Addleton Academic Publishers

Geopolitics, History, and International Relations 13(2), 2021
pp. 135–148, ISSN 1948-9145, eISSN 2374-4383

Urban Internet of Things Systems and Data Monitoring Algorithms in Smart and Environmentally Sustainable Cities

Sarah Burke
sarah.burke@aa-er.org
The Center for Smart Sustainable Urban Mobility
at AAER, Coventry, England
(corresponding author)
Katarina Zvarikova
katarina.zvarikova@fpedas.uniza.sk
Faculty of Operation and Economics
of Transport and Communications,
Department of Economics,
University of Zilina, Zilina, Slovak Republic

ABSTRACT. We develop a conceptual framework based on a systematic and comprehensive literature review on urban Internet of Things systems and data monitoring algorithms in smart and environmentally sustainable cities. Building our argument by drawing on data collected from Capgemini, CBRE Research, DNV GL, ESI ThoughtLab, ITU, and KPMG, we performed analyses and made estimates regarding how networked and integrated sustainable urban technologies have configured smart ecosystems. Smart sustainable city governance and management focus on configuring adequate operational processes. Internet of Things sensing infrastructures are pivotal in gathering massive volumes of data through sensor devices. Huge data streams are produced by networked devices by harnessing integrated sustainable urban technologies. Big data have to be integrated across Internet of Things sensing infrastructures with data-driven planning technologies. The data for this research were gathered via an online survey questionnaire. Descriptive statistics of compiled data from the completed surveys were calculated when appropriate.

Keywords: smart city; sustainability; Internet of Things; big data; monitoring; urban

How to cite: Burke, S., and Zvarikova, K. (2021). "Urban Internet of Things Systems and Data Monitoring Algorithms in Smart and Environmentally Sustainable Cities," *Geopolitics, History, and International Relations* 13(2): 135–148. doi: 10.22381/GHIR132202110.

Received 16 June 2021 • Received in revised form 6 October 2021
Accepted 8 October 2021 • Available online 10 October 2021

1. Introduction

Smart and environmentally sustainable cities can decrease resource use, environmental pollution, traffic congestion, and safety hazards, while optimizing energy efficiency and the standard of living. (Teng et al., 2021) Smart sustainable city governance and management focus on configuring adequate operational processes and attaining enhanced urban outcomes by use of networked and integrated sustainable urban technologies. (Jiang, 2021) Smart interconnected cities are configured through Internet of Things sensing infrastructures. (Cao and Wachowicz, 2019) Increase in networked devices across Internet of Things-enabled smart cities leads to growing levels of collected data. (Ismagilova et al., 2019)

2. Conceptual Framework and Literature Review

Learning algorithms and nonconscious computing brains are integrated in sustainable urban governance networks, articulating cognitive smart cities. (Williamson, 2017) Smart cities harness interconnected sensor networks to solve urban issues, improve the standard of living, and upgrade government performance. (Kim et al., 2021) Smart cities develop on the integration of data technologies, being pivotal in the advancement of a sustainable environment. (Al-Turjman et al., 2020) Sustainable development challenges are associated with Internet of Things-enabled smart city governance, and thus sustainable, groundbreaking, and nondiscriminatory urban environments are needed. (Trindade Neves et al., 2020) Networked and integrated sustainable urban technologies have configured smart ecosystems where public services are automated and can be monitored, handled, and accessed remotely by use of smart interconnected devices. (Ahad et al., 2020) Big data has accelerated the use of data-driven planning technologies in the provision of public services across sustainable urban governance networks. (Löfgren and Webster, 2020) Integrated smart city planning and management enable heterogeneous sharing of human and environment contextual data that are instrumental in cognitive computing-based applications. (Park et al., 2019)

3. Methodology and Empirical Analysis

Building our argument by drawing on data collected from Capgemini, CBRE Research, DNV GL, ESI ThoughtLab, ITU, and KPMG, we performed analyses and made estimates regarding how networked and integrated sustainable urban technologies have configured smart ecosystems. The data for this research were gathered via an online survey questionnaire. Descriptive statistics of compiled data from the completed surveys were calculated when appropriate.

4. Study Design, Survey Methods, and Materials

The interviews were conducted online and data were weighted by five variables (age, race/ethnicity, gender, education, and geographic region) using the Census Bureau's American Community Survey to reflect reliably and accurately the demographic composition of the United States.

⬇

Data sources: Capgemini, CBRE Research, DNV GL, ESI ThoughtLab, ITU, and KPMG.
Study participants: 6,300 individuals provided an informed e-consent.

⬇

This survey employs statistical weighting procedures to clarify deviations in the survey sample from known population features, which is instrumental in correcting for differential survey participation and random variation in samples. All data were interrogated by employing graphical and numeric exploratory data analysis methods. Results are estimates and commonly are dissimilar within a narrow range around the actual value. The data was weighted in a multistep process that accounts for multiple stages of sampling and nonresponse that occur at different points in the survey process.

⬇

Test data was populated and analyzed in SPSS to ensure the logic and randomizations were working as intended before launching the survey. To ensure high-quality data, data quality checks were performed to identify any respondents showing clear patterns of satisficing (e.g., checking for high rates of leaving questions blank). Sampling errors and test of statistical significance take into account the effect of weighting. Question wording and practical difficulties in conducting surveys can introduce error or bias into the findings of opinion polls. The sample weighting was accomplished using an iterative proportional fitting process that simultaneously balanced the distributions of all variables. Stratified sampling methods were used and weights were trimmed not to exceed 3. Average margins of error, at the 95% confidence level, are +/-2%. The design effect for the survey was 1.3. For tabulation purposes, percentage points are rounded to the nearest whole number. The cumulative response rate accounting for non-response to the recruitment surveys and attrition is 2.5%. The break-off rate among individuals who logged onto the survey and completed at least one item is 0.2%.

⬇

The precision of the online polls was measured using a Bayesian credibility interval. Confirmatory factor analysis was employed to test for the reliability and validity of measurement instruments. Addressing a significant knowledge gap in the literature, the research has complied with stringent methodology, reporting, and data analysis requirements.

Flow diagram of study procedures

5. Statistical Analysis

Multivariate analyses, and not univariate associations with outcomes, are more likely to factor out confounding covariates and more precisely determine the relative significance of individual variables. Independent *t*-tests for continuous variables or chi-square tests for categorical variables were employed. Descriptive analyses (mean and standard deviations for continuous variables and counts and percentages for categorical variables) were used. Descriptive statistical analysis and multivariate inferential tests were undertaken for the survey responses and for the purpose of variable reduction in regression modeling.

⬇

Mean and standard deviation, *t*-test, exploratory factor analysis, and data normality were inspected using SPSS. To ensure reliability and accuracy of data, participants undergo a rigorous verification process and incoming data goes through a sequence of steps and multiple quality checks. Descriptive and inferential statistics provide a summary of the responses and comparisons among subgroups. AMOS-SEM analyzed the full measurement model and structural model.

⬇

An Internet-based survey software program was utilized for the delivery and collection of responses. Panel research represents a swift method for gathering data recurrently, drawing a sample from a pre-recruited set of respondents. Behavioral datasets have been collected, entered into a spreadsheet, and cutting-edge computational techniques and empirical strategies have been harnessed for analysis. Groundbreaking computing systems and databases enable data gathering and processing, extracting meaning through robust deployment. Non-response bias and common method bias, composite reliability, and construct validity were assessed.

Flow diagram of statistical parameters and reproducibility

6. Results and Discussion

Internet of Things sensing infrastructures are pivotal in gathering massive volumes of data through sensor devices to supply precise decision-making recommendations (Andrei et al., 2016; Kliestik et al., 2021; Lyons and Lăzăroiu, 2020; Pricina, 2020) in smart sustainable city governance and management by use of machine learning-based analytics. (Teng et al., 2021) Neurocomputational cognitive systems cover how citizens are reconfigured in smart cities. (Williamson, 2017) Huge data streams are produced by networked devices by harnessing integrated sustainable urban technologies, thus enabling the analysis automation of acquired data in smart and environmentally sustainable cities. (Cao and Wachowicz, 2019) (Tables 1–6)

Table 1 Smart technologies can combat crime and increase public safety. (%, relevance)

Big data and artificial intelligence for real-time facial recognition, license plate scanning, crowd-sourcing apps, as well as predictive policing tools to anticipate where and when crimes may occur.	92
Drones for search and rescue missions, viewing hostage situations, monitoring fires and automobile accidents, and tracking down escaped criminals.	90
Acoustic sensors to alert police departments when a gunshot is fired.	89
Body cameras for police to keep both officers and the public accountable during interactions, and to photograph evidence or record interviews.	88
Smart street lighting to detecting gunshots and show whether pedestrians and vehicles are approaching.	87

Sources: ESI ThoughtLab; our survey among 6,300 individuals conducted April 2021.

Table 2 Smart cities manage to cohesively leverage and invest in their physical, social and technology infrastructure to fuel sustainable economic growth and a high quality of life for its citizens (%, relevance)

A smart city harnesses emerging technologies such as the Internet of Things, artificial intelligence, machine learning and big data in order to make it more liveable, workable and sustainable.	96
Planning for resilience requires robust evidence based on real-time, local data. Significant investment in IoT projects is needed as governments and organisations across the world seek to manage, monitor and automate operations remotely.	94
Ubiquitous connectivity is the backbone for a productive, sustainable and resilient city.	93
Connectivity networks support the diverse spectrum of activities that have been forced to rapidly shift to online and are critical to enable the continued operations of essential services.	93
If not adequately secured, the IoT devices and the data that are available from smart cities could be targeted to affect the confidentiality of citizens' information.	91
The true power of a city's diverse data streams can only be unlocked when the data is integrated, analysed and transformed.	93
Communicating data in accessible formats enables communities to make better decisions and empowers them to engage in the co-creation of cities.	92
Advanced technologies are comprehensively transforming the urban fabric of cities via the instrumentation, measurement and collection of data from potentially every physical thing within a city, assisting in making better, faster decisions, automating processes and enabling prediction of future events, and leading to improved city services such as better waste management, efficient transportation, as well as more closely monitored and improved food and water supplies, and better air quality.	90

Sources: KPMG; our survey among 6,300 individuals conducted April 2021.

Table 3 Which technologies does your city use to support its operations? (%, relevance)

Cloud-based technology	97
Internet of Things/Sensors/Wearables	94
Mobile apps	93
Biometrics/Facial recognition	88
Chatbots/Natural language processing	84
Artificial intelligence/Machine learning	56
Augmented and virtual reality	54
Smart beacons/Near field communication	49
Drones and robots	42
Blockchain	31

Sources: ESI Thought Lab; CBRE Research; our survey among 6,300 individuals conducted April 2021.

Table 4 Key drivers for smart cities (%, relevance)

Technology-enabled smart city initiatives will help to make my city more sustainable.	93
Technology-enabled smart city initiatives will help my city improve the quality of urban services in my city.	90

Sources: Capgemini; our survey among 6,300 individuals conducted April 2021.

Table 5 Barriers to smart green city initiatives (%, relevance)

Funding	84
Technical expertise	81
Staffing	78
Limited support of utilities	75
Political support/will	73
Lack of plan/roadmap of how to start	72
Bureaucratic issues	71

Sources: DNV GL; our survey among 6,300 individuals conducted April 2021.

Smart cities are cognitive environments in which residents are configured computationally as regards neurobiological adjustability and disposition to algorithmic optimization. (Williamson, 2017) Massive volumes of interconnected devices are embedded into fabric of data-driven smart sustainable cities, furthering operational performance and planning. (Cao and Wachowicz, 2019) Increase in collected data across Internet of Things-enabled smart cities necessitates considerable resources for cloud storage by use of sensor-based big data applications. (Ismagilova et al., 2019) Smart cities require integrated smart city planning and management in handling and enhancing the intricacy of urban living. (Trindade Neves et al., 2020) Digitally-oriented big data routines gather, manage, mine, store, process, and analyze large sets of information (Andronie et al., 2021a, b; Konhäusner et al., 2021a, b; Mircică, 2020; Sawyer et al., 2020) through machine learning-based analytics in sustainable urban governance networks. (Löfgren and Webster, 2020)

Table 6 Smart technologies provide opportunities to collect detailed information about the city, the people in it, and how it is functioning. (%, relevance)

If smart cities are developed based on needs, they can provide public services that are more efficient, effective and personalized.	96
Widespread technology and software deployment will become key to managing cities. Technologies that collect and analyze data, as well as communicate between city actors and infrastructure, can automatically and rapidly respond to situations in the city.	96
Smart interventions in a city may entail installing new infrastructure, like smart lighting along city streets, or a new software system, such as an automated voice system to respond to queries coming to the city's helpdesk.	95
For cities that are starting to become smarter it makes sense to begin with simple interventions and to use the experience to develop capacities, processes and institutional knowledge that can be leveraged for more complex interventions over time.	95
Harnessing simple, smart solutions, taking advantage of technological development such as artificial intelligence, machine learning, mobile computing, cloud computing and Internet of Things, can help cities to better understand their problems, to design and test smart interventions, to track in real-time the impact of those interventions, to scale up the things that work and to quickly put an end to those that don't.	94
Smart solutions are inhibited by organizational structures and cultures at odds with principles of collaboration, agility, accessibility, dynamism, transparency, openness, simplicity, and people empowerment.	94
A smart city is an urban innovation ecosystem that effectively manages its own development by innovating constantly in aspects of city management and operations as well as in the ways that the city is occupied and used by residents and visitors.	94
A good starting point for cities that aspire to being smarter is to focus on their administration and internal capacity, to harness technology to improve what they do, and in the process to develop internal capacity and understanding of the potential of smart technologies and data.	93
By exploring ways to improve administrative functions, city employees can learn more about the capabilities of smart technologies and can use their own experience and deep knowledge of administration to good effect.	93
Cloud services are useful for cities because infrastructure can be added and removed flexibly, simplifying procurement and reducing costs.	94
By digitizing and automating city administration, cities can improve on their internal processes. Electronic workflows are more consistent, can be monitored for efficiency, and documentation cannot be lost along the way.	94
Digital processes generate data along the way: not only will the city have records in electronic form, but data about how many applications are received, how fast they are processed, and the results can be used to monitor the effectiveness of city processes and to improve them over time.	95
Smart interventions have tackled many environmental problems, from managing energy and water supply and demand, to waste collection and air quality monitoring: smart technologies allow the collection and analysis of data that improves understanding of the problems and the effectiveness of the solutions.	93
Smart Internet of Things devices can be used as environmental sensors to monitor dust, air pollution, odors, noise, humidity, weather and radiation levels. Environmental monitoring solutions also enable the observation, control, and sustainable management of infrastructure for power supply, air quality, recycling, waste management, water and sewerage.	93

Cities need to be concerned with cleaner transport, energy efficient buildings, clean power generation, the energy sources used in homes, industrial waste and better municipal waste management, all of which will contribute to better air quality.	92
Smart technologies enable cities to effectively connect their inhabitants to each other, connecting both their human intelligence and their smart devices, and collecting data from residents about what city services they use and how, i.e., input used to inform city planning.	93
Smart lighting not only provides light, and manages the cost and energy consumption involved, it can also turn street-lights into an intelligent resource providing services such as Internet access, environmental sensors, crime detection and traffic monitors.	91
Smart solutions can assist in optimizing the use of existing parking space by directing drivers to vacant spaces using apps that show pricing, distance, popularity, and number of remaining spaces. For cities and private companies that operate parking lots, smart solutions can be used to improve revenue collection through the use of license plate recognition, e-ticketing, and the automated recording of parking time.	92
Smart technologies give cities new tools for taking preventive measures, responding to emergencies, and planning for longer-term sustainability and growth.	93
Smart tools that improve what cities know about their current state as well as real-time information that helps cities to observe the impact of interventions as they happen, better equip cities for absorbing shocks and to find effective adaptation and recovery solutions faster.	91

Sources: ITU; our survey among 6,300 individuals conducted April 2021.

Big data collected from citizens' inputs should be handled efficiently as machine learning-based analytics optimizes the level of responsive governance in smart cities. (Kim et al., 2021) Big data have to be integrated across Internet of Things sensing infrastructures with data-driven planning technologies to improve citizen and device networking. (Ismagilova et al., 2019) Heterogeneous data generated throughout the urban ecosystem are essential in smart sustainable city governance and management and in identifying knowledge-based solutions in smart and environmentally sustainable cities. (Trindade Neves et al., 2020) Sensors and actuators are embedded in smart interconnected devices that enable streamlined decision making, microcontrollers being programmed to operate automatically based on the collected data in integrated smart city planning and management. (Ahad et al., 2020) Sustainable governance networks constitute the infrastructure of Internet of Things-enabled smart cities. (Löfgren and Webster, 2020) Smart cities generate massive volumes of data streams that reconfigure cognitive computing-based solutions as computationally networked urbanism. (Park et al., 2019) Smart city software systems are shifting the activity of citizens from physical realm to cyberspace. (Kumari et al., 2020) Smart equity may empower citizens as end-users in urban areas typified by sustainable urban governance networks. (Han and Kim, 2021) Internet of Things platforms facilitate smart city initiatives, enhancing the standard of living by use of networked and integrated sustainable urban technologies. (Fahmideh and Zowghi, 2020)

7. Conclusions, Implications, Limitations, and Further Research Directions

Smart urban governance articulates a context-based, sociotechnical manner of administering Internet of Things-enabled smart cities. (Jiang, 2021) In smart cities, data technologies are integrated across Internet of Things sensing infrastructures (Franklin and Potcovaru, 2021; Lăzăroiu et al., 2017; Pop et al., 2021; Valaskova et al., 2021) by harnessing sensor-based big data applications. (Ahad et al., 2020) Smart cities develop on massive volumes of data generated by Internet of Things-based connected sensors. (Park et al., 2019) Smart and environmentally sustainable cities rely on networked and integrated sustainable urban technologies (Gordon, 2021; Lăzăroiu et al., 2019; Popescu Ljungholm and Olah, 2020) to increase operational performance across urban Internet of Things systems. (Zvolska et al., 2019) This article focuses only on urban Internet of Things systems and data monitoring algorithms in smart and environmentally sustainable cities. Limitations of this research also include a convenient sample, small sample size, and cross-sectional data collection, thus limiting generalizability. Certain variables were dichotomized because of small cell sizes throughout the analysis. The sample size and the richness of the cohort study dataset enable the control for numerous potential confounders in the multivariable analysis, and provide novel data on the topic. More data gathered either cross-sectionally or longitudinally that utilize larger study populations are required to check and support the conclusions drawn in this study. Further research should consider Internet of Things sensors and digital urban governance in data-driven smart sustainable cities.

Sarah Burke, https://orcid.org/0000-0003-0864-9915
Katarina Zvarikova, https://orcid.org/0000-0001-5278-9275

Research method
Cross-sectional design employing self-report questionnaires.

Data analysis
The gathered data were entered into a spreadsheet and analyzed.

Software information
To process and inspect the collected data, IBM SPSS 24 and AMOS 20 tools were used.

Data and materials availability
All research mentioned has been published and datasets used and inspected during the current study are available from respective outlets. All raw, results, and key source data supporting the conclusions, statistics, models, and codes

generated or used, together with the details of the study design and the procedures for information analysis, are provided with this article. Note: The publisher is not responsible for the content or functionality of any supporting information supplied by the authors. Any queries (other than missing content) should be directed to the corresponding author for the article. Other modeling input assumptions are available on reasonable request.

Compliance with ethical standards

Ethical approval
All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent
The ethical consequences of this research have been carefully considered. Best practices have been respected so as to inform the participants and protect the data and integrity of the interviewees whose participation was voluntary and who were given a plain language document with information as regards the research. The data have been processed in a way that ensures appropriate security of personal data against unauthorized or unlawful processing, accidental loss, destruction or damage, employing appropriate technical or organizational measures. All the information provided by the interviewees has been anonymized for confidentiality reasons. Study participants were informed clearly about their freedom to opt out of the study at any point of time without providing justification for doing so. If a participant began a survey without completing it, that was withdrawal of consent and the data was not used. To prevent missing data, all fields in the survey were required. Any survey which did not reach greater than 50% completion was removed from subsequent analysis to ensure quality. Throughout the research process, the total survey quality approach, designed to minimize error at each stage as thus the validity of survey research would be diminished, was followed. At each step in the survey research process, best practices and quality controls were followed to minimize the impact of additional sources of error as regards specification, frame, non-response, measurement, and processing. Only participants with non-missing and non-duplicated responses were included in the analyses. Individuals who completed the survey in a too short period of time, thus answering rapidly with little thought, were removed from the analytical sample.

Animal studies statement verification
This article does not require animal studies verification.

Code availability

This project has employed statistical analytical techniques standard in all statistical packages.

Funding information

This paper was carried out with support from the Operational Program Integrated Infrastructure 2014–2020 of the project *Research and development of the usability of autonomous aerial drones in the fight against the pandemic caused by COVID-19,* code ITMS 313010ATR9, co-financed by the European Regional Development Fund. The funder had no role in study design, data collection analysis, and interpretation, decision to submit the manuscript for publication, or the preparation and writing of this paper.

Author contributions

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication. The authors take full responsibility for the accuracy and the integrity of the data analysis.

Conflict of interest statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Disclosure by the editors of record

The editors declare no conflict of interest in the review and publication decision regarding this article.

Transparency statement

The authors affirm that the manuscript represents an honest, accurate, and transparent account of the research being reported, that no relevant aspects of the study have been left out, and that any inconsistencies from the research as planned (and, if significant, registered) have been clarified.

Publisher's note

Addleton Academic Publishers remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Acknowledgments

We wish to thank the anonymous reviewers, whose feedback greatly improved the paper.

REFERENCES

Ahad, M. A., Paiva, S., Tripathi, G., and Feroz, N. (2020). “Enabling Technologies and Sustainable Smart Cities,” *Sustainable Cities and Society* 61: 102301. doi: 10.1016/j.scs.2020.102301.

Al-Turjman, F., Zahmatkesh, H., Al-Oqily, I., and Daboul, R. (2020). “Optimized Unmanned Aerial Vehicles Deployment for Static and Mobile Targets’ Monitoring,” *Computer Communications* 149: 27–35. doi: 10.1016/j.comcom.2019.10.001.

Andrei, J.-V., Ion, R. A., Popescu, G. H., Nica, E., and Zaharia, M. (2016). “Implications of Agricultural Bioenergy Crop Production and Prices in Changing the Land Use Paradigm – The Case of Romania,” *Land Use Policy* 50: 399–407. doi: 10.1016/j.landusepol.2015.10.011.

Andronie, M., Lăzăroiu, G., Iatagan, M., Uță, C., Ștefănescu, R., and Cocoșatu, M. (2021a). “Artificial Intelligence-Based Decision-Making Algorithms, Internet of Things Sensing Networks, and Deep Learning-Assisted Smart Process Management in Cyber-Physical Production Systems,” *Electronics* 10(20): 2497. doi: 10.3390/electronics10202497.

Andronie, M., Lăzăroiu, G., Iatagan, M., Hurloiu, I., and Dijmărescu, I. (2021b). “Sustainable Cyber-Physical Production Systems in Big Data-Driven Smart Urban Economy: A Systematic Literature Review,” *Sustainability* 13(2): 751. doi: 10.3390/su13020751.

Cao, H., and Wachowicz, M. (2019). “The Design of an IoT-GIS Platform for Performing Automated Analytical Tasks,” *Computers, Environment and Urban Systems* 74: 23–40. doi: 10.1016/j.compenvurbsys.2018.11.004.

Fahmideh, M., and Zowghi, D. (2020). “An Exploration of IoT Platform Development,” *Information Systems* 87: 101409. doi: 10.1016/j.is.2019.06.005.

Franklin, K., and Potcovaru, A.-M. (2021). “Autonomous Vehicle Perception Sensor Data in Sustainable and Smart Urban Transport Systems,” *Contemporary Readings in Law and Social Justice* 13(1): 101–110. doi: 10.22381/CRLSJ131202110.

Gordon, A. (2021). “Internet of Things-based Real-Time Production Logistics, Big Data-driven Decision-Making Processes, and Industrial Artificial Intelligence in Sustainable Cyber-Physical Manufacturing Systems,” *Journal of Self-Governance and Management Economics* 9(3): 61–73. doi: 10.22381/jsme9320215.

Han, M. J. N., and Kim, M. J. (2021). “A Critical Review of the Smart City in Relation to Citizen Adoption towards Sustainable Smart Living,” *Habitat International* 108: 102312. doi: 10.1016/j.habitatint.2021.102312.

Ismagilova, E., Hughes, L., Dwivedi, Y. K., and Raman, K. R. (2019). “Smart Cities: Advances in Research – An Information Systems Perspective,” *International Journal of Information Management* 47: 88–100. doi: 10.1016/j.ijinfomgt.2019.01.004.

Jiang, H. (2021). “Smart Urban Governance in the ‘Smart’ Era: Why Is It Urgently Needed?,” *Cities* 111: 103004. doi: 10.1016/j.cities.2020.103004.

Kim, B., Yoo, M., Park, K. C., Lee, K. R., and Kim, J. H. (2021). “A Value of Civic Voices for Smart City: A Big Data Analysis of Civic Queries Posed by Seoul Citizens,” *Cities* 108: 102941. doi: 10.1016/j.cities.2020.102941.

Kliestik, T., Belas, J., Valaskova, K., Nica, E., and Durana, P. (2021). “Earnings Management in V4 Countries: The Evidence of Earnings Smoothing and Inflating,” *Economic Research-Ekonomska Istraživanja* 34(1): 1452–1470. doi: 10.1080/1331677X.2020.1831944.

Konhäusner, P., Shang, B., and Dabija, D.-C. (2021a). “Application of the 4Es in Online Crowdfunding Platforms: A Comparative Perspective of Germany and China,” *Journal of Risk and Financial Management* 14(2): 49. doi: 10.3390/jrfm14020049.

Konhäusner, P., Cabrera Frias, M. M., and Dabija, D.-C. (2021b). “Monetary Incentivization of Crowds by Platforms,” *Információs Társadalom* XXI(2): 97–118. doi: 10.22503/inftars.XXI.2021.2.7.

Kumari, K., Singh, J. P., Dwivedi, Y. K., and Rana, N. P. (2020). “Towards Cyberbullying-Free Social Media in Smart Cities: A Unified Multi-Modal Approach,” *Soft Computing* 24: 11059–11070. doi: 10.1007/s00500-019-04550-x.

Lăzăroiu, G., Pera, A., Ștefănescu-Mihăilă, R. O., Mircică, N., and Neguriță, O. (2017). “Can Neuroscience Assist Us in Constructing Better Patterns of Economic Decision-Making?,” *Frontiers in Behavioral Neuroscience* 11: 188. doi: 10.3389/fnbeh.2017.00188.

Lăzăroiu, G., Andronie, M., Uţă, C., and Hurloiu, I. (2019). “Trust Management in Organic Agriculture: Sustainable Consumption Behavior, Environmentally Conscious Purchase Intention, and Healthy Food Choices,” *Frontiers in Public Health* 7: 340. doi: 10.3389/fpubh.2019.00340.

Löfgren, K., and Webster, C. W. R. (2020). “The Value of Big Data in Government: The Case of ‘Smart Cities,’” *Big Data & Society*. doi: 10.1177/2053951720912775.

Lyons, N., and Lăzăroiu, G. (2020). “Addressing the COVID-19 Crisis by Harnessing Internet of Things Sensors and Machine Learning Algorithms in Data-driven Smart Sustainable Cities,” *Geopolitics, History, and International Relations* 12(2): 65–71. doi: 10.22381/GHIR12220209.

Mircică, N. (2020). “Restoring Public Trust in Digital Platform Operations: Machine Learning Algorithmic Structuring of Social Media Content,” *Review of Contemporary Philosophy* 19: 85–91. doi: 10.22381/RCP1920209.

Park, J.-h., Salim, M. M., Jo, J. H., Sapalo Sicato, J. C., Rathore, S., and Park, J. H. (2019). “CIoT-Net: A Scalable Cognitive IoT Based Smart City Network Architecture,” *Human-centric Computing and Information Sciences* 9: 29. doi: 10.1186/s13673-019-0190-9.

Pop, R.-A., Săplăcan, Z., Dabija, D.-C., and Alt, M.-A. (2021). “The Impact of Social Media Influencers on Travel Decisions: The Role of Trust in Consumer Decision Journey,” *Current Issues in Tourism*. doi: 10.1080/13683500.2021.1895729.

Popescu Ljungholm, D., and Olah, M. L. (2020). “Will Autonomous Flying Car Regulation Really Free Up Roads? Smart Sustainable Air Mobility, Societal Acceptance, and Public Safety Concerns,” *Linguistic and Philosophical Investigations* 19: 100–106. doi: 10.22381/LPI1920206.

Pricina, G. N. (2020). “Effects of Leader Approach in the Reconfiguration of Socio-Economic Structures in the Rural Area,” *Journal of Community Positive Practices* 20(2): 3–10. doi: 10.35782/JCPP.2020.2.01.

Sawyer, J., Kral, P., Durana, P., and Suler, P. (2020). "Algorithmic Compatibility: Love, Intimacy, and Pleasure on Geosocial Dating Apps," *Journal of Research in Gender Studies* 10(1): 94–100. doi: 10.22381/JRGS101202010.

Teng, H., Dong, M., Liu, Y., Tian, W., and Liu, X. (2021). "A Low-Cost Physical Location Discovery Scheme for Large-Scale Internet of Things in Smart City through Joint Use of Vehicles and UAVs," *Future Generation Computer Systems* 118: 310–326. doi: 10.1016/j.future.2021.01.032.

Trindade Neves, F., de Castro Neto, M., and Aparicio, M. (2020). "The Impacts of Open Data Initiatives on Smart Cities: A Framework for Evaluation and Monitoring," *Cities* 106: 102860. doi: 10.1016/j.cities.2020.102860.

Valaskova, K., Durana, P., and Adamko, P. (2021). "Changes in Consumers' Purchase Patterns as a Consequence of the COVID-19 Pandemic," *Mathematics* 9(15): 1788. doi: 10.3390/math9151788.

Williamson, B. (2017). "Computing Brains: Learning Algorithms and Neurocomputation in the Smart City," *Information, Communication & Society* 20(1): 81–99. doi: 10.1080/1369118X.2016.1181194.

Zvolska, L., Lehner, M., Palgan, Y. V., Mont, O., and Plepys, A. (2019). "Urban Sharing in Smart Cities: The Cases of Berlin and London," *Local Environment* 24(7): 628–645. doi: 10.1080/13549839.2018.1463978.