

Cities 4.0 Research Trend

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Abstract

A digital city is a result of the development of a city through a technology-based or digital platform. This research is conducted descriptively based on scopus.com data, where researchers obtained 586 documents over the last ten years (2012-2021). The analysis process uses (1) research country documents, (2) affiliation documents, (3) affiliation documents, and (4) funding sponsor documents. From the results and discussion, researchers find that (1) The United States has the most digital city research articles over the last ten years (2012-2021), followed by China and the United Kingdom. (2) The University with the most research articles on digital cities over the last ten years (2012-2021) is Pontificia Universidade Catolica do Parana (Brazil), followed by Universidade de Sao Paulo - U.S.P. (Brazil), The University of Sydney (Australia), and the University of Illinois at Chicago (U.S.). (3) The field of social studies has been a favorite of research articles on digital cities for the last ten years (2012-2021), followed by the field of computer science and engineering. Finally, (4) the National Natural Science Foundation of China has the most research funding sponsors in digital cities over the past ten years (2012-2021), followed by the European Commission and U.K. Research and Innovation. Digital city research is the future of the world.

Keywords

Digital city, digital platforms, social studies, computer science

1. Introduction

A digital city is a result of the development of a town through a technology-based or digital platform. This research is conducted descriptively based on scopus.com data, where researchers obtained 586 documents over the last ten years (2012-2021). Scopus data covers more than 7,000 publishers, 12,751 serial titles, 82 million items, 80,000 affiliate profiles, 17 million author profiles, and 1.7 billion references cited since 1970. Authors and researchers can find trends and collaborators by analyzing thousands of search results with only one click. Scopus helps researchers succeed with common research workflows. The four main tools of Scopus analysis are Results Analysis, View Citation Overview, Search Sources & Compare Journals, and Scopus Profile – Author output analysis (M.I. Setiawan, Abdullah, Lestari, & Yuniningsih, 2019b).

2. Literature Review

The literature used is based on the 2020 research, namely Ikhsan Setiawan et al. (2020) "Sustainable Mobility, Maritime, Airports, and Local Government Revenue and Expenditures (APBD)," Ikhsan Setiawan, et al. (2020) "City G.D.P., Transport, and Warehousing that are Sustainable," Ikhsan Setiawan, et al. (2020) "Sustainable mobility, development of integrated public transportation technology 4.0 GIS supports regional development,"

Ikhsan Setiawan, et al. (2020) "Revitalization of T.P.A. Banjardowo, Jombang to improve the quality of life of the community," and Ikhsan Setiawan, et al. (2020) "Impact of infrastructure in improving health, education, and society to improve the quality of human resources in Ngawi."

In addition, this research is also based on the research paper of Ikhsan Setiawan, et al. (2019) "Examining the mediating role of environmental performance and green purchasing between environmentally friendly designs and green information systems with performance, supported renewable energy," Ikhsan Setiawan, et al. (2019) "Supply chain and sustainable fisheries development of portable solar cold storage house technology in Indonesia, bibliometric analysis," Ikhsan Setiawan, et al. (2019) "Research trends in fish cell and solar cell technology," Ikhsan Setiawan, et al. (2019) "Research on sustainable mobility and transportation in Indonesia," Ikhsan Setiawan, et al. (2019) "Mediated the role of competitive advantage between customer relationships, supply chain collaboration value innovation and supply chain capabilities and supply chain performance: Manufacturing industry supports sustainable mobility in Indonesia," Ikhsan Setiawan, et al. (2019) "Airports, passengers and aircraft that support regional growth," and Ikhsan Setiawan, et al. (2019) "Indonesian airports, passengers and planes have an impact on the APBD."

Furthermore, this study also refers to the research paper of Ikhsan Setiawan, et al. (2018) "The Correlations between Airport Sustainability and Indonesia's Economic Growth," Ikhsan Setiawan, et al. (2018) "E-Business, Airport Development and Its Impact on Improving Communication Development Information in Indonesia," Ikhsan Setiawan, et al. (2018) "E-Business, Impact of Regional Growth on Increasing Information and Communication Development," Ikhsan Setiawan, et al. (2018) "E-Business, Impact of Regional Government Development (APBD) Information Development and Communications in Indonesia," Ikhsan Setiawan, et al. (2018), "A Model for Development of Airport Area Business Centers in Supporting Airport Sustainability in Indonesia," Ikhsan Setiawan, et al. (2018), "Portable inflated solar power cold storage house technology as a means of supporting the improvement of production and marketing of fishery products," Ikhsan Setiawan, et al. (2018) "Analysis of Airport Sustainability Correlation and Local Government Budgets." and Ikhsan Setiawan, et al. (2018) "Inflated Portable Cold Storage House with Solar Cells as a facility to support fishery production and marketing". Researchers received information that sustainable city development in the port and airport area by integrating public transportation and supporting facilities to improve environmental quality is growing, especially in East Java.

3. Methods and Data Collection

A digital city is a result of the development of a town through a technology-based or digital platform. This research is conducted descriptively based on scopus.com data, where researchers obtained 586 documents over the last ten years (2012-2021). Scopus data covers more than 7,000 publishers, 12,751 serial titles, 82 million items, 80,000 affiliate profiles, 17 million author profiles, and 1.7 billion references cited since 1970. Authors and researchers can find trends and collaborators by analyzing thousands of search results with only one click. Scopus helps researchers succeed with common research workflows. The four main tools of Scopus analysis are Results Analysis, View Citation Overview, Search Sources & Compare Journals, and Scopus Profile – Author output analysis. (M.I. Setiawan, Abdullah, Lestari, & Yuniningsih, 2019b). The analysis process, using: (1) research country documents; (2) affiliation documents; (3) affiliation documents; and (4) funding sponsor documents.

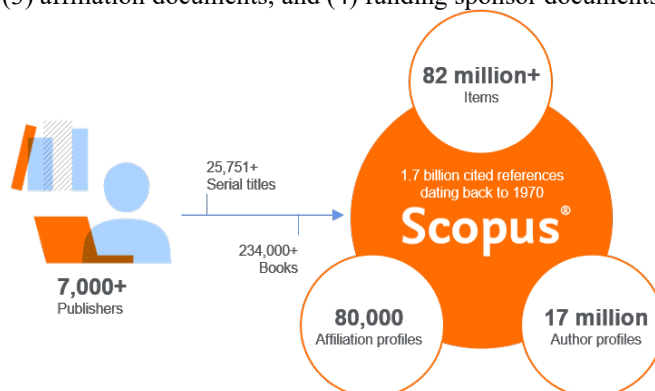


Figure 1. SCOPUS.COM profiles

Figure 1 above shows the SCOPUS.COM profile.

4. Results and Discussion

First, the results obtained are in the form of research country documents, namely the United States with 95 documents, China 70, the United Kingdom 49, Italy 37, Brazil 35, Spain 30, Russian Federation 29, Australia 23, Germany 23, Canada 22, and the Netherlands 21 documents. The United States has the most research articles on digital cities over the past ten years (2012-2021), followed by China and the United Kingdom.

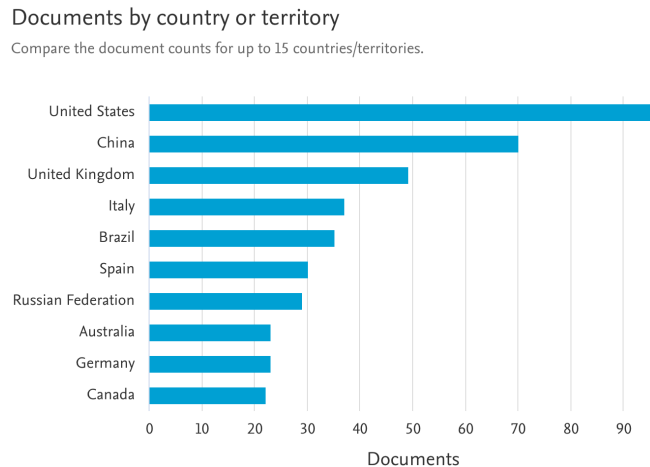


Figure 2. the documents of the research country

Figure 2 above shows the SCOPUS.COM the documents of the research country about Digital Cities Research.

Second, the results obtained are in the form of affiliation documents. Pontificia Universidade Catolica do Parana (Brazil) 12 documents, Universidade de Sao Paulo - U.S.P. (Brazil) 6, The University of Sydney (Australia) 6, the University of Illinois at Chicago (U.S.A.) 6, Uniwersytet im. Adama Mickiewicza w Poznaniu (Poland) 5, Texas A&M University (USA) 5, Universidad Complutense de Madrid (Spain) 5, University of Ottawa (Canada) 5, University of Wuhan (China) 5, Universidad Nacional Autónoma de Mexico 5. Pontificia Universidade Catolica do Parana (Brazil) has the most research articles on digital cities over the past ten years (2012-2021), followed by Universidade de Sao Paulo - U.S.P. (Brazil), The University of Sydney (Australia), and the University of Illinois at Chicago (U.S.A).

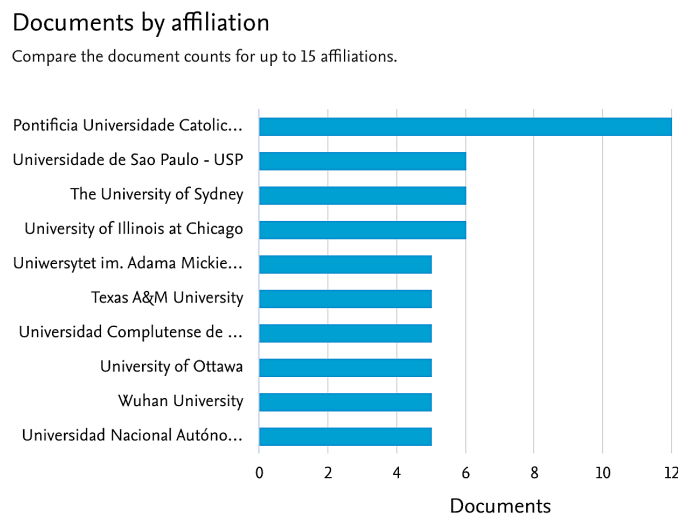


Figure 3. the documents of the affiliation

Figure 3 above shows the SCOPUS.COM the documents of the affiliation about Digital Cities Research.

Third, the results obtained are in the form of documents in the field of study. Social Sciences 247 documents, Computer Science 239, Engineering 185, Arts and Humanities 79, Business, Management, and Accounting 61,

Earth and Planetary Sciences 58, and Environmental Sciences 52. The field of social studies has become a favorite research article on digital cities for the past ten years. (2012-2021), followed by the field of study in Computer Science and Engineering.

Documents by subject area

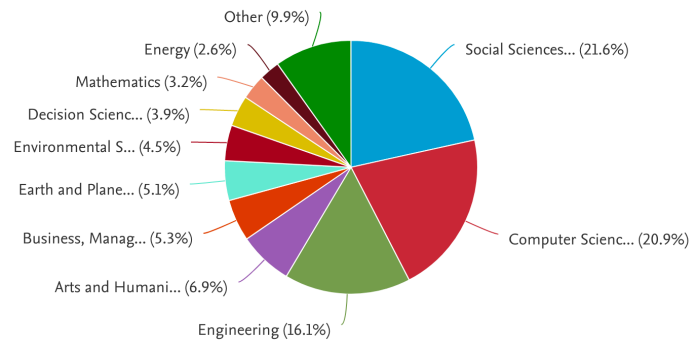


Figure 4. the documents of the subject area

Figure 4 above shows the SCOPUS.COM the documents of the subject area about Digital Cities Research.

Finally, the results obtained are in the form of funding sponsor documents. Researchers found 13 documents from the National Natural Science Foundation of China, European Commission 11, U.K. Research and Innovation 11, Engineering and Physical Sciences Research Council 8, Conselho Nacional de Desenvolvimento Científico e Tecnológico 7, National Science Foundation 7, Horizon 2020 Framework Program 6, Ministério da Ciência, Tecnologia e Inovação 6, Ministry of Education, Culture, Sports, Science and Technology 5, and Russian Foundation for Basic Research 5. China's National Natural Science Foundation has sponsored the most research funding in digital cities during the last ten years (2012-2021), followed by the European Commission and U.K. Research and Innovation.

Documents by funding sponsor

Compare the document counts for up to 15 funding sponsors.

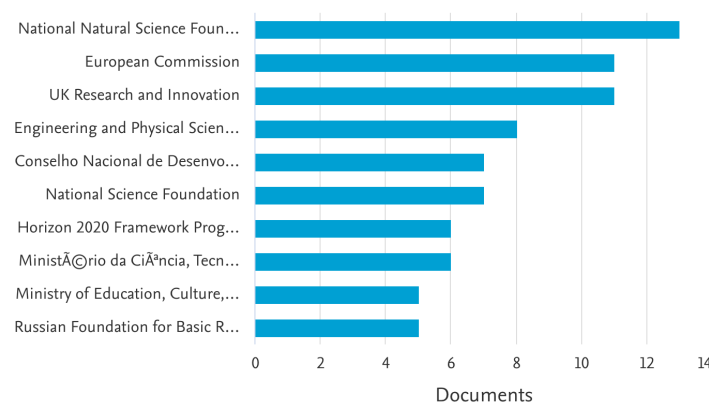


Figure 5. the documents of the funding sponsor

Figure 5 above shows the SCOPUS.COM the documents of the funding sponsor about Digital Cities Research.

5. Conclusion

Digital city is the development of cities through technology-based or digital platforms. This research was conducted descriptively based on SCOPUS.COM data, obtained 586 documents over the last ten years (2012-2021). Analysis using: (1) the documents of the research country; (2) the documents of the affiliation; (3) the documents of the affiliation; and (4) the documents of the funding sponsor. From the results and discussion, researchers find that (1)

The United States has the most digital city research articles over the last ten years (2012-2021), followed by China and the United Kingdom. (2) The University with the most research articles on digital cities over the last ten years (2012-2021) is Pontificia Universidade Catolica do Parana (Brazil), followed by Universidade de Sao Paulo - U.S.P. (Brazil), The University of Sydney (Australia), and the University of Illinois at Chicago (U.S.). (3) The field of social studies has been a favorite of research articles on digital cities for the last ten years (2012-2021), followed by the field of computer science and engineering. Finally, (4) the National Natural Science Foundation of China has the most research funding sponsors in digital cities over the past ten years (2012-2021), followed by the European Commission and U.K. Research and Innovation. Digital city research is the future of the world.

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References

- Ikhsan Setiawan, M, Dhaniari, I., Hasyim, C., . Y., Abdullah, D., Nugraheni Sri Lestari, V., Mulyo Utomo, W., Sukoco, A., Wiwoho Mudjanarko, S., Alimudin, A., Harmanto, D., & Saleh Ahmar, A. (2018). Inflated Portable Cold Storage House with Solar Cells as facilities to support the fisheries production and marketing. *International Journal of Engineering & Technology*, 7(2), 323–326. <https://doi.org/10.14419/ijet.v7i2.6.11703>
- Ikhsan Setiawan, Muhammad, Durrotun Nasihien, R., Mohammad Razi, M. A., & Ting, I.-H. (2020). Sustainable Mobility, Maritime, Airport, and Regional Government Revenue and Expenditure (APBD). *I.O.P. Conference Series: Earth and Environmental Science*, 498, 012111. <https://doi.org/10.1088/1755-1315/498/1/012111>
- Ikhsan Setiawan, Muhammad, Sukoco, A., Harmanto, D., Halim, P., Mursidi, A., & Ting, I.-H. (2020). Sustainable Cities, Transportation and Warehousing G.D.P. *I.O.P. Conference Series: Earth and Environmental Science*, 498, 012112. <https://doi.org/10.1088/1755-1315/498/1/012112>
- Setiawan, M.I., Nasihien, R.D., Razi, M. A. B. M. (2020). Sustainable mobility, development of integrated public transportation technology 4.0 gis supports regional development. *Proceedings of the International Conference on Industrial Engineering and Operations Management Detroit, Michigan, U.S.A.*, 3919–3926.
- Setiawan, M.I., Rahayu, T. (2020). Revitalization of the final disposal place of Banjardowo, Jombang, to improve the community's quality of life. *Proceedings of the International Conference on Industrial Engineering and Operations Management Detroit, Michigan, U.S.A.*, 3934–3940.
- Setiawan, M.I., Sulandrianingrum, K. N. (2020). The impact of infrastructure in improving health, education, and community increases the quality of human resources in Ngawi. *Proceedings of the International Conference on Industrial Engineering and Operations Management Detroit, Michigan, U.S.A.*
- Setiawan, M.I., Abdullah, D., Lestari, V. N. S., & Yuniningsih. (2019a). Examining the mediating role of environmental performance and green purchasing between green eco-design and green information systems with performance, supporting renewable energy—*International Journal of Supply Chain Management*, 8(6).
- Setiawan, M.I., Abdullah, D., Lestari, V. N. S., & Yuniningsih. (2019b). Supply chain and sustainable fisheries development of portable inflated solar power cold storage house technology in Indonesia, bibliometric analysis. *International Journal of Supply Chain Management*, 8(6).
- Setiawan, M.I., Abdullah, D., Lestari, V. N. S., Yuniningsih, & Bon, A. T. (2019). Fish and solar cell technology research trend. *Proceedings of the International Conference on Industrial Engineering and Operations Management, November*.
- Setiawan, M.I., Dhaniarti, I., Utomo, W. M., Sukoco, A., Mudjanarko, S. W., Hasyim, C., Prasetijo, J., Kurniasih, N., Wajdi, M. B. N., Purworusmiardi, T., Suyono, J., Sudapet, I. N., Nasihien, R. D., Wulandari, D. A. R., Ade, R. T., Atmaja, W. M. T., Sugeng, & Wulandari, A. (2018). The Correlations between Airport Sustainability and Indonesian Economic Growth. *IOP Conference Series: Earth and Environmental Science*, 140(1). <https://doi.org/10.1088/1755-1315/140/1/012089>
- Setiawan, M.I., Hasyim, C., Kurniasih, N., Abdullah, D., Napitupulu, D., Rahim, R., Sukoco, A., Dhaniarti, I., Suyono, J., Sudapet, I. N., Nasihien, R. D., Wulandari, D. A. R., Reswanda, Mudjanarko, S. W., Sugeng, & Wajdi, M. B. N. (2018a). E-Business, Airport Development and Its Impact on the Increasing of Information of Communication Development in Indonesia. *Journal of Physics: Conference Series*, 1007(1). <https://doi.org/10.1088/1742-6596/1007/1/012046>
- Setiawan, M.I., Hasyim, C., Kurniasih, N., Abdullah, D., Napitupulu, D., Rahim, R., Sukoco, A., Dhaniarti, I., Suyono, J., Sudapet, I. N., Nasihien, R. D., Wulandari, D. A. R., Reswanda, Mudjanarko, S. W., Sugeng, & Wajdi, M. B. N. (2018b). E-Business, the impact of regional growth on the improvement of Information and

- Communication Development. *Journal of Physics: Conference Series*, 1007(1). <https://doi.org/10.1088/1742-6596/1007/1/012044>
- Setiawan, M.I., Hasyim, C., Kurniasih, N., Abdullah, D., Napitupulu, D., Rahim, R., Sukoco, A., Dhaniarti, I., Suyono, J., Sudapet, I. N., Nasihien, R. D., Wulandari, D. A. R., Reswanda, Mudjanarko, S. W., Sugeng, & Wajdi, M. B. N. (2018c). E-Business, the impact of the Regional Government Development (APBD) on Information and Communication Development in Indonesia. *Journal of Physics: Conference Series*, 1007(1). <https://doi.org/10.1088/1742-6596/1007/1/012045>
- Setiawan, M.I., Mohammad Razi, M. A. B., Nasihien, R. D., & Bon, A. T. (2019). Sustainable mobility and transportation research in Indonesia. *Proceedings of the International Conference on Industrial Engineering and Operations Management*, November.
- Setiawan, M.I., Nasihien, R. D., & Razi, M. A. B. M. (2019). Mediating role competitive advantage between customer relationship, supply chain, which collaborates value innovation and supply chain capability, and supply chain performance: Manufacturing industry-supported sustainable mobility in Indonesia. *International Journal of Supply Chain Management*, 8(6).
- Setiawan, M.I., Surjokusumo, S., Ma'Soem, D. M., Johan, J., Hasyim, C., Kurniasih, N., Sukoco, A., Dhaniarti, I., Suyono, J., Sudapet, I. N., Nasihien, R. D., Mudjanarko, S. W., Wulandari, A., Ahmar, A. S., & Wajdi, M. B. N. (2018). Business Centre Development Model of Airport Area in Supporting Airport Sustainability in Indonesia. *Journal of Physics: Conference Series*, 954(1). <https://doi.org/10.1088/1742-6596/954/1/012024>
- Setiawan, M I, Ade, R. T., & Harmanto, D. (2018). *Portable inflated solar power cold storage house technology as a supporting facility to increase the production and marketing of fishery fishers. 2018-March*, 1191–1192. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85051538874&partnerID=40&md5=9034042cc0a773cfe4a60edb01b143cd>
- Setiawan, M I, Sukoco, A., Halim, P., Hermanto, D., Bin Bon, A. T., Wan Ibrahim, M. H., Mohammad Razi, M. A., Othman, N. B., Bin Juki, M. I., Bin Mohd Ali, A. Z., & Utomo, W. M. (2019). Airport, passengers, and aircraft are supporting regional growth. *Proceedings of the International Conference on Industrial Engineering and Operations Management*, 1(M.A.R.), 1759–1761. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85067254447&partnerID=40&md5=6e40269aa4760da49c96cef24c6c75c6>
- Setiawan, M I, Sukoco, A., Mudjanarko, S. W., Nasihien, R. D., Suyono, J., Hermanto, D., Bin Bon, A. T., & Ibrahim, M. H. W. (2019). Indonesia airport, passenger, and aircraft impact on regional budget (APBD). *Proceedings of the International Conference on Industrial Engineering and Operations Management*, 1(M.A.R.), 1752–1753. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85067235786&partnerID=40&md5=5b345595b49130ff73bbea0a0334b8f6>
- Setiawan, M Ikhsan, Dhaniarti, I., Hasyim, C., T Atmaja, W. M., Sugeng, S., Mulyo Utomo, W., Sukoco, A., Mudjanarko, S. W., Suyono, J., Sudapet, I. N., Durrotun Nasihien, R., Wulandari, D. A. R., T Ade, R., Prasetijo, J., Kurniasih, N., & Wajdi, M. B. N. (2018). Correlations Analysis of Airport Sustainability and Local Government Budget. *International Journal of Integrated Engineering*, 10(2), 71–76. <https://doi.org/10.30880/ijie.2018.10.02.014>

Biographies

Muhammad Ikhsan Setiawan received his Bachelor of Civil Engineering (1998) from Universitas Merdeka, Malang, Indonesia, and Master of Civil Engineering (2000) from Universitas Indonesia before pursuing Doctor of Philosophy (Civil Engineering) at Universitas Tarumanagara, Indonesia (2018). He is currently an Assistant Professor at the Faculty of Civil Engineering, Narotama University, Indonesia, and registered as Engineer Expert Certified. He currently leads a research team in Sustainable and Digital for Transportation, Tourism and Regional Economic, a grant from the Ministry of Education, Indonesia. His research interests include Smart City and Sustainability. He is also a Chairman of WORLD CONFERENCE. I.D., IPEST commerce, SONGSONG ridt, member of IEEE, editors, and reviewers some Journal indexed in SCOPUS, DOAJ, CROSSREF, and GOOGLE, also until now as Vice-Rector of Narotama University, Indonesia.

Ronny Durrotun Nasihien is an Assistant Professor at Faculty of Engineering, Universitas Narotama, Surabaya Indonesia. Bachelor of Architecture from Institut Teknologi Adhi Tama Surabaya, Indonesia (1997), Master of GIS in Institut Teknologi Sepuluh Nopember, Surabaya, Indonesia (2011) and Doctoral of Management Business in

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Agus Sukoco is an Assistant Professor at the Faculty of Economics and Business, Universitas Narotama, Surabaya, Indonesia. Bachelor of Marine Engineering in faculty naval engineering from Institut Teknologi Sepuluh Nopember (1996), Master of Management Business in Narotama University (2006), and Doctoral of Management Business in STESIA Indonesia (2021). He has been recognized as a professional management business consultant with over 18 years of experience working with closely-held businesses. He is also Editor in Chief of IJEBD International Journal of Entrepreneurship and Business Development, indexed International DOAJ, as Head of Department Management, Narotama University, Indonesia.

Firman Aditya earned a Bachelor's degree in Civil Engineering (1992) from the Sepuluh Nopember Institute of Technology (ITS), Surabaya, Indonesia, and a Master of Business Administration in Finance (1994) from Hawaii Pacific University, Honolulu, Hawaii, U.S.A. He is currently working as a Lecturer at the Faculty of Economics and Business, Narotama University, Indonesia. His research interests include Management, Finance, and Business.

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Che Zalina Zulkifli (Universiti Pendidikan Sultan Idris) is a Professor in the Computing Department, Faculty of Arts, Computing and Creative Industry at Sultan Idris Education University, Malaysia. She had over 22 years of professional teaching experience as a lecturer and active researcher in Electronics & Electrical Engineering, I.O.T., Embedded System, and Wireless Sensor Network. Her research projects have collaborated with multinational company which contributes to a network that leads to new ideas and concrete research projects. The developed automation projects that focused on Automation, IoT, and Wireless Communication fields have been successfully adopted by the industry to date. A total of more than 3 million Ringgit has been generated as an income to the University mainly from the Research grant, Commercialization of innovative research products, and the services as a principal consultant. Expertise in the agriculture sector with a new invention to improve crop production adopted high technology. Sincerely dedicated to the very wise in the green project, she was appointed by Seberang Perai City Council as a Project Leader for the Edu-Green Centre located in Seberang Perai, Penang, Malaysia, which is an active site for green technology hub.

Muhammad Isradi, born in Kandangan on 18 August 1972. He is the secretary of the Civil Engineering Department at Mercu Buana University. He earned a degree in Civil Engineering from Universitas Muhammadiyah Malang in 1998 with the thesis entitled "One-Way Flat Plate Planning at Ratu Plaza Madiun. He then obtained a Master's degree in Civil Engineering, Transportation Concentration from Brawijaya University in 2001 with a thesis entitled "Family Movement Awakening Model in Sawojajar Housing Area, Malang." He also teaches several subjects such as Pavement Planning, Geometric Road Planning, Transportation Planning, and Environmental Engineering.