Proceedings of the
22nd European Conference on Knowledge Management
A Virtual Conference hosted by Coventry University, UK
2–3 September 2021

Edited by
Professor Alexeis Garcia-Perez
Professor Lyndon Simkin

Proceedings of the
22nd European Conference on Knowledge Management
ECKM 2021

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UK

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Dr Alexeis Garcia-Perez
Coventry University, UK

Professor Lyndon Simkin
Coventry University, UK

Review Process
Papers submitted to this conference have been double-blind peer reviewed before final acceptance to the conference. Initially, abstracts were reviewed for relevance and accessibility and successful authors were invited to submit full papers. Many thanks to the reviewers who helped ensure the quality of all the submissions.

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ECKM Preface

These proceedings represent the work of contributors to the 22nd European Conference on Knowledge Management (ECKM 2021), hosted by Coventry University, UK on 2–3 September 2021. The Conference Chair is Dr Alexeis Garcia-Perez from Coventry University, UK and the Programme Chair is Professor Lyndon Simkin, also from Coventry University, UK.

ECKM is now a well-established event on the academic research calendar and now in its 22nd year the key aim remains the opportunity for participants to share ideas and meet the people who hold them. The conference was due to be held at by Coventry University, UK but due to the global Covid-19 pandemic it was moved online to be held as a virtual event. The scope of papers will ensure an interesting two days. The subjects covered illustrate the wide range of topics that fall into this important and ever-growing area of research.

The opening keynote presentation is given by Prof. Dr. Dagmar Monett, Professor of Computer Science (Artificial Intelligence, Software Engineering) Berlin School of Economics and Law (HWR Berlin), and AGISI.org, on the topic of *Intelligence, The Elusive Concept And General Capability Still Not Found in Machines.* There will be an afternoon Keynote presentation given by Dr. Denise Bedford, Georgetown University's Communication Culture and Technology, a Visiting Scholar at the University of Coventry, UK on the topic of *The Culture and Community of Knowledge Sciences.*The second day of the conference will open with an address by Peter Pawlowsky, Chemnitz University of Technology, Germany, who will talk about *KM in post pandemic times"KM unde venis-quo vadis?".*

With an initial submission of 205 abstracts, after the double blind, peer review process there are 101 Academic research papers, 9 PhD research papers and 5 work-in-progress papers published in these Conference Proceedings. These papers represent research from Australia, Austria, Brazil, Colombia, Czech Republic, England, Finland, France, Germany, Greece, Hungary, Iceland, Iraq, Ireland, Italy, Japan, Kuwait, Lithuania, Malaysia, Morocco, Netherlands, North Cyprus, Norway, Pakistan, PARAGUAY, Poland, Portugal, Qatar, Romania, Russia, Saudi Arabia, Slovakia, Slovenia, South Africa, Spain, Switzerland, Turkey, UK and USA

We hope you enjoy the conference.

Dr Alexeis Garcia-Perez
Coventry University, UK
September, 2021

ECKM Conference Committee

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Dr. Marta Mas-Machuca, Universitat, Internacional de Catalunya, Spain; Prof. Maurizio Massaro, Ca' Foscari University of Venice, Italy; Fiona Masterson, National University

Biographies

Conference and Programme Chairs

Dr Alexeis Garcia-Perez is an Associate Professor in Cyber Security Management at the Centre for Business in Society at Coventry University (UK) and a Visiting Research Scholar at Georgetown University (USA). His original background in computer science was complemented by a PhD in knowledge management from Cranfield University. This socio-technical understanding of information systems has enabled Alexeis to focus on the wider challenges of data, information and knowledge management in organisations and society. Alexeis is a Senior Fellow of the UK Higher Education Academy. He leads the Data, Organisations and Society Research Group at Coventry University's Centre for Business in Society. Alexeis has been the course director for KM-based programmes including the MBA Cyber Security at Coventry University, and has collaborated extensively with key industry players on their KM strategies, as well as with UK and international academic and business associations as a KM expert.

Prof Lyndon is director of the Centre for Business in Society at Coventry University before which he was Professor of Strategic Marketing and Head of School at Henley Business School (University of Reading), having been Research Lead at Oxford Brookes and previously Director of the Warwick MBA at Warwick Business School. He is an acknowledged expert in strategy creation, planning processes and implementation management, guiding practitioners with their execution and mentoring COEs and leadership teams. Lyndon is a member of the Academy of Marketing's research Committee, Associate Editor of the Journal of Marketing Management and co-chair of the Academy's special interest groups in CRM and Market Segmentation and Strategy. Lyndon is author of eleven books, including the market leading Marketing: Concepts and Strategies, Marketing Planning, Market Segmentation Success: Making it Happen! and research based The Dark Side of CRM.

Keynote Speakers

Dr. Denise Bedford is currently Faculty, Georgetown University's Communication Culture and Technology, a Visiting Scholar at the University of Coventry, and a Distinguished Practitioner/Virtual Fellow with the U.S. Department of State. Dr. Bedford is a retirement failure. In 2010, Dr. Bedford retired as Senior Information Officer, World Bank and in 2015, she retired from her role as Goodyear Professor of Knowledge Management. Dr. Bedford has also worked for Intel Corporation, NASA, University of California Systemwide Administration, and Stanford University. Over her career she has also taught for Catholic University, University of Tennessee, and York University. She currently serves as an Associate Editor of the Journal of Knowledge Management, has conducted research funded by the National Academies of Sciences, Engineering and Medicine, and is the author of nine published books. She is the series editor for Emerald's new series, Working Methods for Knowledge Management, which is now in its second year of production, and working on the third year titles.

Dagmar Monett is Professor of Computer Science at the Berlin School of Economics and Law; Co-founder of the AGI Sentinel Initiative, AGISI.org; and AI expert at Ms.AI, "Artificial Intelligence for and with Women." With over 30 years of research and teaching experience in different countries, her current research fields include AI, digital ethics, software engineering, and computer science education, among others. Her most recent work focuses on intelligence research, particularly on defining and understanding both machine and human intelligence. She is also interested in machine learning, robotics in education, metaheuristics, knowledge-based systems, and software design and development including Agile.

Prof. Dr. Peter Pawlowsky, currently Senior Research Professor „Team- and Knowledge Management" at Chemnitz University of Technology. Between 1994 and 2020 Full Professor in Personnel Management and Leadership Studies at Chemnitz University of Technology. He was co-founder and president of the German Society for Knowledge Management, and was appointed as vice president for the Commission on Learning in Further Training Institutions of the Federal Ministry for Education and Research (BMFT). He has played an active role in the New Club of Paris developing concepts for intellectual capital management (ICM) and has conducted large studies on the development of KM

Knowledge Management (KM) and ICM in the German economy. Prof. Pawlowsky initiated the first European Master Program in Knowledge Management and was course director of the CUT "Executive Master of Knowledge Management" program. As Director of the Research Institute for Organizational Competence and Strategy (FOKUS), TU-Chemnitz he has been successful in fund raising and has been playing a leading role in several national and international research projects in knowledge management and high performance research. Lately his focus has been on high performance management and excellence in culture, sports, business and emergency operation as well as on the development of transfer trainings that promote learning from high performance teams. Recently, his research team has focused on learning in emergency and disaster management systems and ambulatory healthcare.

Knowledge Cafe Facilitator

David Gurteen is a writer, speaker, and conversational facilitator. The focus of his work is Conversational Leadership – a style of working where we appreciate the power of conversation and take a conversational approach to the way that we connect, relate, learn and work with each other. He is the creator of the Knowledge Café – a conversational process to bring a group of people together to learn from each other, build relationships and make a better sense of a rapidly changing, complex, less predictable world. He has facilitated hundreds of Knowledge Cafés and workshops in over 30 countries around the world over the past 20 years. He is also the founder of the Gurteen Knowledge Community – a global network of over 20,000 people in 160 countries. Currently, he is writing an online book on Conversational Leadership.

Workshop Facilitators

Dr Mahdi Bashiri is Assistant Professor of Business Analytics in School of Strategy and Leadership, Faculty of Business & Law, Coventry University and also a Course Director of International Business Management. Mahdi is a Senior Fellow of the UK Higher Education Academy and has more than 17 years of Management, Leadership, Research, and Teaching experience in the HE sector. Mahdi's research and teaching interests are in the quantitative methods and Operations Research. He has significant experience as an industry consultant.

Dr Rebecca Beech is Lecturer in Business Management at the School of Strategy and Leadership at Coventry University. Prior to joining the School, Rebecca was awarded her PhD in July 2020 at the Centre for Business in Society at Coventry University and was a consultant at a branding agency in London, delivering insights into millennials use of technology. Alongside lecturing and research roles since 2014. Her doctoral studies explored knowledge sharing and consumer empowerment in online communities within the context of green clothing. Rebecca's research interests are, knowledge sharing, online communities, consumer empowerment, social media, sustainability and sustainable fashion.

Dr Constantin Bratianu is Professor Emeritus of the UNESCO Department of the Bucharest University of Economic Studies, Romania. He is a professor of Strategic Management and Knowledge Management and the President of the International Association for Knowledge Management (IAKM). He is known for his contributions to the theory of knowledge fields, knowledge dynamics in organizations, and knowledge strategies. He is Associate Editor of the Electronic Journal of Knowledge Management, and former Associate Editor of VINE Journal of Information and Knowledge Management Systems.

Dr Anitha Chinnaswamy is an Assistant Professor at the Business School in Coventry University and a Research Associate with the Centre for Business in Society (CBiS). Anitha has a broad multidisciplinary area of research. Her interests include researching the links between digital transformations and security risk management and how organisations can be assisted with a proper knowledge management system to deal with these risks.

Dr Rasha Kassem is an internationally-oriented academic with expertise in Forensic Accounting; Fraud Prevention; Fraud Investigation and Financial Reporting. Rasha is currently an Assistant Professor in the Faculty of Business and Law at Coventry University. She is also a Certified Fraud Examiner, an academic advisor at Cifas, a member of the Cross Sector Advisory Group at the Cabinet Office, and a member of the ACFE Fraud Advisory Council. Rasha has authored numerous publications in Fraud and over the last couple of years, Rasha has also been working closely with the City of London Police to develop online fraud courses for fraud investigators and law enforcement in fraud prevention and detection.

Dr Sandra Moffett is a Reader in Business Analytics and Acting Head of the Department of Global Business and Enterprise, Ulster University, Magee Campus. Sandra is a core member of the Business and Management Research Institute, researching in the areas of Business Analytics, Knowledge Management and Digital Transformations. Her expertise on Knowledge Management contributes to her being one of the UK leading authors in this field, with over 100 high quality, international research publications. She has received a number of research awards and citations for her work.

Dr Esin Yoruk is Senior Lecturer at the School of Strategy and Leadership and Research Associate at the Centre for Business in Society at Coventry University. Her main research interests are in the field of innovation studies and entrepreneurship and their effects on sustainable economic growth. She has extensive in interest in novel research methodologies.

Mini Track Chairs

Dr. Gianluigi Baldesi is a senior manager at the European Space Agency with 15+ years of technology leadership experience in assessing and executing complex projects for future aerospace missions in a cross-cultural environment. Currently, he is in charge of leading the Corporate Knowledge Management activities and coordinating corporate strategic planning for the Agency. He holds a PhD in Systems Engineering and Executive MBA from Columbia Business School and London Business School.

Lorenzo Cobianchi MD, PhD is an Associate Professor in General Surgery at the Department of Clinical-Surgical, Diagnostic and Pediatric Sciences at the University of Pavia, Italy. Besides his clinical research topics about mini-invasive surgery, oncology, new integrated approaches for the treatment of pancreatic cancer and regenerative medicine, he is interested in the impact of new technologies on surgery and healthcare, knowledge translation, teams dynamics and co-production in medicine and surgery.

Francesca Dal Mas is a Senior Lecturer in Strategy and Enterprise at the Lincoln International Business School at Lincoln, UK. She has a Master's Degree in Business Administration from Udine University and a Law Degree from Bologna University, Italy. She got her Ph.D. in Managerial and Actuarial Sciences from Udine University. Her research interests include strategy, knowledge management, and intellectual capital.

Paulo Gonçalves Pinheiro is a Professor of Beira Interior University (UBI), Business & Economics Department, and a researcher at the NECE, Research Center in Business Sciences (UBI). His teaching activities are mainly on knowledge management and comprehend undergraduate, master, and doctoral students. He is a Ph.D. in management and author of several publications. https://orcid.org/0000-0003-2397-6463

Raysa Geaquinto Rocha (MSc) is a Ph.D. student at the University of Beira Interior, a researcher at the NECE, Research Center in Business Sciences (UBI), and a lawyer. She received her master's degree in management from Fucape Business School in 2016. Her main research areas are organizational spirituality, organizational practical wisdom, and knowledge management. https://orcid.org/0000-0002-6542-1397

Prof Dr Sağsan is the Director of the Graduate School of Social Sciences at the Near East University, North CYPRUS and also Editor-in-Chief of NEU Journal of Social Sciences since 2015. He is also a founding chairperson of Innovation and Knowledge Management Program at the same University. He received his Ph.D. from Başkent University, Ankara TURKEY in Management and Organization Science in 2008. His research focuses on innovation and knowledge management, organizational theories, strategic management, human resources management, e-government studies, and philosophy of social science. He published more than 150 scientific papers so far.

Maria José Sousa, Ph.D. in Management and Post Doc in Digital Learning, is a University Professor and a research fellow at ISCTE-Instituto Universitário de Lisboa. She has organized and peer-reviewed international conferences and is the guest-editor of several Special Issues from Elsevier and Springer. She has participated in European projects of innovation transfer and is also External Expert of COST Association - European Cooperation in Science and Technology and President of the ISO/TC 260 – Human Resources Management, representing Portugal in the International Organization for Standardization.

Dr. Changiz Valmohammadi is Associate Professor at Islamic Azad University, South Tehran Branch and affiliate professor of CENTRUM Católica Graduate Business School (CCGBS), Pontificia Universidad Católica del Perú (PUCP). For more than 23 years he has taught undergraduate, graduate and industry courses and carried out research in various aspects of operations management.He has published research papers in journals such as Information & Management, International Journal of Production Economics, The TQM Journal, International Journal of I EEE TRANSACTIONS ON ENGINEERING MANAGEMENT, Performance, Innovation: Management, Policy & Practice, Total Quality Management & Business Excellence, Journal of Enterprise Information Management, among others. He is a senior member of American Society for Quality (ASQ) and on editorial board of Journals such as International Journal for Quality Research, Industrial, and Commercial Training.

Juan Manuel Verde MD, MSs is an Associate Researcher in Surgical Innovation and Image-Guided liver procedures at the Institute of Image-Guided Surgery Institut Hospitalo-Universitaire (IHU) of Strasbourg, France. His research interests include the impact of disruptive technologies in the field of minimally-invasive and image-guided hepatobiliary surgery. He is also interested in the use of blockchain and artificial intelligence technologies in healthcare.

Biographies of Contributing Authors

Wala Abdalla is a Ph.D. researcher in managing knowledge in the context of smart cities at the Faculty of Science and Engineering, University of Wolverhampton. She holds an MSc in Civil Engineering management and is a Fellow of the UK Higher Education Academy. Her research interests include knowledge management, smart cities, business model innovation for smart cities, sustainability strategies, and competitiveness.

Aderonke Olaitan Adesina has a Bachelor's degree in Physics and a Master of Information Science degree, both from the University of Ibadan, Nigeria. Aderonke is an emerging scholar and a doctoral student of the Department of Information Studies, University of Zululand, South Africa. Her areas of interest include knowledge management, information systems, and academic libraries.

Yasanthi Alahakoon is a Lecturer at the University of Sri Jayewardenepura, Sri Lanka. She is currently reading for PhD at Queensland University of Technology, Australia, in Knowledge Management. She has authored publications on Knowledge Management and Organizational Studies in international journals and conference proceedings. Her research interests are in epistemological stances and perspectives of knowledge management.

Anna Albrychiewicz-Słocińska is an assistant professor at Częstochowa University of Technology, Poland. She received her PhD in social sciences from Częstochowa University of Technology in 2008. She has been participating and organizing several international conferences on human resources management. Her main research areas are human resources management, knowledge sharing, knowledge management, ethics and organizational behaviour.

Areej Alqahtani is information systems lecturer in College of Community in Abqaiq at King Faisal University in Saudi Arabia. She has Master degree in computing (Information and Knowledge Management) from Ireland. She is currently working on her PhD research at University of Technology in Sydney (UTS). Her main research interests are Knowledge Management and innovation platforms.

Ekaterina Avduevskaia is the PhD student of Graduate School of Industrial Economics, Peter the Great St. Petersburg Polytechnic University. Her main research arears are the human capital, regional economy and intellectual capital. In 2020, she defended master's thesis on the topic of human capital development in the context of the digital economy.

Lisa-Maria Baumgartner, BSc (WU) is a research assistant at the Institute for Data, Process and Knowledge Management at the Vienna University of Economics and Business, Austria. Her research is on meaningful work as well as the impact and elaboration of visions. She holds a bachelor's degree in business administration.

Negalegn A. Bekele studied MSC in Industrial Engineering at Addis Ababa University, Ethiopia in 2011. From 2011-2019, he worked as a lecturer and researcher at Debre Markos University, Ethiopia. Currently, he is working as full-time researcher at Padova University, Italy in the area of consumer Internet of Things and startups.

Marco Berardi is a Senior Lecturer in "Accounting management and business economics", Department of Management and Business Administration, "G. d'Annunzio" University, Pescara, Italy.

Marco Bettoni. Prof. emer. in Knowledge Technologies, Director of the Steinbeis Consulting Center for Knowledge Management and Collaboration (since 2018). Director of Research at Fernfachhochschule Schweiz (2005-2017). Since 1981 research in Knowledge Theory (Radical Constructivism). From 1977 to 2005 researcher, engineer and lecturer with industrial and academic organisations in machine design, engineering education, IT development, knowledge engineering and knowledge management.

Evgeny Blagov, PhD, is a Senior Lecturer of the Information Technologies in Management Department, Graduate School of Management, Saint Petersburg University, and a leading expert of the EduNet Working Group of Russia's National Technology Initiative program. His research and practical interests focus around knowledge management in higher education and in University-Industry collaboration.

Karsten Böhm is Professor of Applied Computer Science (University of Applied Sciences in Kufstein Tirol, Austria). He is directing course programs in the area of Web-based/Mobile technologies and Data Analytics. Research interests are in the field of IT-supported Knowledge Management with a current research focus on the use of semantic technologies and agile methods in higher education institutions.

Ettore Bolisani - Associate Professor - Padova University; previously researcher at Manchester University, visiting lecturer - Coventry University, Kaunas Technological University, Universidad Politecnica de Cartagena, Technische Hochschule Köln; Chair - ECKM 2009, 2018, IAKM Past President; Series co-editor - "Knowledge Management and Organisational Learning" (Springer), Editor-in-chief EJKM, management committee EU Action INDCOR

Constantin Bratianu: Professor of *Strategic Management* and *Knowledge Management*, Bucharest University of Economic Studies, Romania. Founding editor of the international journals *Management & Marketing*, and *Management Dynamics in the Knowledge Economy*, President of the International association for Knowledge Management and Associate Editor of the *Electronic Journal of Knowledge Management*. Academic interests: knowledge dynamics, knowledge management, intellectual capital, and strategic management.

Claire Brewis is a postgraduate research fellow at Coventry University's Centre for Business in Society. She has a business background and her research interest is the digital transformation of firms from a strategic perspective. Living in the mountains, Claire is also interested in the effects of the urban / rural digital divide.

Anthony Paul Buckley is Assistant Head, School of Marketing in the College of Business, TU Dublin, Ireland. He received his PhD from Lancaster University in 2013. His main research interests are in the knowledge management, innovation/entrepreneurship and research methodology and evaluation domains. https://scholar.google.com/citations?user=GT8U_roAAAAJ&hl=en&oi=sra

Felicjan Bylok is a Full Professor of sociology. Head of the Department of Sociology, Psychology and Communication of Management at the Faculty of Management (Czestochowa University of Technology). His scientific interests is as follows: the social capital and trust, Human Recourses Management, the sociology of organization. The educational background of Prof. Bylok is in Sociology and HRM.

Delio Ignacio Castaneda PhD. en Organizational Behavior, with an emphasis in Knowledge Management from Universidad Autonoma de Madrid, and Master in Education with emphasis in Organizations from Manchester University in UK. At the moment, Professor in the Business Department of Pontificia Universidad Javeriana in Bogota, Colombia.

Behiye Cavusoglu is a Head of Innovation and Knowledge Management Department at Near East University, North Cyprus. Her original background is Economics; she completed her PhD in innovation and knowledge management and mainly focuses on knowledge economy, intellectual capital and human capital.

Piera Centobelli is Asst. Professor of Business Economics and Organization at the University of Naples Federico II. She acts as guest editor and reviewer for several peer-reviewed journals. Her research interests focus on knowledge and technology management, logistics and supply chain management, decision support systems, Industry 4.0, digital transformation, environmental, economic and social sustainability.

Jolanta Chluska is a professor of accounting at the Faculty of Management of Częstochowa University of Technology (Częstochowa, Poland). She is the head of the Department of Finance, Banking and Accounting. Its main research areas are financial accounting and management accounting of medical entities and other economic organizations. Since 1999 she is a statutory auditor.

Andrzej Chluski is an assistant professor at the Faculty of Management at Czestochowa University of Technology, Poland. He obtained a PhD degree in management science at Czestochowa University of Technology (2012). He has published over 50 peer-reviewed papers. His current research focuses on management of knowledge, information systems and information and communication technology in healthcare organizations.

Grzegorz Chmielarz: PhD, studied English Drama (University of Lodz), Economics and Law (Polonia University of Czestochowa) and Computer Networks (Czestochowa University of Technology). Currently at the Department of Information Management Systems (Czestochowa University of Technology, Faculty of Management). Primary areas of research interest are information and personal data security management and the application of Artificial Intelligence in this area.

Ewelina Chrapek is an assistant professor at the Institute of Psychology, Sociology and Communication in Management at Częstochowa University of Technology, Poland. She defended her PhD thesis in 2019. The area of her research interests is the psychology of management, occupational psychology, psychology of cognitive processes, as well as health and clinical psychology.

Leszek Cichobłaziński: Assistant Professor of Human Resources Management and Negotiation (Management Faculty of the Częstochowa University of Technology, Poland). His main scholarly interests are in human resources management. Research focuses on the anthropology of organization, knowledge management, organizational semiotics, mediation in collective bargaining as well as on organizational conflict management. His educational background is in Sociology.

Simone Cifolelli is a PhD student in "Accounting management and business economics", Department of Management and Business Administration, "G. d'Annunzio" University, Pescara, Italy.

Concetta Lucia Cristofaro: is a post-doc Research Fellow at the Magna Graecia University (Catanzaro) in Italy, where, she received her Ph.D. in Health Economics and Management. Currently, she is adjunct Professor of in Organization theory, Conflict Management and Human Resource Management, Public and Private Organization at the Magna Graecia University.

Roberta Cuel (Ph.D.) is associate professor of Organizations Studies, at the Department of Economics and Management, University of Trento. Her research interests are aimed at discovering the impacts of ICT on the

living conditions of companies, in particular on intangible assets, behaviours, routines and practices, teams and communities.

Greg Curda is currently an Assistant Professor in the Film&TV department at Nord University in Steinkjer, Norway. As a Hollywood veteran sound mixer with over 80 international feature films to his credit, Greg's work has contributed to multiple Oscar nominations, with *The Hunt for Red October* winning for Best Sound Effects Editing in 1990.

Francesca Dal Mas is a Senior Lecturer in Strategy and Enterprise at the Lincoln International Business School at Lincoln, UK. She has a Master's Degree in Business Administration from Udine University and a Law Degree from Bologna University, Italy. She got her Ph.D. in Managerial and Actuarial Sciences from Udine University. Her research interests include strategy, knowledge management, and intellectual capital.

Tiphaine de Valon is a first year PhD student in cotutelle between Coventry University (UK) and the Technical University of Cartagena (Spain). Her fields of study are processes of co-creation, value creation, relationship and knowledge management, and sustainability in business.

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Performance and Conscientiousness in Teams: A Field Experiment

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Abstract: This study investigated whether conscientiousness, one of the five personality traits, affects team performance. Although previous studies have shown that conscientiousness is the most potent noncognitive construct for individual occupational performance, experimental evidence of the impact of conscientiousness on group performance is scarce. Results in the present study derived from a field experiment, with 120 students paired according to their level (high vs. low) of previously measured conscientiousness score. Three types of dyads were obtained: low-conscientiousness, high-conscientiousness, and heterogeneous. The low (high)-conscientiousness dyads consisted of two members, both with low (or high) scores on the conscientiousness trait. Heterogeneous dyads consisted of two members, of which one had high scores on the conscientiousness trait, and one had low scores. All teams then worked on case studies provided by the "Samsung Innovation Camp" project. The goal of each group was to propose a genuinely practical solution. Team performance was measured on several criteria by an external board. The results showed that high-conscientiousness dyads significantly outperformed the other teams. In contrast, heterogeneous dyads were not different from the low-conscientiousness dyads. These data confirm the central role of the conscientiousness trait in predicting performance, extending it to workgroups and not just individuals. They also show that members with high scores in the conscientiousness trait must be paired with similarly high individuals in the same trait to have a competitive advantage.

Keywords: knowledge creation, conscientiousness, team performance, team composition, field experiment

1. Knowledge management and teamwork

Knowledge, in its different forms, is increasingly recognized as a crucial asset that serves as the foundation of competitive advantages in modern organizations (Grant 1996, Davenport and Prusak 1998, Cuel et al. 2011).

The organizational capability to leverage its knowledge strongly depends on the abilities of employees to create, organize, store, and share knowledge, since individuals are the primary holders and movers of knowledge (Nonaka 1994). Knowledge management literature has generally focused on social and organizational dimensions of knowledge management, studying incentives, job design, task performance, teamwork, and communities of practices (Stevens and Campion 1994, Sung and Choi 2012, Wang and Noe, 2010, Nonaka and Takeuchi 2019, Wenger et al. 2002). According to Huczynski and Buchanan (2013), the main limitation of workers' performances lies more in the ability to work in a team, than in the individuals' intellect or equipment.

The belief that teamwork is more productive than individual works is commonly accepted by practitioners. Therefore, managers consider teams as the most effective solution to solve challenging jobs (Hitt et al. 2011, Huczynski and Buchanan 2013). Given the growing importance of individual knowledge in organizational learning, it is necessary to understand the role of individual characteristics, behaviors, and contributions that bring a variety of skills and capabilities to the team and the whole organization. Teams are complex systems since people differ in how they perceive knowledge and emotions, how they understand the environment and interact with others. Because of these differences, individuals behave and adapt to a variety of work situations in their ways. In other words, individual knowledge, expertise, values, feelings, thoughts, and behaviors –which are in turn influenced by their personality traits – affect interpersonal activities and team performances as well (LePine et al. 2011). The way teams are composed should therefore be based on various attributes such as diversity in terms of age, gender, and reputation. All these attributes are fundamental for the overall functioning of a team, but not necessarily matter most. It is the deep-level factors, such as members' personality traits, values, and abilities that may have the greatest impact on team performances (Cohen and Bailey 1997, Guimera 2005).

While individuals' behaviors and knowledge management are widely studied from managerial and sociological perspectives, few scientific contributions examined how individual personalities influence knowledge management and performances of teams (Hwang 2016, Wang et al. 2014, Gardner 1996). Some of the most recent contributions used the psychological theories on personality traits to better understand their effects on

team performances. These studies offer a new research perspective on knowledge sharing and integrate personality traits theories and social cognitive theory into more traditional knowledge management and job design models. For instance, Gupta (2008) examined the impact of Big Five personality characteristics on knowledge-sharing and knowledge-acquisition behaviors using a questionnaire. He determined that individuals high on agreeableness and conscientiousness were more involved in knowledge sharing activities than individuals low on agreeableness and conscientiousness. Individuals high on conscientiousness were more involved in knowledge acquisition activities than individuals low on conscientiousness. Esmaeelinezhad and Afrazeh (2018) attempt to link personality traits and individuals' knowledge management behavior examining the impact of the Big Five personality traits (openness, conscientiousness, extraversion, agreeableness, and neuroticism) on four aspects of individuals' knowledge management behaviors: knowledge acquisition, knowledge storage, knowledge sharing, and knowledge application. Chae et al. (2019) studied how conscientiousness (i.e., dutifulness and achievement striving) influences knowledge sharing among employees, and how specific personalities shape employee behaviors. Hao et al. (2019) analyzed how conscientiousness, job demands of skill variety, and knowledge sharing self-efficacy have joint effects on virtual team performances.

2. Group composition and team performance

The above-mentioned studies have confirmed that the personality mix of team members influences the performances. A fundamental and commonly accepted model for describing personality is the Big Five traits that strongly predict work behaviors across time, contexts, and cultures (Barrick and Mount 1991, Digman 1990). The five factors are:

- Agreeableness is denoted by individual characteristics such as being helpful, generous, courteous, warm, likable, emotionally supportive, and nurturing. In work contexts, agreeable employees show higher levels of interpersonal competence (Witt et al. 2002) collaborate effectively when joint action is needed (Mount, Barrick and Stewart 1998), and are less competitive (Caliguiri 2000).
- Neuroticism is denoted by individual attributes such as being self-conscious and high self-monitors, experiencing negative emotions such as fear, sadness, and embarrassment. People with a high level of neuroticism are less able to control impulses and stress (Costa and McCrae 1992). On the contrary, people with a high level of emotional stability are generally calm, tempered, less anxious, depressed, angry, embarrassed, worried, and insecure (Barrick and Mount 1991; Ones and Viswesvaran 1997).
- Extraversion is denoted by individual attributes such as being sociable, assertive, active, bold, energetic, adventuresome, expressive, self-confident, talkative, gregarious, and spontaneous (Barrick, Mount and Piotrowski 2002; Costa and McCrae 1992).
- Openness is denoted by individuals' attributes such as being imaginative, creative, cultured, original, broadminded, intelligent, and artistically sensitive (Goldberg 1992).
- Conscientiousness is denoted by individual attributes such as being neat, punctual, careful, self-disciplined, reliable, achievement-oriented, self-motivated, and task-oriented (Barrick and Mount 1993), committed to the task (Ones and Visweswaran 1997), be trusted by others in the organization (Caliguiri 2000), methodical and thorough in work (Witt et al. 2002).

2.1 Conscientiousness and team performance

Conscientiousness is considered by far the personality dimension most associated with job performance (Barrik and Mount, 1991; Wilmot and Ones, 2019). Conscientiousness refers to a personality trait characterized by consistency, reliability, industriousness, diligence, dutifulness, and perseverance (Goldberg, 1990; MacCann et al., 2009; McCrae and John, 1992). However, we should be cautious about generalizing the positive effects of conscientiousness to organizations as well. Previous studies showed, for example, that high conscientiousness detracted attention away from other important performance aspects, such as innovation and creativity in teams (Zhou and George, 2001).

The studies exploring the effect of conscientiousness on organizations' and teams' performance are scarce. Some studies found that being similar to other teammates in terms of conscientiousness increased the team's satisfaction, but it did not significantly affect members' satisfaction with the team's performance (Gevers and Peeters, 2009). This does not tell us anything about the role of conscientiousness on performance. It has been stressed (Wilmot and Ones, 2019) that high conscientiousness is associated with variables such as helping coworkers, effective teamwork, and leading others to accomplish shared goals. In principle, then, high conscientious individuals should also be excellent team workers. Support for this hypothesis was found in several works showing that teams higher in conscientiousness received higher supervisor ratings for team performance

(e.g., Barrick et al., 1998). It must be noted that the type of teams examined by Barrick et al. (1998) were teams working in organizations (e.g., teams of workers that assembled small appliances). In particular, the authors used the definition by Guzzo and Dickson (1996), who emphasize the importance of team member's interdependency due to the task they perform, but also the significance of being embedded in a larger social system (e.g., organization) and the relevance of performing a task that affect others (such as customers or coworkers). However, in none of these studies was conscientiousness experimentally manipulated to determine a causal relationship between the presence of this personality trait and performance in teamwork.

2.2 Overview and hypotheses
The effect of group conscientiousness-trait composition on team performance was investigated in an experimental study. The study is aimed to validate two following hypotheses:
- H1: groups composed of high-conscientiousness members would outperform groups composed of low-conscientiousness members.
- H2: homogeneous high-conscientiousness teams would outperform heterogeneous teams.

Two naïve participants were assigned to the same team and worked in groups that consisted of either two high-conscientiousness participants, two low-conscientiousness participants, or one high- and one low-conscientiousness participant. Within the groups, there was no acknowledgment of each other's conscientiousness. After participants were assigned to teams, each group worked together to solve a problem, and their solution was later coded for performance.

Teams were informed that they were competing for the best solution. The winning team would have received the opportunity to present their innovative solution in front of the actual company that proposed the organizational problem that needed to be solved.

In line with previous literature and the hypothesis above mentioned, we predicted that groups composed of high-conscientiousness members would outperform groups composed of low-conscientiousness members. Also, we predicted that homogeneous high-conscientiousness teams would outperform heterogeneous teams.

3. Method

3.1 Participants
The final sample included 120 students (73 males 47 females), which formed 60 two-person groups, of which 17 were homogeneous low-conscientiousness teams, 24 were homogeneous high-conscientiousness teams, and 19 were heterogeneous low- and high-conscientiousness teams.

The participants of our study are not the typical "work team" that can be found in an organization (as depicted by Barrick et al. 1998). This because we wanted to investigate how the personality traits affect performances of the same task without any other organizational variable that may affect the results.

In any case a common cultural trait can be found since participants were students from the same university.

3.2 Materials

3.2.1 Conscientiousness.
Conscientiousness was assessed with the 10-items conscientiousness scale of the NEO Personality Inventory from the International Personality Item Pool (http://ipip.ori.org/) (Goldberg et al., 2006; Johnson, 2014). Participants rated the extent to which each of ten self-descriptive statements described them using a 5-point scale (1 = Very inaccurate, 5 = Very accurate; α = .76). Sample items include "I am always prepared", "I pay attention to details", "I waste my time" (reverse scored), and "I find it difficult to get down to work" (reverse-scored).

3.2.2 Group task.
Participants completed a group task as part of their business course. They were provided a decision case and were asked to work through their decision case as a group. Each team was asked to produce a presentation of up to 10 pages/slides, in English with an introduction with a description of the Client Company's request, an

analysis of the initial situation and any data provided by the client company, an original solution proposed by the team to solve the decision case.

3.2.3 Team performance.

Performance at the team level was measured by experts using an evaluation grid. The project works were assessed on the basis of an evaluation grid implemented in compliance with the indications present within articles 4, 4.1, and 5 of the official regulations of Samsung Innovation Camp 2019/20, supplemented with some factors deemed necessary for completeness and objectivity of the evaluation itself. In particular, these factors had to undergo two key elements indicated in the regulation, namely "structure and form" and "quality of the proposal", with a weight on the evaluation of 40% and 60%, respectively. The factors underlying the "structure and form" element were (1) length of the project (maximum 10 pages/slides) (2) description of the client company's request (3) analysis of the initial situation (4) conclusions (5) attachments (maximum 3) (6) clarity of content (7) quality of language and grammar (8) quality of layout (9) reference to sources used.

The "quality of the proposal" was evaluated according to the following criteria: (1) originality of the proposal (2) innovativeness of the idea (3) coherence with the objectives of the client company (4) description of technologies and other solutions (5) benchmark analysis (6) presence of economic numbers (7) scientific references or references to existing theories/models (8) degree of applicability of the proposed solution.

For each of the 60 project works delivered, these 17 factors were analyzed and evaluated, assigning a score from 0 to 5 to each factor. The average of the scores was then calculated separately for "structure and form" and for "quality of the proposal", this average was converted into decimals and the final weighted average was calculated, taking into account the weight on the total of the two elements under analysis (as mentioned above, a weight of 40% for "structure and form" and a weight of 60% for "quality of the proposal").

Finally, to reward the ability to collaborate, 10% more on the final score was added to the project work carried out in teams, no additional points to the project work carried out by a single member, as already mentioned, the latter were not taken into account for the analysis purpose.

3.2.4 Control variables.

Team members' age and sex were collected from each team member and included as controls in our analyses to ensure a balanced distribution of these characteristics between experimental groups.

3.2.5 Design

Groups were assembled to be either homogeneously high on conscientiousness, homogeneously low on conscientiousness, or mixed (one member high and one low on conscientiousness), resulting in one factor, i.e., group composition, with three levels (homogeneous high, homogeneous low, mixed) manipulated in a between-subjects experimental design.

3.2.6 Procedure

An initial number of 180 students enrolled in a business master public university course participated in the program. Of these initial students, some declined to participate until the end of the program, or provided missing or incomplete information and were therefore retained from the final sample. It should be noticed that students cannot be compared to workers from the same organization. For this reason, they might lack the significance of being embedded in a larger social system (e.g., organization) and the relevance of performing a significant task – such as a task that affect the whole organization, customers, coworkers, and other stakeholders. The peculiarity of our sample might affect the generalizability of the results to other types of teams working in an organization.

3.2.7 Experimental manipulation

Groups were composed of either two high conscientiousness members, two low conscientiousness members, or a mix of one high and one low conscientiousness member. Membership was assigned using data from a questionnaire completed before the project work assignment. The questionnaire included questions on conscientiousness as detailed in the previous section. The composite conscientiousness score was computed by averaging the ten questions on conscientiousness. The score ranged from 2.6 to 4.8 with a mean of 4.0, a median of 4.1, and a standard deviation of 0.44. Each participant was labeled as low or high in the conscientiousness trait according to a median split procedure based on the 50th percentile. Participants scoring more than 4.00 on

the conscientiousness trait were labeled high in conscientiousness, while those scoring 4.00 or less were labeled low in conscientiousness. Individuals were then matched to form groups made of two members, either homogeneously high in conscientiousness, homogeneously low in conscientiousness, or mixed (one high and one low in conscientiousness). The final sample was made of 17 homogeneously low conscientiousness groups, 24 homogeneously high conscientiousness groups, and 19 mixed low-high conscientiousness groups.

4. Results

All analyses were conducted with the group as the unit of analysis. The hypothesized effect of group composition on the primary dependent variable, group performance, was assessed by an independent-samples Kruskal-Wallis test to account for the marginal significance of the Shapiro-Wilk test of normality (p = 0.98). The Kruskal-Wallis test was significant, H(2) = 19.34, p = .0001, showing that the group composition significantly affected the performance. Groups made of homogeneous high conscientiousness members (Mdn = 7.65) performed significantly better than groups made of mixed low-high conscientiousness members (Mdn = 6.44) and groups made of homogeneous low conscientiousness members (Mdn = 6.03) (see Figure 1). Dunn's post hoc tests were carried out on each pair of groups. As multiple tests were carried out, the p-value was adjusted through a Bonferroni alpha level correction of .017 (0.05/3). The difference in performance between groups made of low conscientiousness members and those made of mixed low-high conscientiousness members was not significant (p = 1.00); whereas the groups made of homogeneous high conscientiousness members performed significantly better than groups made of homogeneous low conscientiousness members (p = .0001) and those made of mixed low-high conscientiousness members (p = .002).
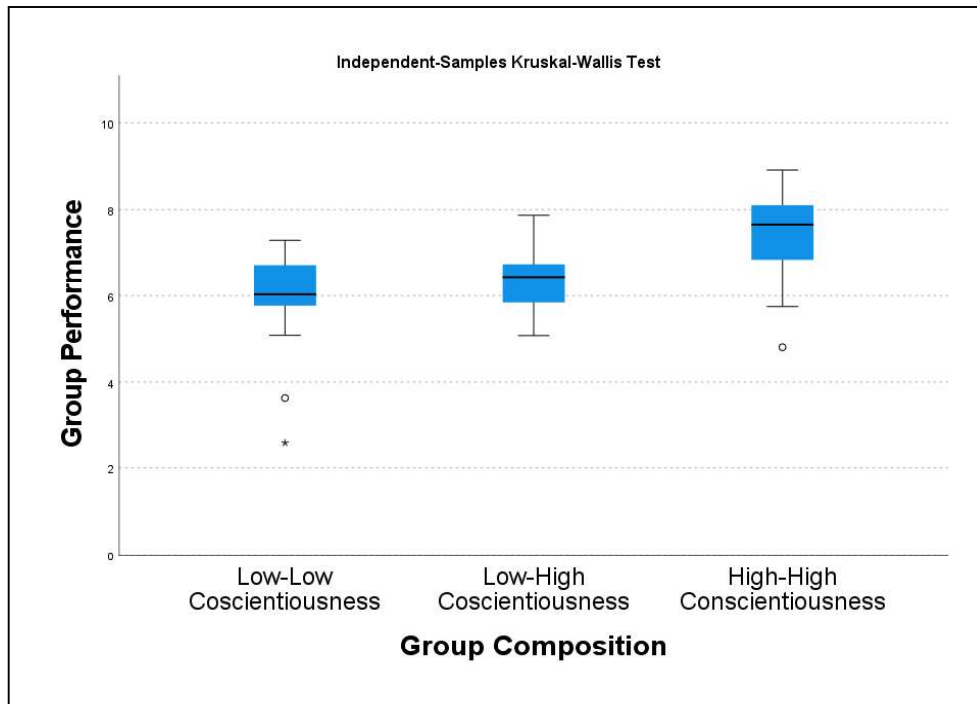
Figure 1: Boxplot comparing the medians and spread of the data by group

4.1 Balance and manipulation checks
To check that demographics characteristics were not unequally distributed across treatment groups, we computed tests for age and gender. Group members' average age was 22 years (SE = 0.31), and it was not statistically different between the three groups, H(2) = 5.54, p = .063. Males (61%) were generally more numerous than females (39%), and this proportion was not statistically different between the three groups, $\chi2$ (2, N = 120) = 1.98, p = .372.

In order to check that our treatment manipulation (i.e., the assignment of members differing in their conscientiousness score to the three experimental groups) was effective, we compared the mean conscientiousness score of the members in the three groups. Since the dependent variable, conscientiousness

score, was not normally distributed (p = .009), we proceeded to compute the Kruskal-Wallis test for differences between means. The test was significant, H(2) = 63.42, p = .0001, demonstrating that the conscientiousness trait was significantly different between the three groups. Groups made of homogeneously high conscientiousness members were higher on the conscientiousness trait (Mdn = 4.30; p = .0001) than groups made of mixed low-high conscientiousness members (Mdn = 4.10; p = .0001), and these, in turn, were higher on the conscientiousness trait than homogeneously low conscientiousness members (Mdn = 3.7; p = .0001).

5. Conclusions

This study experimentally investigated the role played by conscientiousness, one of the most studied personality factors and most predictive of job performance, in teamwork.

This study has certain directions for researchers. Unlike previous studies that measured the relationship between team members' conscientiousness and team performance in a correlational manner. In this study, we first measured conscientiousness at an individual level and then matched team members in order to manipulate the degree of conscientiousness of the resulting group. Consistent with our hypotheses we showed that teams made up of high conscientiousness members outperformed teams made up of less conscientiousness members.

The results of this study may also have some implications for practitioners who select people in a company and want to have workers who are good at working in teams. The belief that conscientiousness prevents healthy teamwork because it suppresses creativity seems to be disconfirmed in this study. In fact, the team had to come up with an innovative solution to win the competition. Conscientiousness not only did not prevent the team from achieving a better performance but also significantly helped the team achieve a more innovative solution. Further studies should address whether high-conscientiousness teams are not only more capable but also more satisfied in working together than less conscientiousness teams as non-performance indicators are key to long-term job satisfaction and team cohesion.

Future research perspectives should address some aspects that were only marginally addressed in the present study. First, this study had a small sample size which put constrain on the generalizability of the findings. More importantly, the peculiarity of our sample might have affected the generalizability of the results to other types of teams working in an organization. Indeed, this study was conducted in an educational setting on university students. As mentioned by Adler and Weiss (1998) personality may have a different influence in a weak situation as teams built for a university assignment. Personality might have less impact when workers have more defined roles, rules, and contingencies. As a consequence, future research needs to replicate this study in a corporate setting to validate these findings. Moreover, our study examined students from the same university and not workers of an organization. To improve external validity, future studies employing our same experimental paradigm should quantitatively assess the team members' perceptions of task interdependence to check that they meet the definition of teams.

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