot running in the metaverse. Elves are powered by AI and can become your best intelligent assistant/coach. One of the main goals of KM has always been to provide the right information, to the right person, at the right time in the right format so the best decision can be made. Metaverse elves will be able to make this dream come true. Since they will follow on a daily basis someone's activities, behaviors, and preferences in both the Physical world and the Digital world, they will understand someone's needs, preferences, mood and will be able to answer any question they might have digging information available on your corporate knowledge repositories, from the Internet and/or from advanced neural networks like GPT-3. The Metaverse will offer the opportunity to visualize and experience situations, information, and environments in three dimensions (3D). This will allow moving away from the 2D display/visualization limitations, where instead of looking at things (Internet 2.0), you will become part of them (inside) (Internet 3.0). These new immersive environments will disrupt the way we learn (acquire new knowledge). We suddenly can experience situations, experiment, and learn from the impact of our actions and behaviors in a safe and low-cost environment. The learning curve will be reduced, and skills (hard and soft) can be developed more rapidly, benefiting onboarding, reskilling, and upskilling learning and development practices. These are just a few examples of how KM could benefit from the Metaverse.

Keywords: Knowledge management, metaverse, virtual reality, augmented reality.

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Determine the status and opportunities of circular economy activities in business processes

[Research-in-Progress]

Roisin Mullins, Institute of Management and Health, University of Wales Trinity Saint David, Wales, r.mullins@uwtsd.ac.uk

Sandra Dettmer, School of Management, Swansea University, Wales, s.p.l.dettmer@swansea.ac.uk

Monika Eisenbardt, Faculty of Finance and Insurance, University of Economics in Katowice, Poland, monika.eisenbardt@ue.katowice.pl

Ewa Ziemba, Faculty of Finance and Insurance, University of Economics in Katowice, Poland, ewa.ziemba@ue.katowice.pl

Extended Abstract

The purpose of this research was to determine the status of Circular Economy (CE) activity in enterprises. The data set was collected in 2019 through internet research and random selection of enterprises and consists of 333 records. Early analysis showed 89% of enterprises reported a clear sustainability statement on their websites and associated actions to address specific sustainability development goals. In 2022 the same 2019 dataset was analyzed to assess how many of these had a CE statement. CE is concerned with moving away from a linear system and defined by the Ellen McArthur Foundation as consisting of four main areas; repair, reuse / redistribute, refurbish / remanufacture, and recycle.

The findings show that 47% of these enterprises evidenced a CE statement on their web sites. The CE statements were analyzed to determine if they align with the APQC 2016 business processes, namely BP1 (Develop Vision and Strategy), BP2 (Develop and Manage Products and Services), BP3 (Market and Sell Products and Services), BP4 (Deliver Products and Services) and BP5 (Manage Customer Service). The results indicate that most CE activities (59%) are related to 'recycle' whereas the smallest percentage (3.4%) is reported in 'repair' with figures of (25.4%) and (12.2%) linked to 'reuse' and 'refurbish' respectively. Mapping these findings against the value loops in the CE model indicates that most of the studied enterprises engage in the CE mainly in the least valuable CE processes; 'repair' as the most valuable loop activity is the least used.

Furthermore, the results reveal a tendency of CE activities related to BP2 with 90.2% of all cases reported in this category and only marginal cases in the other three business processes BP3, BP4 and BP5. This also suggests that enterprises do not fully explore the different opportunities and potential the various processes offer for CE engagement with particular stakeholder groups. The missed opportunities indicate a lack of matching novel systems to support the transition to CE to improve information flows, facilitate process planning and lifecycle design and development.

Keywords: Circular economy, novel systems, business process.

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Cybersecurity of small and medium enterprises in Poland

[Complete Research]

Celina Sołek-Borowska, Warsaw School of Economics, Poland, csolek@sgh.waw.pl

Patryk Dziurski, Warsaw School of Economics, Poland, pdziur@sgh.waw.pl

Extended Abstract

Effective protection of Information Technology (IT) systems, collected data, and information is nowadays a key element for the stable operation of the company. Looking at the long-term perspective of the company, maintaining an appropriate level of security is the art of skillful adaptation to the peculiarity of the business, the accompanying threats, and technologies necessary to gain a competitive advantage. Interestingly, according to the study conducted by PricewaterhouseCoopers in 2017, the declared increase in interest in new technologies is not accompanied by an increase in the demand for cybersecurity in a given area in Poland. Therefore, the objective of this study is to assess activities undertaken to combat cybersecurity issues by Small and Medium-sized Enterprises (SMEs) in Poland. The research was conducted in 2020 on a group of 115 SMEs using a questionnaire. This research excluded micro companies – companies that employ up to nine employees. The research results reveal that the vast majority of companies limit themselves to securing the elementary components of IT infrastructure and do not decide to implement technologies that can significantly build their competitive advantage. SMEs spend resources cautiously on technology, guided by financial considerations rather than the prospect of achieving specific business results, but there are significant changes in budget positions. SMEs spend the highest percentage of the budget on hardware-related expenses, which accounts for almost 30% of the IT budget, which means that these companies are at the stage of increased investments. Software is in second place (19.8%) and IT security is in third place, which constitutes 14.2%.

Keywords: Cybersecurity, Small and Medium-sized Enterprises (SMEs), IT budget for SMEs.