Industry X.0 and Strategic Ambidextrous Trilogy of Professional Engineering, Industrial Engineering and Business Engineering

K E N Soebandrija*
Industrial Engineering Department, Faculty of Engineering, Bina Nusantara University, Jakarta, Indonesia 11480

*Corresponding author: Knugroho@Binus.edu

Abstract. Industry X.0 colligates agile, nimble and breakthrough smart technologies in digital transformation of industry era. In this paper, the mentioned Industry X.0 synergizes strategic ambidextrous trilogy of professional engineering, industrial engineering and business engineering. The objective of this paper is to enhance the theoretical perspectives within industrial and managerial implementation in Indonesia and Global Situation. The enhancement is intended to accelerate corporate operational efficiency and corporate wide growth. The research methodology in this paper refers to quantitative strategic ambidextrous approach that requires exploration and exploitation trilogy. This trilogy enhances every single advantage from unison of professional engineering, industrial engineering and business engineering. The result and discussion of this paper refers to 4 indispensable corporate transformations through both exploration and exploitation within unison of incremental and radical innovation, known as ambidexterity. Those 4 corporate transformations are characterized by the strategic ambidextrous trilogy toward: a. manufacturing and production; b. design and product engineering; c. innovation and growth; d. support and services. Ultimately both Industry X.0 and Strategic Ambidextrous Trilogy synergize into sustainable transformation to enhance theoretical perspective within industrial and managerial implementation through several benchmarks. Those benchmarks refer to Industry 4.0 (IR 4.0), Making Indonesia 4.0 (MI 4.0), Society 5.0, and Hallyu 2.0.

1. Introduction
Industry X.0 colligates agile, nimble and breakthrough smart technologies in digital transformation of industry era. In this paper, the mentioned Industry X.0 synergizes strategic ambidextrous trilogy of professional engineering, industrial engineering and business engineering.

There are several backgrounds surrounding the decision making to prioritize Ambidexterity as recommended strategic implementation in Industry X.0. The aforementioned strategic implementation is useful for the turbulence of volatility, uncertainty, complexity and ambiguity of the situation in the digital transformation of industry era. Therefore, there are still open rooms for ambidexterity in the strategic implementation in the corporate.
2. Materials

The objective of this paper is to enhance the theoretical perspectives within industrial and managerial implementation in Indonesia and Global Situation. The enhancement is intended to accelerate corporate operational efficiency and corporate wide growth.

The implementation of the aforementioned industrial and managerial implementation refers to the productive publication of scholar works from the Institute of Industrial and Systems Engineering (IISE), within Industrial Engineering, as illustrated in Table 1 [2].

Table 1. Publication of Institute of Industrial and Systems Engineering (IISE) within Ambidextrous Organization

| No | Total Citation | Publication Title | Author(s) | Year |
|----|----------------|-------------------|-----------|------|
| 1  | 775            | Economic production cycles with imperfect production processes | Rosenblatt M.J., Lee H.L. [3] | 1986 |
| 2  | 510            | An EOQ model for items with Weibull distribution deterioration | Covert R.P., Philip G.C. [4] | 1973 |
| 3  | 458            | A review of multivariate control charts | Lowry C.A., Montgomery D.C [5] | 1995 |
| 4  | 458            | Facility location under uncertainty: A review | Snyder L.V. [6] | 2006 |
| 5  | 449            | An algorithm for the control of a flexible manufacturing system | Kinmena J., Gershwin S.B [7] | 1983 |
| 6  | 427            | A Review of Production Planning and Scheduling Models in the Semiconductor Industry Part I: System Characteristics, Performance Evaluation and Production Planning | Uzsoy R., Lee C.-Y. [8] | 1992 |
| 7  | 412            | Residual-life distributions from component degradation signals: A Bayesian approach | Gebraeel N.Z., Lawley M.A., Li R., Ryan J.K [9] | 2005 |
| 8  | 381            | Appointment scheduling in health care: Challenges and opportunities | Gupta D., Denton B. [10] | 2008 |
| 9  | 329            | Travel-time models for automated storage/retrieval systems | Bozer Y.A., White J.A., Sr. [11] | 1994 |
| 10 | 323            | On how to prioritize design requirements during the QFD planning process | Wasserman G.S. [12] | 1993 |
| 11 | 312            | Strategies for robust multiresponse quality engineering | Pignattello J.J., Jr. [13] | 1991 |
| 12 | 292            | Application of the similarity coefficient method in group technology | Seifioglu H., Wolfe P.M., Sr. [14] | 1986 |
| 13 | 291            | A review of production planning and scheduling models in the semiconductor industry part h: Shop-floor control | Uzsoy R., Lee C.-Y., Martin-Vega L.A. [15] | 1994 |
| 14 | 280            | Reliable preventive maintenance scheduling | Malik M.A.K. [16] | 1979 |
| 15 | 279            | Determining the importance weights for the customer requirements In QFD using a fuzzy AHF with an extent analysis approach | Kwong C.K., Bai H. [17] | 2003 |
| 16 | 256            | A review of integrated analysis of production-distribution systems | Sarmiento A.M., Nage R. [18] | 1999 |
| 17 | 234            | Design of automatic guided vehicle systems | Maxwell W.L. [19] | 1982 |
| 18 | 230            | Controlling factor weights in data envelopment analysis | Roll Y., Cook W.D., Godany B. [20] | 1991 |
| 19 | 226            | Robustness measures and robust scheduling for job shops | Leon E.J., Wu S.D., Storer R.H. [21] | 1994 |
| 20 | 220            | An AHP framework for prioritizing customer requirements in QFD: An industrialized housing application | Armacost R.L., Componation P.J., Mullens M.A., Swart W.W. [22] | 1994 |

3. Methods

The research methodology in this paper refers to quantitative strategic ambidextrous approach that requires exploration and exploitation trilogy [23], [24], [25], [26]. The ambidextrous trilogy enhances every single advantage from unison of professional engineering, industrial engineering and business engineering that require corporate transformation. In this situation, corporate transformations are characterized by the strategic ambidextrous trilogy toward: a. manufacturing
and production; b. design and product engineering; c. innovation and growth; d. support and services.

4. Result and Discussion

The result and discussion of this paper refers to 4 indispensable corporate transformations through both exploration and exploitation within unison of incremental and radical innovation, known as ambidexterity.

Those 4 corporate transformations are characterized by the strategic ambidextrous trilogy toward: a. manufacturing and production; b. design and product engineering; c. innovation and growth; d. support and services. Ultimately both Industry X.0 and Strategic Ambidextrous Trilogy synergize into sustainable transformation to enhance theoretical perspective within industrial and managerial implementation through several benchmarks. Those benchmarks refer to Industry 4.0 (IR 4.0), Making Indonesia 4.0 (MI 4.0), Society 5.0, and Hallyu 2.0.

Agile, nimble and breakthrough smart technologies constitute characteristics of Industry X.0. Therefore, the roles of ambidextrous characteristics are indispensable, including its trilogy of professional engineering, industrial engineering and business engineering. The Industry X.0, according to Accenture, has its unique path within the ambidextrous organization toward digital transformation in digital era. In term of Innovation and Growth, corporate is required to synergize the decision making toward their disruptive business model innovation within products and services in order to provide customers the new excellence level.

Furthermore, in term of Manufacturing and Production, Industry X.0 is established based upon individual customer requirements within design phase. To some extent, this requirement is further followed up into manufacturing process using cutting edge technologies toward cost reductions while simultaneously augment the world class quality standards. Eventually, in term of Service and Support, Industry X.0 is personalized to cater each unique customer’s requirements. The agile, nimble and breakthrough smart technologies of Industry X.0 is enabled through the Artificial Intelligence software and networks.

5. Conclusion

Industry X.0 colligates agile, nimble and breakthrough smart technologies in digital transformation of industry era. In this paper, the mentioned Industry X.0 synergizes strategic ambidextrous trilogy of professional engineering, industrial engineering and business engineering.

The objective of this paper is to enhance the theoretical perspectives within industrial and managerial implementation in Indonesia and Global Situation. The enhancement is intended to accelerate corporate operational efficiency and corporate wide growth. The research methodology in this paper refers to quantitative strategic ambidextrous approach that requires exploration and exploitation trilogy.

This trilogy enhances every single advantage from unison of professional engineering, industrial engineering and business engineering. The result and discussion of this paper refers to 4 indispensable corporate transformations through both exploration and exploitation within unison of incremental and radical innovation, known as ambidexterity.

Those 4 corporate transformations are characterized by the strategic ambidextrous trilogy toward: a. manufacturing and production; b. design and product engineering; c. innovation and growth; d. support and services. Ultimately both Industry X.0 and Strategic Ambidextrous Trilogy synergize into sustainable transformation to enhance theoretical perspective within industrial and managerial implementation through several benchmarks. Those benchmarks refer
to Industry 4.0 (IR 4.0), Making Indonesia 4.0 (MI 4.0), Society 5.0, and Hallyu 2.0.

The Industry X.0 has its unique path within the ambidextrous organization toward digital transformation in digital era. In term of Innovation and Growth, corporate is required to synergize the decision making toward their disruptive business model innovation within products and services in order to provide customers the new excellence level.

Furthermore, in term of Manufacturing and Production, Industry X.0 is established based upon individual customer requirements within design phase. To some extent, this requirement is further followed up into manufacturing process using cutting edge technologies toward cost reductions while simultaneously augment the world class quality standards.

References

[1] Lis, A, Józefowicz, B, Tomanek, M, Gulak-Lipka, P 2018 The Concept of the Ambidextrous Organization: Systematic Literature Review International Journal of Contemporary Management 17 77–97

[2] Hu, S 2019 Fifty years of IJSE Transactions: A bibliometric overview. IOSR Journal of Mechanical and Civil Engineering 16 76-87

[3] Rosenblatt, M J and Lee, H L 1986 Economic production cycles with imperfect production processes IIE Transactions 18 48–55

[4] Covert R P and Philip G C 1973 An EOQ model for items with Weibull distribution deterioration AIIE Transactions 5 (4) 323–326

[5] Laengle S, Modak N M, Merigó J M and De La Sota C 2018 Thirty years of the International Journal of Computer Integrated Manufacturing: A bibliometric analysis. International Journal of Computer Integrated Manufacturing 31 (12) 1247–1268

[6] Snyder L V 2006 Facility location under uncertainty: A review IIE Transactions 38 (7) 547–564

[7] KchaouBoujelben M and Boulaksil Y 2018 Modeling international facility location under uncertainty: A review, analysis, and insights IIE Transactions 50 (6) 535–551

[8] Vieira E S, Cabral J A S and Gomes J A N F 2014 Definition of a model based on bibliometric indicators for assessing applicants to academic positions Journal of the American Society for Information Science & Technology 65 (3) 560–577

[9] Fu H, Fang K and Fang C 2018 Characteristics of scientific impact of Resources Conservation and Recycling in the past 30 years Resources, Conservation & Recycling 137 251–259

[10] Gupta D and Denton B 2008 Appointment scheduling in health care: Challenges and opportunities IIE Transactions 40 (9) 800–819

[11] Bottani E and Vignali G 2019 Augmented reality technology in the manufacturing industry: A review of the last decade IIE Transactions 51 (3) 284–310

[12] Wang C, Lim M K and Lyons A 2018 Twenty years of the International Journal of Logistics Research and Applications: A bibliometric overview International Journal of Logistics Research and Applications 22 (3) 304–323

[13] Noyons E C M, Moed H F and Luwel M 1999 Combining mapping and citation analysis for evaluative bibliometric purposes: A bibliometric study Journal of the American Society for Information Science 50 (2) 115–131

[14] Scis Team. 2009. Science of Science (Scis) Tool. Indiana University and SciTech Strategies. Retrieved from http://sci.slis.indiana.edu.

[15] Zupic I and Cater T 2015 Bibliometric methods in management and organization. Organizational Research Methods 18 (3) 429–472

[16] Merigó J M, Pedrycz W, Weber R and de la Sotta C 2018. Fifty years of Information Sciences: A bibliometric overview Information Sciences 432 245–268

[17] Kessler M M 1963 Bibliographic coupling between scientific papers. American
Documentation 14 (1) 10–25

[18] Small H 1973 Co-citation in the scientific literature: a new measure of the relationship between two documents Journal of the American Society for Information Science 24 (4) 265–269

[19] Merigó J M, Pedrycz W, Weber R and de la Sotta C 2018 Fifty years of Information Sciences: A bibliometric overview Information Sciences 432 245–268

[20] Bottani E and Vignali G 2019 Augmented reality technology in the manufacturing industry: A review of the last decade IIEE Transactions 51 (3) 284–310

[21] Laengle S, Modak N M, Merigó J M and De La Sotta C 2018 Thirty years of the International Journal of Computer Integrated Manufacturing: A bibliometric analysis International Journal of Computer Integrated Manufacturing 31 (12) 1247–1268

[22] Archambault É, Campbell D, Gingras Y and Larivière V 2009 Comparing bibliometric statistics obtained from the web of science and Scopus Journal of the American Society for Information Science and Technology 60 (7) 1320–1326

[23] Basias N and Pollais Y 2018 Quantitative and Qualitative Research in Business & Technology: Justifying a Suitable Research Methodology Review of Integrative Business and Economics Research 7 91-105

[24] Goertz G and Mahoney J 2012 A Tale of Two Cultures: Qualitative and Quantitative Research in the Social Sciences New York: Princeton University Press.

[25] Martin W and Bridgmon K 2012 Quantitative and Statistical Research Methods. From Hypothesis to Results New York: John Wiley & Sons

[26] Yin R 2011 Applications of Case Study Research New York: SAGE Publications